Application For
Certificate of Public Convenience and Necessity

And

Utility Permit Application
Part 2

Barnhart-Branch River
Electric Reliability Project

PSCW Docket No.
137-CE-162

October 2012

AMERICAN TRANSMISSION COMPANY®

INTRODUCTION AND OVERVIEW

SECTION **PAGE**

A. INTRODUCTION 1
B. PROJECT DESCRIPTION 1
C. PURPOSE AND NECESSITY 2
D. PROJECT COST 3
E. CONSTRUCTION SCHEDULE 3
F. ENVIRONMENTAL IMPACTS 3
G. ENTITIES AFFECTED 4
H. COST OF OPERATION AND RELIABILITY OF SERVICE 4
I. CONCLUSION 4

TECHNICAL SUPPORT DOCUMENT

SECTION **PAGE**

2.1 ENGINEERING INFORMATION 1
2.1.1 Type and Location of Line Construction 1
2.1.2 General Description of Proposed Line 21
2.1.3 Transmission Studies 28
2.1.4 Substation Facilities 43
2.1.5 Contractual Agreements 50
2.1.6 Transmission Service Agreements 50
2.1.7 Transmission Costs 50
2.1.8 Construction Schedule and Seasonal Construction Constraints 65
2.1.9 Transmission Tariffs 66
2.2 PROJECT DEVELOPMENT AND ALTERNATIVES CONSIDERED 67
2.2.1 Local Transmission-Level Alternatives 67
2.2.2 Route Evaluation Factors 69
2.2.3 Route Corridor Alternatives 70
2.2.4 Public Outreach 71

SECTION **PAGE**

2.3 GENERAL TRANSMISSION LINE SITING INFORMATION.....73
2.3.1 General Route Maps 73
2.3.2 Aerial Photographs 73
2.3.3 GIS Data..... 73
2.3.4 Zoning..... 74
2.3.5 Land Use Plans 74
2.3.6 Floodplain Maps 74
2.4 DETAILED ROUTE INFORMATION.....75
2.4.1 General Route Impacts 75
2.4.2 Detailed Route Impacts by Existing Land Cover 95
2.4.3 Impacts by Land Ownership – Public & Tribal Lands 105
2.4.4 Route Summary Table (Table 4).....108
2.4.5 Agricultural Information by Segment and Route (Table 2).....113
2.4.6 Forest Land Segment and Route Summaries (Table 2).....116
2.4.7 Conservation Easements 118
2.4.8 Endangered, Threatened, or Special Concern Species and Natural Communities 118
2.4.9 Archaeological and Historic Resources.....120
2.4.10 Project Affected Airports.....120
2.4.11 Off ROW Construction Access Issues 121
2.4.12 Waterway Permitting Activities.....121
2.4.13 Wetlands and Wetland Crossings 122
2.4.14 Mapping Wetland and Waterway Crossings.....126
2.5 CONSTRUCTION METHODS 127
2.5.1 General Construction Information.....127
2.5.2 Underground Construction Details 133
2.5.3 Stream/River Crossings.....133
2.5.4 Wetland Crossings.....134
2.5.5 Re-vegetation.....138

SECTION **PAGE**

2.5.6 Erosion Control Plan (sites greater than 1 acre) 140
2.5.7 Materials Management Plan 145
2.5.8 Dewatering Plan 152
2.6 SUBSTATION INFORMATION 154
2.6.1 Substation Location, Dimensions & Layout 154
2.6.2 Size (acres) and Orientation 154
2.6.4 Substation Plat and Topographic Maps 155
2.6.5 Transmission Lines and Structures 155
2.6.6 Access Roads 157
2.6.7 Construction Procedures including erosion control techniques (see section 2.5.6) 157
2.6.8 Environmental Information including: 158
2.7 EMF INFORMATION 164
2.7.1 Transmission Line EMF 164
2.7.2 Existing Substations EMF levels (affected by new generation and/or transmission lines) on drawing including: 166
2.7.3 New Power Plants (requiring no line additions 166
2.8 WDNR PERMITS AND APPROVALS 167
2.8.1 Waterways and Wetlands 167
2.8.2 Wetlands Practicable Alternatives Analysis including: 168
2.8.3 Storm Water Management Permit 171
2.8.4 Endangered/Threatened Species Analysis and Incidental Take Request for Authorization 171
2.9 OTHER AGENCY CORRESPONDENCE 172
2.9.1-2.9.2 Copies of ATC Correspondence with Other State, Federal and Local Government Agencies 172
2.9.3 Agency Permits 172
2.10 PROPERTY OWNER INFORMATION 174
2.10.1 Property Owners 174
2.10.2 Public Property 174

SECTION **PAGE**

2.10.3 Clerks of Cities, Villages, Townships, Counties, and Regional Planning Commissions.....174

2.10.4 State and Federal Agencies/Local Media 174

APPENDIX A	PROJECT MAPS & ENVIRONMENTAL TABLES	PAGES
Figure 1	Proposed Project (shows proposed & alternate routes)	1
Figure 2 Alt 1	Alternative 1 Page Index – 1"=400' Scale Maps	1
Figure 2 Alt 1A	Alternative 1A Page Index – 1"=400' Scale Maps	1
Figure 2 Alt 1B	Alternative 1B Page Index – 1"=400' Scale Maps	1
Figure 2 Alt 2	Alternative 2 Page Index – 1"=400' Scale Maps	1
Figure 2 OPGW	OPGW Page Index – 1"=400’ Scale Maps	1
Figure 3 Alt 1	Alternative 1 Page Index – 1"=2000' Scale Maps	1
Figure 3 Alt 1A	Alternative 1A Page Index – 1"=2000' Scale Maps	1
Figure 3 Alt 1B	Alternative 1B Page Index – 1"=2000' Scale Maps	1
Figure 3 Alt 2	Alternative 2 Page Index – 1"=2000' Scale Maps	1
Figure 4 Alt 1	Existing Land Use Alternative 1	13
Figure 4 Alt 1A	Existing Land Use Alternative 1A	6
Figure 4 Alt 1B	Existing Land Use Alternative 1B	6
Figure 4 Alt 2	Existing Land Use Alternative 2	12
Figure 5 Alt 1	Orthophotography Alternative 1	67
Figure 5 Alt 1A	Orthophotography Alternative 1A	27
Figure 5 Alt 1B	Orthophotography Alternative 1B	29
Figure 5 Alt 2	Orthophotography Alternative 2	63
Figure 6 Alt 1	Topography Alternative 1	13
Figure 6 Alt 1A	Topography Alternative 1A	6
Figure 6 Alt 1B	Topography Alternative 1B	6
Figure 6 Alt 2	Topography Alternative 2	12

APPENDIX A	PROJECT MAPS & ENVIRONMENTAL TABLES	PAGES
Figure 7 Alt 1	Zoning Alternative 1	13
Figure 7 Alt 1A	Zoning Alternative 1A	6
Figure 7 Alt 1B	Zoning Alternative 1B	6
Figure 7 Alt 2	Zoning Alternative 2	12
Figure 8 Alt 1	Tax Parcels Alternative 1	67
Figure 8 Alt 1A	Tax Parcels Alternative 1A	27
Figure 8 Alt 1B	Tax Parcels Alternative 1B	29
Figure 8 Alt 2	Tax Parcels Alternative 2	63
Figure 9 Alt 1	Floodplain Alternative 1	13
Figure 9 Alt 1A	Floodplain Alternative 1A	6
Figure 9 Alt 1B	Floodplain Alternative 1B	6
Figure 9 Alt 2	Floodplain Alternative 2	12
Figure 10	Adopted Land Use Plans	61
Figure 11A	Airport Height Limitation Manitowoc County	1
Figure 11B	Airport Height Limitation Sheboygan County	1
Figure 12 Alt 1	Confined Animal Operations & Distribution Facilities Alternative 1	13
Figure 12 Alt 1A	Confined Animal Operations & Distribution Facilities Alternative 1A	6
Figure 12 Alt 1B	Confined Animal Operations & Distribution Facilities Alternative 1B	6
Figure 12 Alt 2	Confined Animal Operations & Distribution Facilities Alternative 2	12
Figure 13 Alt 1	Environmental Features & Access Plan Alternative 1	67
Figure 13 Alt 1A	Environmental Features & Access Plan Alternative 1A	27
Figure 13 Alt 1B	Environmental Features & Access Plan Alternative 1B	29

APPENDIX A	PROJECT MAPS & ENVIRONMENTAL TABLES	PAGES
Figure 13 Alt 2	Environmental Features & Access Plan Alternative 2	63
Figure 13 OPGW	Environmental Access Plan OPGW	87
Figure 14	Laydown Yards	6
Figure 15	Branch River North Tax Parcels	1
Figure 16	Branch River South Tax Parcels	1
Figure 17	Branch River North Topography	1
Figure 18	Branch River South Topography	1
Figure 19	Barnhart North Tax Parcels	1
Figure 20	Barnhart South Tax Parcels	1
Figure 21	Barnhart North Topography	1
Figure 22	Barnhart South Topography	1
Figure 23	Branch River North Environmental Access Plan	2
Figure 24	Branch River South Environmental Access Plan	2
Figure 25	Barnhart North Environmental Access Plan	6
Figure 26	Barnhart South Environmental Access Plan	6
Table 1A	General Route Impacts	
	- 345 kV Alternative 1, 138 kV Alternative 1A	2
	- 345 kV Alternative 1, 138 kV Alternative 1A	3
	- 345 kV Alternative 2	2
Table 1B	Distance to Potentially Sensitive Buildings	
	- 345 kV Alternative 1, 138 kV Alternative 1A	1
	- 345 kV Alternative 1, 138 kV Alternative 1A	2
	- 345 kV Alternative 2	1
Table 2	Impacts by Segment and Route	
	- 345 kV Alternative 1, 138 kV Alternative 1A	2
	- 345 kV Alternative 1, 138 kV Alternative 1A	3
	- 345 kV Alternative 2	2

APPENDIX A	PROJECT MAPS & ENVIRONMENTAL TABLES	PAGES
Table 3	Impacts – Public and Tribal Lands	
	- 345 kV Alternative 1, 138 kV Alternative 1A	2
	- 345 kV Alternative 1, 138 kV Alternative 1A	1
	- 345 kV Alternative 2	2
Table 4	Route Impact Summary	
	- 345 kV Alternative 1, 138 kV Alternative 1A	1
	- 345 kV Alternative 1, 138 kV Alternative 1A	1
	- 345 kV Alternative 2	1

APPENDIX B	TRANSMISSION FACILITIES	PAGES
Figure 1	Existing 345 kV Double-Circuit I-String Lattice Tower	1
Figure 2	345 kV Double-Circuit I-String Steel Pole	1
Figure 3	Existing 138 kV Double-Circuit I-String Steel Pole	1
Figure 4	138 kV Single-Circuit Delta Steel Pole with Braced-Post Insulators	1
Figure 5	138 kV Single-Circuit Vertical Steel Pole	1
Figure 6	138 kV Single-Circuit Vertical Steel Pole with Horizontal Post Insulators	1
Figure 7	138 kV Single-Circuit Delta I-String Pole	1
Figure 8	138 kV Double-Circuit Steel Pole	1
Figure 9	345 kV Double-Circuit V-String Pole	1
Figure 10	345 kV Single-Circuit Delta V-String Pole	1
Figure 11	345 kV Single-Circuit Vertical V-String Pole	1
Figure 12	Barnhart Substation – North, Alternative 1	1
Figure 13	Barnhart Substation – South, Alternative 1	1
Figure 14	Barnhart Substation – North, Alternative 2	1
Figure 15	Barnhart Substation – South, Alternative 2	1

APPENDIX B	TRANSMISSION FACILITIES	PAGES
Figure 16	Branch River Substation – North, Alternative 1	1
Figure 17	Branch River Substation – South, Alternative 1	1
Figure 18	Branch River Substation – North, Alternative 2	1
Figure 19	Branch River Substation – South, Alternative 2	1
Figure 20	Forest Junction Substation, Alternative 1	1
Figure 21	Howards Grove Substation, Alternatives 1A and 1B	1
Figure 22	Erdman Substation, Alternatives 1A and 1B	1
Figure 23	Point Beach Substation, Alternatives 1 and 2	1
Figure 24	345 kV Substation, Typical Elevation Drawing	1

APPENDIX C	TRANSMISSION STUDIES	PAGES
Exhibit 1	Project Scoping Document	75
Exhibit 2	Interconnection System Impact Study	132
Exhibit 3	Interim Operation Study	102

APPENDIX D	PUBLIC OUTREACH	PAGES
Exhibit 1	Open House One	17
Exhibit 2	Open House Two	22
Exhibit 3	Open House Three	19

APPENDIX E	WDNR UTILITY PERMIT APPLICATION	PAGES
	WDNR Utility Permit Application-Part 1	100

APPENDIX F	EMF STUDIES	PAGES
	Report on Magnetic Field Evaluation	184

APPENDIX G	AGENCY CORRESPONDENCE	PAGES
Exhibit 1	Detailed Project Plan	7
Exhibit 2	WDNR Response to Detailed Project Plan	1
Exhibit 3	WisDOT Constructability Report Transmittal 3/5/2012	1
Exhibit 4	WisDOT Constructability Report 7/27/2012	48
Exhibit 5	Wetland Delineation Report Transmittal	1
Exhibit 6	WisDOT Constructability Report Response	1
Exhibit 7	Communications – Local Permitting Authorities	24

APPENDIX H	MAILING LISTS	PAGES
List 1	Property Owners	9
List 2	Public Property Owners	1
List 3	Clerks, Libraries, Regional Planning Commissions, Media, Agencies	2
List 4	Local Officials	4

APPENDIX I	ENVIRONMENTAL SUPPORT	PAGES
Exhibit 1	Endangered Resource Review Request	6
Exhibit 2	Endangered Resources Review	8
Exhibit 3	Cultural Resources Review	88

ATC	American Transmission Company
BER	Bureau of Endangered Resources (WDNR)
BHA	Barnhart Substation
BMPs	Best Management Practices
BRV	Branch River Substation
CCRG	Commonwealth Cultural Resources, Inc.
CPCN	Certificate of Public Convenience and Necessity
CTH	County Trunk Highway
DATCP	Department of Agriculture Trade and Consumer Protection
EAP	Environmental Access Plan
EMF	electromagnetic field
ft	feet
I-43	United States Interstate Highway 43
kcmil	kilo circular mils
kV	kilovolt
Midwest ISO	Midwest Independent Transmission System Operator
MVA	megavolt amperes
NAIP	National Agriculture Imagery Program
NERC	North American Electric Reliability Council
OPGW	optical ground wire
PSCW	Public Service Commission of Wisconsin (Commission)
PSS/E	Power System Simulation/Engineering program
ROW	right-of-way
STH	State Trunk Highway
USACE	United States Army Corps of Engineers
WDNR	Wisconsin Department of Natural Resources (Department)
WisDOT	Wisconsin Department of Transportation

A. INTRODUCTION

American Transmission Company LLC and ATC Management Inc., its corporate manager, known collectively as American Transmission Company (ATC), own and operate transmission facilities and transact business as a transmission company with the sole purpose of planning, constructing, operating, and maintaining the transmission facilities that it owns. ATC is obligated to provide adequate and reliable energy transmission service and facilities that meets the needs of all transmission users in the area it serves and supports effective competition in energy markets without favoring any market participant.

Application for Certificate of Public Convenience and Necessity: To meet this obligation, pursuant to the requirements of *Wis. Stat.* §§ 196.49 and 196.491 and *Wis. Admin. Code* chs. PSC 4, 111 and 112, ATC hereby applies to the Public Service Commission of Wisconsin (PSCW) for a Certificate of Public Convenience and Necessity (CPCN), together with any other authorization necessary, to construct two new substations with a new interconnecting 345 kV transmission line, related 138 kV transmission lines dependent on the project alternative and associated facilities. This project is generally known as the Barnhart-Branch River Electric Reliability Project (Project) and is described in further detail below.

Utility Permit Application (Part 2): Through this Application, pursuant to *Wis. Stat.* ch. 283 and §§ 30.025(1s), 30.19, 30.123 and 281.36, and *Wis. Admin. Code* chs. NR 103, 216, 299, and 320, ATC hereby applies to the Wisconsin Department of Natural Resources (WDNR) for the permits and authorizations necessary to construct the proposed facilities.

This Joint Application has been prepared in accordance with the PSCW, WDNR and DATCP *Application Filing Requirements for Transmission Line Projects in Wisconsin*, Version 18B (Application Filing Requirements).

B. PROJECT DESCRIPTION

The proposed Project involves constructing two new substations, one each in Manitowoc and Sheboygan counties, at one of two locations, interconnecting existing ATC 345 kV transmission lines at or near the proposed substation locations. A new 345 kV transmission line would be constructed between the new substations. ATC is proposing to construct the new 345 kV transmission line through one of two Project Alternatives.

Project Alternative 1, preferred by ATC, would construct the new 345 kV line with as a double-circuit line with an existing 345 kV transmission line, primarily on existing structures in an existing transmission line right-of-way,

displacing a 138 kV transmission line. The displaced 138 kV transmission line would be replaced by a new 138 kV transmission line constructed on one of two route alternatives (Alternative 1A and Alternative 1B). This Project Alternative maximizes the use of existing ATC facilities, thereby minimizing new right-of-way required, associated environmental impacts, and project cost. The other alternative, Project Alternative 2, would construct the new 345 kV transmission line, primarily as a single-circuit line within new right-of-way. Transmission line details are presented in Sections 2.1.1 and 2.1.2 of the attached Technical Support Document (TSD).

The proposed new substations to be owned by ATC are the Barnhart Substation (BHA), to be located in Sheboygan County, and the Branch River Substation (BRV), to be located in Manitowoc County. ATC is proposing two locations for each substation, referred to as the Barnhart North, Barnhart South, Branch River North, and the Branch River South. ATC's preferred locations are the Branch River South Substation Option and the Barnhart South Substation Option.

Additional proposed substation work consists of the addition of a 345 kV line termination at Forest Junction Substation (Project Alternative 1 only) small expansions of the fenced area (on existing substation property) at the Howards Grove Substation to accommodate the new 138 kV transmission line (Alternative 1 only), and the Point Beach Substation to accommodate the addition of a 345 kV line breaker. Various minor modifications, all inside the existing fenced areas, at other substations (including Erdman, Forest Junction, Edgewater, Sheboygan Energy Center, and others) are required. The number of existing substations requiring minor work varies between the Project Alternatives. Substation details are presented in Section 2.1.6 of the attached Technical Support Document (TSD).

The Project also includes the installation of new Optical Ground Wire (OPGW) on several circuits; a thermal uprate on 345 kV line 796L41 resulting in the replacement of six to eight structures depending on the Project Alternative; and the replacement of several structures on 138 kV line X-2 to strengthen them to be able to hold the OPGW.

C. PURPOSE AND NECESSITY

The purpose of the Project is to strengthen the ATC transmission system to increase operational flexibility in eastern Wisconsin and remove operating restrictions on the Point Beach (NextEra Energy) and Kewaunee (Dominion) nuclear generating units that are necessary to assure reliable operation of the transmission system. These restrictions, which exist under both normal

and contingency conditions, can be alleviated by reconfiguring the 345 kV transmission system in eastern Wisconsin.

Under normal conditions the minimum excitation level of the Point Beach and Kewaunee units need to be adjusted to maintain the reactive power output of the generating units above a certain required level. This condition needs to be maintained to ensure generation stability in anticipation of critical fault conditions until the proposed project is in service. Under low system load conditions, maintaining this minimum level of reactive output inhibits the ability of ATC to use the units to control system voltage.

ATC's studies also show that generator instability can occur at the Point Beach, Kewaunee and Fox Energy generating units should certain system faults occur under prior transmission system outage conditions. These issues are presently addressed by limiting the power output of the Point Beach and Kewaunee generating units. This condition prevents ATC from providing the required level of service to the generators and reliability delivering power to load.

Additional detail and discussion can be found in Section 2.1.3, and Appendix C of the TSD.

D. PROJECT COST

ATC estimates the total cost of the proposed project to be between $192,966,000 and $261,739,800 depending on the project alternative, route and substation sites ordered by the Commission. Estimated project costs are set forth in greater detail in Section 2.1.7 of the TSD.

E. CONSTRUCTION SCHEDULE

If the proposed Project is approved, depending on the alternative chosen by the PSCW, ATC expects to begin construction in 2015 with the project in service in 2018. Additional detail may be found in Section 2.1.8 of the TSD.

F. ENVIRONMENTAL IMPACTS

ATC believes this Project is categorized as a Type 1 action pursuant to *Wis. Admin. Code* § PSC 4.10(1). Information necessary for the initial preparation of an Environmental Impact Statement is provided in the attached TSD.

In accordance with *Wis. Stat*. § 30.025(1s), ATC submitted Part 1 of its Utility Permit Application to the WDNR for the proposed Project on August 31, 2012. (*See* Appendix E) Part 1 included the required permit application forms. This Joint Application to the PSCW and WDNR includes Part 2 of ATC's Utility Permit Application. The information contained within the attached TSD and Appendices includes the information required by the WDNR to evaluate

and issue the required permits for construction. This information is being provided to the WDNR by copy of this Joint Application.

G. ENTITIES AFFECTED

The Project affects several federal, state, regional and local units of government. Mailing lists in the prescribed format for affected public, government officials, libraries and other entities requiring notification are provided in the TSD, Appendix H.

If the Project is approved, then certain units of local government may attempt to assert permitting authority over its construction and operation. Wisconsin law grants the PSCW exclusive jurisdiction to determine the need for, location of and type of facilities, along with other pertinent conditions for the construction and operation of high voltage transmission lines and associated facilities. Further, the statutes provide that any local ordinance that interferes with the construction or operation of PSCW-approved facilities is preempted. Nonetheless, it is ATC's practice to keep local governments advised of construction activities and plans even when a local ordinance is unenforceable by virtue of state law. Furthermore, certain local ordinances of general application that provide for public safety and welfare (such as highway load limits or restrictions on the hours during which construction can occur) may apply to the Project. It is ATC's practice to apply for and obtain such permits from affected local governmental units. A fuller discussion of ATC's policy for dealing with local ordinances, regulations and permits is in Section 2.9.3 of the attached TSD.

H. COST OF OPERATION AND RELIABILITY OF SERVICE

The proposed project is the most reasonable means for discharging ATC's obligation as a public utility and transmission company to provide reliable, competitively-priced transmission service to all users. The proposed transmission facilities will accommodate electric generation facilities that are necessary to meet the growing electrical needs of ATC's distribution customers. The proposed facilities meet this need and do not provide facilities in excess of present and probable future requirements. When placed in operation, the proposed facilities will not result in annual costs disproportionate to the service value of the work performed or the quantity of available service.

I. CONCLUSION

Based on the material contained in this application, and any subsequent material requested by the Commission and the Department or its staff relative to this application, ATC requests that the Commission issue a

Certificate of Public Convenience and Necessity and other such authorizations as may be required to construct the transmission facilities as described and in the manner set forth, and to determine the amount of the environmental impact fee and the allocation of that fee to the appropriate parties.

Similarly, ATC requests that the WDNR issue all the permits and authorizations as may be required to construct the transmission facilities as described and in the manner set forth, within 30 days of the date that the PSCW issues its decision on the CPCN Application, pursuant to *Wis. Stat.* § 30.025(4).

Respectfully submitted this 16 th day of October 2012

American Transmission Company LLC, and ATC Management Inc.

/s/ Stephen Parker

Stephen Parker
Manager, State Regulatory Affairs
ATC Management Inc.

TECHNICAL SUPPORT DOCUMENT

The information provided below follows the format of the Public Service Commission of Wisconsin (PSCW or Commission), Department of Natural Resources (WDNR), and Department of Agriculture, Trade and Consumer Protection's, "Application Filing Requirements for Transmission Line Projects in Wisconsin," Version 18B (February 2012). The information provided relates to the proposed construction project for which authority is sought in this application.

2.1 ENGINEERING INFORMATION

2.1.1 Type and Location of Line Construction

Two Project Alternatives are proposed. The scope of the substation and transmission line construction required varies depending on the Project Alternative as discussed below.

Two New 345 kV Substations (Common to Project Alternatives)

One substation, to be known as the Branch River Substation (BRV), would be constructed in the town of Franklin, Manitowoc County, in close proximity to existing 345 kV circuits 121 (Point Beach-Forest Junction) and 111 (Point Beach-Sheboygan Energy Center). These 345 kV circuits would be split and routed into the substation creating circuits 121E and 111E (Point Beach-Branch River), 121W (Branch River-Forest Junction), and 111S (Branch River-Sheboygan Energy Center). New circuit, 345-BRV-BHA (Branch River-Barnhart) would also be routed into the substation. Project Alternative 1 also creates a new 345 kV circuit 345-FJT-BRV (Forest Junction-Branch River)

The other substation, to be known as the Barnhart Substation (BHA), would be constructed in the town of Lima, Sheboygan County, in close proximity to existing 345 kV transmission circuits W-1 (Edgewater-South Fond du Lac), L-SEC31 (Sheboygan Energy Center-Granville) and 796L41 (Edgewater-Cedarsauk). These 345 kV transmission lines would be split and routed into the substation resulting in new circuits W-1E and 796L41E (Edgewater-Barnhart), W-1W (Barnhart-South Fond du Lac), L-SEC31N (Sheboygan Energy Center-Barnhart), L-SEC31S (Barnhart-Granville), and 796L41S (Barnhart-Cedarsauk). The new circuit, 345-BRV-BHA (Branch River-Barnhart) would also be routed into the substation.

Construction and interconnection of the new substations with the ATC system provides two 345 kV interconnections between the two substations by way of circuits 345-BRV-BHA (Branch River-Barnhart), and

111S (Branch River-Sheboygan Energy Center) and L-SEC31N (Sheboygan Energy Center-Barnhart) through the Sheboygan Energy Center switchyard.

The new 345 kV connection between the substations would be established through one of two transmission line alternatives. Transmission Line Alternative 1 plus the substations, associated facilities and other common upgrades constitutes Project Alternative 1. Likewise, Transmission Line Alternative 2 plus the substations, associated facilities and other common upgrades constitutes Project Alternative 2.

ATC prefers Project Alternative 1 for several reasons. Alternative 1 converts an existing 138 kV line to 345 kV which maximizes the use of existing transmission line infrastructure and right-of-way (ROW) thus reducing the new environmental impacts, the number of new property owners who would be affected by the Project, and reduces the overall project cost compared to Project Alternative 2 which would construct a new 345 kV transmission line on new ROW.

Project Alternative 1 (Conversion Option, Preferred)

Project Alternative 1 would convert an existing double-circuit 345 kV/138 kV transmission line to a double-circuit 345 kV transmission line, displacing the 138 kV circuit, in the town of Brillion in Calumet County; the towns of Maple Grove, Franklin, Cato, Liberty, and Meeme, and the village of Valders in Manitowoc County; and the towns of Herman, Sheboygan Falls and Lima in Sheboygan County.

The existing transmission system in the project area includes 138 kV circuits 971K51 (Forest Junction-Howards Grove) and HOLG21 (Howards Grove-Plymouth #4-Holland Substation). Circuit 971K51 is constructed for most of its length as a double-circuit line with portions of 345 kV circuits 121 and 111, and 138 kV circuit HOLG21. HOLG21 is constructed for most of its length as a double-circuit line with portions of 345 kV circuits 111, L-SEC31 and 796L41, and 138 kV circuit 971K51.

Project Alternative 1 would remove the portions of circuits 971K51 and HOLG21 from the double-circuit structures between the Forest Junction Substation and the proposed Branch River Substation and between the proposed Branch River and Barnhart substations. The tower positions vacated by the 138 kV line would be reinforced, re-insulated and re-conductored for operation at 345 kV, creating a new Forest Junction-Branch River 345 kV circuit (345-BRV-FJT) and a new Barnhart-Branch River 345 kV circuit (345-BRV-BHA-ALT1). Some of the existing structures would require replacement due to existing conditions or to

meet required transmission line to ground clearance. The new 345 kV circuit would be connected to a new 345 kV terminal at the Forest Junction Substation, routed into the proposed Branch River Substation, and from the Branch River Substation into the proposed Barnhart Substation, bypassing Howards Grove and Plymouth #4 substations, as well as the Sheboygan Energy Center.

Implementation of Project Alternative 1 removes the 138 kV transmission lines serving the Howards Grove and Plymouth #4 substations. To restore 138 kV service to these substations and reintegrate these substations into the transmission grid, ATC proposes as part of Project Alternative 1 to construct new single-circuit 138 kV transmission lines on one of two routes in the towns of Lima, Sheboygan Falls, Herman, Mosel, and Sheboygan, and village of Howards Grove in Sheboygan County.

A 138 kV bus and 345/138 kV transformer would be constructed at the Barnhart Substation. The portion of 138 kV circuit HOLG21 from the Holland Substation, which was not displaced by the new 345 kV transmission line, would be routed into and connected to the 138 kV bus at the Barnhart Substation, resulting in a new 138 kV circuit HOLG21S (Barnhart-Holland). ATC would then construct new 138 kV transmission lines from Barnhart to Plymouth #4 and Plymouth #4 to Howards Grove (HOLG21N), and Howards Grove to the existing Erdman Substation (138-HOG-ERD) north of the city of Sheboygan, each on one of two alternate routes. The two 138 kV transmission line route alternatives are designated Alternative 1A (ATC preferred) and Alternative 1B. See Appendix A, Figure 1, for an overview of the project alternatives and routes.

The proposed route alternatives for the new 138 kV lines follow existing roads and transmission lines to the extent practical to mitigate new impacts. Each of the proposed 138 kV route options between Barnhart and Plymouth #4 substations, and between Plymouth #4 and Howards Grove substations would use portions of transmission structures supporting existing circuits 971K51 and HOLG21 that were not displaced by the new 345 kV circuit. Howards Grove Substation would be expanded on utility property to accommodate the new terminal for the line between the Howards Grove and Erdman substations. Existing transmission lines connecting at the Erdman Substation would be reconfigured for ease of routing the new line into the substation.

Additionally, to take advantage of the new 345/138 kV transformation at the proposed Barnhart Substation, 138 kV transmission circuit X-57 (South Sheboygan Falls-Mullet River), which is constructed on separate

structures parallel to the existing 345 kV circuit W-1, would be split and routed into and out of the proposed Barnhart Substation creating new 138 kV circuits X-57E (Barnhart-South Sheboygan Falls) and X-57W (Barnhart-Mullet River). These two new circuits further strengthen the 138 kV transmission system in the area.

The proposed transmission line routes were broken down into route segments for characterization and analysis. Primary segments (e.g., 1, 15, 15a) were further broken down into sub-segments (e.g., 1-1, 1-2) for environmental characterization and analysis. The routes of the proposed transmission lines are described below by primary segment.

Because of the number of lines connecting to each substation and the resulting complexity in line routing, line routing in the immediate area of the substation is described separately under "Substation Interconnection."

Route segments and substation interconnection areas are identified on the maps in Appendix A.

Alternative 1 (345 kV only)

On each of the Alternative 1 segments discussed below the new 345 kV transmission line replaces the existing the 138 kV circuit primarily on existing double-circuit lattice towers.

Segment 1. Commencing at the Forest Junction Substation, the existing double-circuit lattice tower transmission line proceeds east, primarily cross country to County Highway W. Near the Forest Junction Substation, Segment 1 is used to route 345 kV circuit 121 to a new line position on the south side of the 345 kV bus. The new 345 kV line will be routed to the west side of the bus on the existing circuit 121 structures. On sub-segments 1-1 and 1-2, circuit 121 and the new BHA-BRV-Alt 1 (replacing existing circuit 971K51) are on separate structures. Up to approximately 29 feet of new ROW width will be required in this area.

Segment 2. From County Highway W, the existing double-circuit lattice tower line continues east to the western edge of the proposed area for the Branch River Substation. No new ROW width is required. The proposed routing in the area into each of the new substation locations is described below under "Substation Interconnection."

Segment 4. From the southern edge of the proposed Branch River Substation area, the line proceeds south on existing double-circuit structures with 345 kV circuit 111S to a point where it is joined by the 345 kV circuit 111E from the Point Beach Nuclear Plant. Approximately 78

feet of new ROW width is required along this segment to route circuit 111E to the Branch River Substation. Circuit 111E would be constructed on new monopole, double-circuit structures along this segment.

Segment 14. The line continues south primarily on the existing double-circuit structures to the location where 138 kV circuits 971K51 and HOLG21 proceed east to the Howards Grove Substation. No new ROW width is required. Distribution on Ryan Lane south of CTH J would be placed underground on the opposite side of the road.

Segment 15. The line continues south primarily on the existing double-circuit structures to County Road A. (Approximately 60 feet of new ROW width will be required to accommodate 138 kV Alternative 1A and 1B.)

Segment 15a. The line continues south primarily on the existing double-circuit structures to the location where circuit HOLG21 turns west to the Plymouth #4 Substation. (Approximately 60 feet of new ROW width will be required to accommodate 138 kV Alternative 1A.)

Segment 16. The line continues south primarily on existing structures to the Sheboygan Energy Center, replacing 138 kV circuit HOLG21 on the existing structures. (Approximately 60 feet of new ROW width will be required to accommodate 138 kV Alternative 1A.)

Segment 17. The line continues south primarily on existing structures to just north of the two potential locations for the Barnhart Substation, replacing 138 kV circuit HOLG21 on the existing structures. (Approximately 60 feet of new ROW width will be required to accommodate 138 kV Alternative 1A.) The proposed routing into each of the new Branch River Substation locations is described below under "Substation Interconnection."

Alternative 1A (138 kV) (Preferred)

Unless otherwise specified in the following segment descriptions, the new 138 kV transmission line will be constructed on steel monopole structures. Where parallel to the 345 kV double-circuit structures, the new 138 kV structures will be matched span-for-span, where possible, with the 345 kV structures.

Segment 54. The new 138 kV line proceeds north and east on substation property before turning north and crossing County Highway J to Interstate Highway (I-43). Approximately 45 feet of new ROW width would be required off the substation property.

Segment 54a. The new 138 kV line continues north on the west side and within I-43 ROW to north of the I-43/State Highway 42 interchange.

Portions of the line may be outside the ROW, as necessary, around interchanges or to maintain clearances to bridge decks necessary to accommodate future bridge work. This segment requires up to an 80-foot of new ROW width.

Segment 54b. The new 138 kV transmission line continues north, located primarily within I-43 ROW to existing, unoccupied transmission line ROW south of County Road FF. Portions of the line may be outside the ROW, as necessary, around interchanges or to maintain clearances to bridge decks necessary to accommodate future bridge work. This segment requires up to an 80-foot ROW width.

Segment 12. The new 138 kV transmission line turns west within existing unoccupied 125-foot wide transmission line ROW to Union Road/County Rd. Y. No additional ROW width is required.

Segment 12a. The new 138 kV transmission line continues west from Union Rd./County Rd. Y from the Howards Grove Substation within existing unoccupied 125-foot width transmission line ROW to the Howards Grove Substation. No additional ROW width is required.

Segment 13. From the Howards Grove Substation the new 138 kV would proceed west to the double-circuit 111S/BHA-BRV utilizing the existing double-circuit HOLG21 structures and one set of conductors. No new ROW is required.

Segment 15. The line turns south parallel to the double-circuit line before crossing to the west and proceeding to County Rd. A. Approximately 60 feet of new ROW width is required to construct the new 138 kV transmission line parallel to the double-circuit 345 kV line.

Segment 15a. The new 138 kV transmission continues south past a residential subdivision south east of the crossing of County Rd. A. The line would then cross to the east side of the double-circuit line and continue south, connecting to the existing HOLG 21 138 kV line to the Plymouth #4 Substation. Approximately 60 feet of new ROW width is required to construct the new 138 kV transmission line parallel to the double-circuit 345 kV line.

Segment 16. Connecting the existing HOLG21 138 kV line from the Plymouth Substation, the new 138 kV transmission line proceeds south on steel monopole structures parallel to the existing double-circuit 345 kV transmission line to a point opposite the Sheboygan Energy Center. Approximately 60 feet of new ROW width is required to construct the new 138 kV transmission line parallel to the double-circuit 345 kV line.

Segment 17. From the point opposite the Sheboygan Energy Center, the line continues south on steel monopole structures parallel to the existing double-circuit transmission line to the area of the proposed Barnhart Substation. Approximately 60 feet of new ROW width is required to construct the new 138 kV transmission line parallel to the double-circuit 345 kV line. The proposed routing into each of the proposed Barnhart Substation locations is described below under "Substation Interconnection."

Alternative 1B (138 kV)

Unless otherwise specified in the following segment descriptions, the new 138 kV transmission line will be constructed on steel monopole structures. Where parallel to the proposed double-circuit 345 kV transmission line, the new structures will be matched span-for-span, wherever possible, with the 345 kV structures.

Segment 54. The new 138 kV line proceeds north and east on substation property before turning north and crossing County Highway J to Interstate Highway (I-43). Approximately 45 feet of new ROW width would be required off the substation property.

Segment 54a. The new 138 kV line continues north on the west side and within I-43 ROW to north of the I-43/State Highway 42 interchange. Portions of the line may be outside the ROW, as necessary, around interchanges or to maintain clearances to bridge decks necessary to accommodate future bridge work. This segment requires up to an 80-foot of new ROW width.

Segment 51. The line turns east, crossing I-43, proceeding northeast along Green Valley Lane to Dairyland Drive then north to a point south of County Rd. FF opposite where ATC's existing unoccupied ROW from the Howards Grove Substation meets the I-43 ROW. Structures would be located approximately five feet outside road ROW. 80 feet of new ROW width is required. Approximately 35 feet of new ROW width would be shared with road ROW. Distribution along Dairyland Drive would be buried on the opposite side of the road.

Segment 52. The line turns west to the I-43 ROW within new 80-foot wide ROW.

Segment 11a. The line will cross I-43 within new 80-foot wide ROW.

Segment 12. The new 138 kV transmission line would continue west within existing unoccupied 125-foot wide transmission line ROW to Union Road/County Rd. Y. No additional ROW width is required.

Segment 52a. The line would turn north following County Rd. Y to County Road FF before turning west along County Rd. FF to the Howards Grove Substation access drive. Structures would be located approximately five feet outside road ROW. 80 feet of new ROW width is required. Approximately 35 feet of new ROW width would be shared with road ROW. Distribution along County Road FF would be buried on the opposite side of the road.

Segment 53. The line would then turn south along the Howards Grove Substation access drive to the substation. 80 feet of new ROW width would be required.

Segment 13. From the Howards Grove Substation the new 138 kV line would proceed west to the double-circuit line 111S/BHA-BRV utilizing the existing double-circuit HOLG21 structures and one set of conductors. No new ROW is required.

Segment 15. The line turns south parallel to the double-circuit line before crossing to the west and proceeding to County Rd. A. Approximately 60 feet of new ROW width is required to construct the new 138 kV transmission line parallel to the double-circuit 345 kV line.

Segment 59. The line turns west along the north side of County Highway A to just east of Bridgewood Road. Structures would be located approximately five feet outside road ROW. 80 feet of new ROW width is required. Approximately 35 feet of new ROW width would be shared with road ROW.

Segment 60. The line turns south along Bridgewood Road to County Highway A. Structures would be located approximately five feet outside road ROW. 80 feet of new ROW width is required. Approximately 35 feet of new ROW width would be shared with road ROW. Distribution along Bridgewood Road would be buried on the opposite side of the road.

Segment 62. The line utilizes one circuit on the existing double-circuit HOLG21 138 kV line to the Plymouth #4 Substation. No new ROW would be required.

Segment 63. The line connects, at County Highway M, to the other circuit of existing double-circuit HOLG21 138 kV line from the Plymouth #4 Substation and proceeds south along County Highway M to State Highway 23. Structures will be placed approximately five feet outside road ROW. 80 feet of new ROW is required. Approximately 35 feet will be shared with road ROW. Distribution along CTH M would be buried on the opposite side of the road.

Segment 64. The line turns east on the south side of State Highway 23 to County Highway to Hillside Rd. 80 feet of new ROW is required. Structures will be placed approximately five feet outside road ROW. Approximately 35 feet of new ROW width will be required.

Segment 65. The line continues south along Hillside Road to County Highway C sharing ROW with Hillside Road. 80 feet of new ROW width is required. Structures will be placed approximately five feet outside road ROW. Approximately 35 feet will be shared with road ROW. Distribution on Hillside Road would be buried on the opposite side of the road.

Segment 66. From County Highway C, the line continues south, cross country, to County Highway M. 80 feet of new ROW width is required for the segment.

Segment 67. The line continues south along County Highway M to where existing 138 kV transmission circuit X-57 crosses County Highway M80 feet of new ROW width is required. Structures will be placed approximately five feet outside road ROW. Approximately 35 feet will be shared with road ROW.

Segment 68. The new 138 kV transmission line continues east as a double-circuit line with existing 138 kV circuit X-57 within the existing ROW to a point near existing 345 kV circuit W-1. No new ROW is required.

Segment 68a. The lie continues in a double-circuit configuration with existing 138 kV circuit X-57 to the Barnhart Substation siting area. No new ROW is required. The proposed routing into each of the proposed Barnhart Substation locations is described below under “Substation Interconnection.”

Substation Interconnection

Limited 345 kV and 138 kV transmission line construction is required to interconnect the new Barnhart Substation to the ATC system. Limited 345 kV transmission line construction is required to interconnect the Branch River Substation to the ATC system. This construction would be on a combination of existing and new ROW, some of which would be all or partially within the substation properties.

ATC is proposing to construct each of the new substations on one of two sites, North or South. New double- and single-circuit steel pole structures will be used to route these 345 kV and 138 kV circuits into the substations.

Structures vacated by routing existing transmission lines to the substations will be removed.

The transmission line construction and configuration for each substation and site option is described below.

Barnhart Substation (BHA)

For a description of the existing and proposed 345 kV circuits to be interconnected at the Barnhart Substation, please see the beginning of this section under the heading "Two New 345 kV Substations (Common to Project Alternatives)."

The 138 kV circuits proposed for interconnection at the Barnhart Substation include circuit HOLG21S from the Holland Substation, and the proposed new circuit HOLG21N (Barnhart-Plymouth #4-Howards Grove). Additionally, 138 kV circuit X-57 (South Sheboygan Falls-Mullet River) will be split and interconnected at the Barnhart Substation creating new circuits X-57E (South Sheboygan Falls-Barnhart) and X-57W (Barnhart-Mullet River).

Structures vacated by routing existing lines to the substation

North Site

Alternative 1 / 1A (See Appendix A, Figures 19 and 21)

On the west side, an approximately 200-foot wide new ROW is required to route circuits W-1W and X-57W from the substation on parallel structures north to their existing ROW. W-1W and X-57W will be constructed on separate double-circuit structures within the ROW. The vacant circuit position on the structures will be retained for future use.

On the east side, circuits W-1E and X-57E will be routed from the substation north to their existing ROW on new double-circuit structures. Approximately 120 foot-wide new ROW will be required.

Coming into the substation property from the north, 138 kV transmission line Alternative 1A (HOLG21N) will be constructed on single-circuit, single-pole structures with braced-post insulators parallel to the double-circuit 345 kV line L-SEC31N/345-BRV-BHA-ALT1. Approximately 60 feet of new ROW width will be required.

One new double-circuit dead-end structure will be required to route L-SEC31N and the proposed 345 kV Circuit 345-BRV-BHA-ALT1 into the substation.

An approximately 120-foot wide new ROW is required to route circuits 796L41E from its existing ROW north to the substation on new double-circuit structures. The vacant position will be retained for future use.

The existing lattice steel towers that presently support circuits L-SEC31 and HOLG21 will be reconfigured on the southern side of the substation to route L-SEC31S and 796L41S to the substation. One double-circuit dead-end structure is required to transfer 796L41S to the former HOLG21 position on the towers. HOLG21S will be routed to the substation on new single-circuit structures parallel to the lattice tower structures. Approximately 60 feet of new ROW width will be required.

All other circuit reroutes will occur entirely within the substation property.

Alternate 1 / 1B (See Appendix A, Figures 19 and 21)

Routing of the transmission lines to the north substation site is as described under Alternative 1/1A above with the exception of the new 138 kV transmission line Alternative 1B (HOLG21N). Circuits HOLG21N and X-57W will be constructed on new double-circuit structures parallel to 345 kV line W-1W. Approximately 180-foot wide new ROW width is required.

South Site

Alternative 1 / 1A (See Appendix A, Figures 20 and 22)

From the endpoint of Segment 17, the new 138 kV transmission line Alternative 1A (HOLG21N) crosses the two 345 kV lines before heading west on new single-circuit structures within the existing 138 kV line X-57 ROW. Circuit HOLG21N will join with X-57W on new double-circuit, single-pole structures and head south parallel to 345 kV circuit W-1W and sharing approximately 200-foot wide ROW to the substation. W-1W will be constructed on double-circuit structures. The vacant position will be retained for future use.

On the southern boundary of the substation site, a new dead-end structure will be constructed to turn circuit L-SEC31S into the substation and new double-circuit structures will be used to route lines 796L41E and 796L41S into the substation.

Coming from the east, circuits X-57E and W-1E will be routed south to the substation from the existing ROW on new double-circuit structures parallel to the existing double-circuit lattice towers supporting 345 kV circuits L-SEC31N and the proposed Alternative 1 345 kV line 345-BRV-BHA-ALT1. Approximately 78 feet of additional ROW width will be

required. Near the substation circuit X-57E will join with circuit HOLG21S on double-circuit structures into the substation.

Immediately east side of the substation site, new double-circuit structures will replace the existing lattice towers to route circuits L-SEC31N and the new 345-BRV-BHA-ALT1 circuit to the substation.

Alternative 1/1B (See Appendix A, Figures 20 and 22)

Routing of the transmission lines to the south substation site is as described under Alternative 1/1A above with the exception of the new 138 kV transmission line Alternative 1B (HOLG21N). HOLG21N comes from the west as a double-circuit line with X-57W as described in Segment 68a before turning south parallel to W-1W as described in for Alternative 1/1A above.

Branch River Substation (BRV)

For a description of the existing and proposed 345 kV circuits to be interconnected at the Branch River Substation, please see the beginning of this section under the heading "Two New 345 kV Substations (Common to Project Alternatives)."

North Site (See Appendix A, Figures 15 and 17)

From the east end of Segment 2, double-circuit line 121W/345-BRV-FJT will be routed in to the substation with one double-circuit dead-end structure, and two single-circuit dead-end structures (one for each circuit).

From the northern end of Segment 4, circuit 111E will be routed into the substation on double-circuit structures parallel and adjacent to the existing lattice towers holding circuits 111S and the new 345-BRV-BHA-ALT1. Approximately 78 feet of additional ROW width is required.

Circuit 111S, the new 345 kV circuit 345-BRV-BHA-ALT1, and circuit 121E will be routed from the substation on single- and double-circuit dead-end structures.

South Site (Preferred) (See Appendix A, Figures 16 and 18)

From the east end of Segment 2, Circuit 121W and the new 345 kV circuit 345-BRV-FJT from Forest Junction will routed in to the substation site on the north side via a double-circuit dead-end structure.

One the northeast, a single-circuit dead-end structure will used to turn circuit 121E into the substation.

From the northern end of Segment 4, circuit 111S, and new 345 kV circuit 345-BRV-BHA-ALT1 will be turned in to the substation on new double-circuit, dead-end structures. Circuit 111E will be routed parallel to the 111S/345-BRV-BHA-ALT1 double circuit line on single-circuit structures to the substation. Approximately 78 feet of new ROW width is required.

Forest Junction Substation (FJT)

New single-circuit tangent and angle structures will be required to reconfigure the termination for circuit 121E and route the new circuit 345-BRV-FJT (Forest Junction-Branch River) line into the Forest Junction Substation.

Project Alternative 2 (new right-of-way option)

Project Alternative 2 would create a new 345 kV circuit (345-BRV-BHA-Alt2) by constructing a new 345 kV transmission line between the Branch River and Barnhart substations in the towns of Centerville, Franklin, Kossuth, Manitowoc Rapids, Newton, village of Cleveland, and city of Manitowoc in Manitowoc County, and the towns of Herman, Lima, Mosel, Sheboygan Falls, and, and village of Howards Grove in Sheboygan County. The new 345 kV line would primarily be on new ROW, making use of existing occupied and unoccupied transmission line ROW and highway ROW to a large extent to mitigate new impacts.

This option does not impact 138 kV transmission circuits. No new or reconfigured 138 kV transmission lines would be required. Additionally, a 138kV transformer, bus and associated facilities would not be required at the Barnhart Substation.

The route of the proposed transmission line is described below. The proposed transmission line routes are broken down into route segments for characterization and analysis. Primary segments (e.g., 1, 15, 15a) were further broken down into sub-segments (e.g. 1-1, 1-2) for environmental characterization and analysis. The routes of the proposed transmission lines are described below by primary segment.

Because of the number of lines connecting to each substation and the resulting complexity in line routing, routing in the immediate area of the substation is described separately under “Substation Interconnection.”

Route segments, substation interconnection areas are identified on the maps in Appendix A.

Alternative 2 (345 kV)

Unless otherwise specified in the following segment descriptions, the new 345 kV transmission line will be constructed on single steel pole structures. Where parallel to existing 138 kV or 345 kV transmission lines the new structures will generally be matched span-for-span with the existing transmission line structures.

Segment 4. From the southern edge of the proposed Branch River Substation area, the line proceeds south primarily on new double-circuit structures parallel to the existing lattice tower structures that are presently occupied by only one-circuit (971K51) to the point where circuit 971K51 joins with 345 kV circuit 111. Approximately 78 feet of new ROW width is required along this segment. Circuit 111E will be constructed double-circuit with the new line. Circuit 111S will be placed on the vacant position on the existing lattice steel structures.

Segment 5. The line turns east on double-circuit structures with existing circuit 111 to the crossing with existing 69 kV line R-44. No new ROW is required.

Segment 6. The line would turn southeast and proceed as a double-circuit line with R-44 until just north of County Highway P. Line R-44 is constructed on a 24-foot wide ROW with additional unspecified allowance for blowout. An additional 96 feet of ROW width would be required.

Segment 7. The line would then turn east on single-circuit structures following field lines for approximately 4000 feet to the I-43 ROW. 120 feet of ROW width would be required.

Segment 8. The line turns south within I-43 ROW crossing to the east side of the highway just north of the Manitowoc River. Segment 8 ends just north of where the new line crosses R-44. Portions of the line may be outside the road ROW as necessary around interchanges or to maintain clearances to bridge decks necessary to accommodate future bridge work. This segment requires up to a 120-foot ROW width.

Segment 9. The line continues south along the east side of I-43 to just south of Custer Street in the city of Manitowoc. Portions of the line may be outside the road ROW as necessary around interchange or to maintain clearances to bridge decks necessary to accommodate future bridge work. This segment requires up to an 120-foot ROW width.

Segment 10. The line continues south on the east side of the I-43 ROW to the 69 kV transmission line A-101 crossing of I-43. A-101, which presently runs south from the Custer Substation on the west side of I-43,

will be constructed double-circuit with the new 345 kV line along this segment on the east side of I-43. Portions of the line may be outside the road ROW as necessary around interchanges or to maintain clearances to bridge decks necessary to accommodate future bridge work. This segment will be constructed within a 100-foot ROW width to provide required clearances to buildings south of Custer Street. Distribution underbuilt on A-101 on the west side of I-43 will remain on the existing structures.

Segment 11. The line continues along I-43 crossing to the west side of I-43 between Clover Road and Carstens Lake Road. On the north side of County Line Road, the line will cross back to the east side of I-43 and continues south until just south of County Highway FF in Sheboygan County. Portions of the line may be outside the road ROW as necessary around interchanges or to maintain clearances to bridge decks necessary to accommodate future bridge work. This segment requires up to an 120-foot ROW width. Distribution on Center Road, south of County Highway X would be buried.

Segment 11a. The line will cross I-43 on new 125-foot wide ROW.

Segment 12. The new 345 kV line continues west within existing, unoccupied 125-foot wide transmission line ROW to County Highway Y. No new ROW width would be required.

Segment 12a. The line continues west within existing unoccupied 125-foot wide ROW to the Howard's Grove Substation. No additional ROW width would be required.

Segment 13. The new 345 kV line then parallels the double-circuit 138 kV line 971K51/ HOLG21 to the existing north-south double-circuit 345 kV/138 kV lines (circuits 111S andHOLG21). Up to 70 feet of additional ROW width would be required. Immediately east of State Highway 32 and east of Meadowlark Road, the existing double-circuit centerline may be shifted north to provide required clearance between the new 345 kV line and structures at those locations.

Segment 15. The line then turns south parallel to the double-circuit 345 kV/138 kV line (circuits 111S/HOLG 21) to County Highway A. Approximately 78 feet of new ROW width would be required.

Segment 15a. The line continues south parallel to the double-circuit 345 kV/138 kV lines (circuits 111S/HOLG21) to the location where HOLG21 turns west to the Plymouth #4 Substation. Approximately 78 feet of additional ROW width will be required. Immediately south of

County Highway A the circuits will be shifted west for a short distance to provide for the adequate clearance to residences at that location.

Segment 16. The line continues south parallel to the double-circuit 345 kV/138 kV lines (circuits 111S/HOLG21) to the point where circuit 111S turns and enters the Sheboygan Energy Center switchyard. Approximately 78 feet of new ROW width would be required.

Segment 17. The line continues south parallel to the double-circuit 345 kV/138 kV lines (circuits L-SEC31N/HOLG21) to just north of the two potential locations for the Barnhart Substation. Approximately 78 feet of new ROW width would be required. The proposed routing into each of the new substation locations is described below under "Substation Interconnection."

Substation Interconnection

To interconnect the new 345 kV substations to the ATC system, Project Alternative 2 requires additional limited 345 kV transmission line construction on new ROW, some of which would be all or partially within the substation properties.

ATC is proposing to construct each of the new substations on one of two sites, North or South. The transmission line construction and configuration for each substation and site option is described below.

Existing structures that are vacated in order to loop the existing lines into the substations will be removed.

Barnhart Substation (BHA)

138 kV circuits X-57 and HOLG21 will bypass the Barnhart Substation.

North Site (See Appendix A, Figures 19 and 21)

Circuit W-1W will be routed from the north in to the substation on new double circuit structures. The vacant position will be maintained for future use. W-1E will be routed from the north in to east side of the on new single-circuit structures. Approximately 120-foot wide new ROW is required for each circuit.

Circuit 796L41E will be routed from the southeast to the substation on new double-circuit structures. The vacant position on the towers will be retained for future use. Approximately 120-footwide new ROW is required.

The existing lattice steel towers that presently support circuits L-SEC31 and HOLG21 will be reconfigured on the southern side of the substation to route circuits L-SEC31S and 796L41S to the substation. One double-

circuit dead-end structure is required to transfer circuit 796L41S to the former HOLG21 position on the east side of the towers. Circuit HOLG21 will be routed to the substation site on new single-circuit structures parallel to the lattice tower structures. It will then transfer back to the existing lattice towers bypassing the Barnhart Substation. Approximately 60 feet of new ROW width will be required.

Circuit L-SEC31N will exit the substation and proceed north on the existing lattice steel towers.

The proposed 345-BRV-BHA-ALT2 will be routed to the substation on new single-circuit structures, routed parallel to the existing double-circuit lattice towers. Approximately 92 feet of new ROW width is required.

All other circuit reroutes will occur entirely within the substation property.

South Site (Preferred) (See Appendix A, Figures 20 and 22)

Circuit W-1W will be routed from the north to the substation on new double-circuit structures. The vacant circuit position will be retained for future use. Approximately 120-foot wide ROW is required.

On the southern boundary of the substation site, a new dead-end structure will be constructed to turn circuit L-SEC31S into the substation and new double-circuit structures on substation property will be used to route circuits 796L41E and 796L41S into the substation.

Circuit W-1E and the proposed 345-BRV-BHA-ALT2 will be routed to the substation on new double-circuit structures parallel to the existing double-circuit lattice towers supporting 345 kV circuit L-SEC31N and 138 kV circuit HOLG21. Approximately 78 feet of additional ROW width will be required.

The existing lattice towers pass immediately adjacent to the substation site. New double structures will be used to route circuit L-SEC31N and the proposed 345-BRV-BHA-ALT2 circuit to the substation.

All other circuit reroutes will occur entirely within the substation property.

Branch River Substation (BRV)

For a description of the existing and proposed 345 kV circuits into Barnhart Substation, please see the beginning of this section under the heading "Two New 345 kV Substations (Common to Project Alternatives)."

North Site (See Appendix A, Figures 15 and 17)

The existing lattice tower structures that support Circuit 121 are located at the southern boundary of the substation site. Two single-circuit dead-end structures will be used to route the circuit 121W in to the substation.

From the northern end of Segment 4, circuit 111E and the new 345 kV Circuit 345-BRV-BHA-ALT2 will be routed into the substation on double-circuit structures parallel and adjacent to the existing lattice towers. 78 feet of additional ROW width is required.

From the northern end of Segment 4, circuit 111S will be routed to the substation on the existing lattice steel towers.

A double-circuit dead-end structure will be installed to route circuit 121E to the substation. Approximately 120 feet of new ROW width will be required.

South Site (Preferred) (See Appendix A, Figures 16 and 18)

The existing lattice tower structures that support existing circuit 121 are located at the northern boundary of the substation site. A single-circuit dead-end will be used to turn circuit 121W in to the substation. A double-circuit dead-end structure will be used to turn circuit 121E in to the substation. The vacant position will be retained for future use. No new ROW is required.

From the northern end of Segment 4, circuit 111S will be routed on single-circuit structures from the existing structures to the substation. Circuit 111E and new circuit 345-BRV-BHA-ALT2 will be constructed on double-circuit structures parallel to the existing lattice tower line to the substation. Approximately 78 feet of ROW width will be required outside the substation property.

Additional Facilities

Optical Ground Wire (OPGW) (See Appendix A, Figure 1)

Both Project Alternatives 1 and 2 require that ATC establish communication channels for protection and control between the proposed Barnhart and Branch River substations and the associated remote-end 345 kV substations. Optical Ground Wire (OPGW) is proposed for digital communications. ATC's protection requirements for 345 kV transmission lines require redundant channels of protection. Traditionally, one channel has used the phase comparison method which uses power line carrier communication technology because of minimal communication

requirements. Relays with reliability acceptable to ATC supporting the phase comparison method are no longer supported by the manufacturer. Therefore, ATC is implementing the current differential method which requires digital communications. OPGW has the added advantage of being more secure and supporting phase measurement unit technology. These remote-end substations include: Forest Junction, Point Beach, Sheboygan Energy Center, Edgewater, Saukville, Granville, and South Fond du Lac. ATC proposes to establish these connections via OPGW installed as the shield wire on the new transmission lines or replacing shield wire on selected existing transmission lines in the project area as described below. Related relay upgrades at these substations will also be required.

In addition to the locations affected by transmission line construction, OPGW installation would take place on existing transmission lines in the towns of Kossuth, Two Rivers, Two Creeks, and Mishicot and village of Francis Creek in Manitowoc County, the towns of Greenbush, Lima, Plymouth, Sheboygan Falls, Wilson, and the cities of Plymouth and Sheboygan, in Sheboygan County, and the towns of Empire, Fond du Lac and Forest in Fond du Lac County.

OPGW will be routed on new and existing transmission lines and structures as described below (Unless otherwise noted, the OPGW is required for both Project Alternative 1 and Project Alternative 2.)

OPGW connections between Branch River, Forest Junction and Point Beach substations will be established by replacing an existing shield wire on the 121/BRV-FJT double-circuit structures and the circuit 111E structures.

Between the Branch River and Barnhart substations, Project Alternative 1 will replace one shield wire on the double-circuit structures with the new 345-BRV-BHA_ALT1 circuit, bypassing Howard's Grove and Plymouth #4 and routed through Sheboygan Center Switchyard on existing structures. Project Alternative 2 would install OPGW on the new 345 kV transmission line and will be routed through the Sheboygan Energy Center on existing structures.

Between the Barnhart and Edgewater substations, for both Project Alternatives, OPGW will replace an existing shield wire on the structures for circuit X-57E (Barnhart-South Sheboygan Falls) and continue on, replacing a shield wire on structures for circuit X-1 (South Sheboygan Falls-Edgewater). For Project Alternative 1 only, the OPGW installed on X-57E and X-1 will also be routed into the South Sheboygan Falls Substation to create a communication path between the Barnhart and

South Sheboygan Falls substations since X-57 would be split and connected in to the Barnhart Substation.

Between the Barnhart and South Fond du Lac substations, OPGW will replace an existing shield wire on the structures for circuit X-57W and be routed into Mullet River. From Mullet River, the OPGW will replace one shield wire on X-97 (Mullet River-Cedar Ridge). At or near the Cedar Ridge Substation, the OPGW will transfer to and replace one shield wire on X-2 (Cedar Ridge-Ohmstead). At the Ohmstead Substation, the OPGW will transfer to and replace a shield wire on 138 kV circuit X-25 (Ohmstead-South Fond du Lac). Near the South Fond du Lac Substation, X-25 circuit and 345 kV circuit line W-1 form a double-circuit line. The OPGW will replace one shield wire on this double-circuit portion of the line.

Additionally, from the Mullet River Substation to the X-97 line crossing with double-circuit transmission line 40561/8241, approximately 0.3 miles of OPGW will replace the second shield wire on the X-97 structures. Near the line crossing, the existing OPGW shield wire will be split and connected to the OPGW to Mullet River. This will provide a communication path to the Saukville/Cedarsauk and Granville substations.

OPGW will be used as the shield wire on the new 138 kV transmission line to be constructed in Project Alternative 1 to provide for communication between Barnhart, Howards Grove, and Erdman substations. Provisions will be made for future connection to Plymouth #4.

Q-303 Breaker Addition

A series breaker would be added to 345 kV circuit Q-303 (Point Beach-Kewaunee) at the Point Beach Substation to prevent generator instability under breaker failure conditions. This will require a small addition to the substation footprint on plant property.

Transmission Line

Both Transmission Line Alternatives 1 and 2 require an uprate of 345 kV circuit 796L41 between Barnhart and Cedarsauk substations in the towns of Saukville and Fredonia in Ozaukee County and the towns of Holland and Lima in Sheboygan County. To obtain the required line rating under each Project Alternative, the scope of the uprate differs slightly between Project Alternatives 1 and 2 due to the differences in line ratings of the Barnhart-Branch River 345 kV transmission line depending on the alternative chosen.

Project Alternative 1. Five existing lattice towers will be replaced to provide the line-to-ground clearance required for the desired line rating. Additionally, one distribution pole will be relocated to provide the required clearance between the distribution and transmission line conductors. All structure replacements will occur on the existing line centerline.

Project Alternative 2. Eight existing lattice towers will be replaced to provide the line-to-ground clearance required for the desired line rating. Additionally, one distribution pole will be relocated to provide the required clearance between the distribution and transmission conductors. All structure replacements will occur on the existing line centerline.

2.1.2 General Description of Proposed Line

2.1.2.1 Size of Line

Voltage

Project Alternative 1

New 345 kV and 138 kV transmission lines would be constructed.

Project Alternative 2

A new 345 kV transmission line would be constructed.

Size of Conductor

Project Alternative 1

Twisted pair (TP) 1113 kcmil ACSR “Bluejay” conductor would be utilized for the new 345 kV transmission line.

TP-477 kcmil ACSR “Hawk” conductor would be utilized for the new 138 kV transmission line. Portions of the existing 138 kV lines to Plymouth #4 and Howards Grove substations will utilize the existing conductor.

Project Alternative 2

TP-1113 kcmil ACSR “Bluejay” conductor would be utilized for the new 345 kV transmission line.

Shield Wire

Project Alternative 1

One of the shield wires on the existing 345 kV structures would be replaced with a 24-fiber OPGW shield wire for ATC protection and control.

Two shield wires would be installed on the new 138 kV transmission lines. One shield wire would be 24-fiber OPGW for ATC protection and control. The other shield wire will be 7/16 inch, 7-strand extra-high strength (EHS) steel.

Project Alternative 2

Two shield wires would be installed on the new 345 kV transmission line. One shield wire would be 24-fiber OPGW. The second shield wire would be 7/16-inch, 7-strand EHS steel.

Structures

All new transmission line structures will be single-shaft, steel-pole structures.

New 345 kV structures on new ROW will have arms and utilize V-string insulators to minimize blowout. The structures will be placed on concrete caisson foundations or an alternate foundation design depending on soil and subsurface conditions encountered.

New 138 kV structures will have arms and utilize suspension insulators (I-string), braced-post insulators or horizontal post insulators. Tangent structures would be direct embedded where possible. Angle and, where necessary, tangent structures would be placed on concrete caisson foundations or an alternate foundation design depending on soil and subsurface conditions encountered.

Structure type, typical span lengths, typical structure height above the ground, and the ROW width required vary depending on the Project Alternative and transmission line route and location as described below.

See Section 2.1.1 for a description of the transmission line configuration in the vicinity of the substations for each alternative.

Project Alternative 1

Alternative 1 (345 kV)

Location (Segment #)	Structure Type	Figure Appendix B	Typical Structure Height (ft)	Typical Span Length (ft)
1, 2, 4, 14,15,15a, 16, 17	Existing 345 kV double-circuit lattice towers	1	140-190	600-1150
1, 2, 4, 14,15,15a 16, 17	345 kV double-circuit with V-string insulators	9	125	600-1150

ATC anticipates replacing approximately 8 lattice structures between the Forest Junction and proposed Branch River substations (Segment 1 & 2) to obtain the required line rating or for structural integrity.

ATC anticipates replacing approximately 33 lattice tower structures between the proposed Branch River and Barnhart substations to obtain the required line rating or for structural integrity.

Alternative 1A (138 kV)

Location (Segment #)	Structure Type	Figure Appendix B	Typical Structure Height (ft)	Typical Span Length (ft)
13 (see table note 1)	Existing double-circuit with I-string insulators	3	95	920
12, 12a	Single-circuit Delta with braced post insulators	4	65	700
54a, 54b (See table Note 2)	Single-circuit Delta with braced post insulators	4	60	550

Location (Segment #)	Structure Type	Figure Appendix B	Typical Structure Height (ft)	Typical Span Length (ft)
54a, 54b (See table Note 2)	Single-circuit Vertical with braced post insulators	5	65	550
54	Single-circuit Vertical with horizontal post insulators	6	65	375
15, 15a, 16, 17	Single-circuit Delta with I-string insulators	7	80	900

[1] Only one circuit will be in-service.

[2] Segments 54A and 54B may be constructed in a Delta or Vertical conductor arrangement depending on the alignment within or along I-43 ROW that is permitted by WisDOT.

Alternative 1B (138 kV)

Location (Segment #)	Structure Type	Figure Appendix B	Typical Structure Height (ft)	Typical Span Length (ft)
13 (See table Note 1)	Existing double-circuit with I-string insulators	3	95	920
62, 68, 68a (See table Note 2)	Existing double-circuit with braced-post insulators	8	75	650

Location (Segment #)	Structure Type	Figure Appendix B	Typical Structure Height (ft)	Typical Span Length (ft)
11a, 12, 51, 52a, 52, 53, 54a, 59, 60, 63, 64, 65, 66, 67 (See table Note 3)	Single-circuit Delta with braced post insulators	4	60	550
51, 52a, 54a, 59, 60, 63, 64, 65, 67 (See table Note 3)	Single-circuit Vertical with braced-post insulators	5	65	550
54	Single-circuit Vertical with horizontal post insulators	6	65	375
15	Single-circuit Delta with I-string insulators	7	80	900

[1] Only one circuit will be in-service.

[2] Along Segment 62, both circuits on the existing double-circuit will be in-service between CTH M and the Plymouth #4 Substation. Only one circuit will be in-service on the remainder.

[3] Segments 51, 52A, 59, 60, 63, 64 65, 67 may be constructed in a Delta or Vertical conductor arrangement depending on the alignment within or along road ROW.

Project Alternative 2

Alternative 2 (345 kV)

Location (Segment #)	Structure Type	Figure Appendix B	Typical Structure Height (ft)	Typical Span Length (ft)
4, 5	Double-circuit with V-string insulators	9	125	900
6, 10	Double-circuit with V-string insulators	9	85-115	500-700
7, 8, 9, 11, 11a, 12, 12a, 13, 15, 15a, 16, 17 (See Table Note 1)	Single-circuit Delta with V-string insulators	10	95	700
8, 9, 11 (See Table Note 1)	Single-circuit Vertical with V-string insulators	11	125	700

[1] Segments 8, 9, and 11 may be either a Delta or Vertical conductor arrangement depending on the alignment along or within I-43 ROW that is permitted by the WisDOT.

2.1.2.2 Line Configuration

The configuration of the transmission lines in the proposed Project Alternatives is provided in the tables in Section 2.1.2.1 above and in the Segment descriptions provided in Section 2.1.1. Summary descriptions are provided below.

Project Alternative 1

Alternative 1 (345 kV)

The proposed 345 kV transmission circuit will be constructed double-circuit with an existing 345 kV circuit primarily on the existing

structures within the existing ROW. New ROW will be required to route the lines into the proposed Barnhart and Branch River substations and to reconfigure the lines at the Forest Junction Substation.

Alternative 1A (138 kV)

This proposed 138 kV transmission line alternative will be constructed primarily as a new single-circuit line on new ROW. The existing transmission line ROW will be expanded to accommodate the new line between the proposed Barnhart Substation and the existing double-circuit loop to the Howards Grove Substation. One of the existing lines on the existing structures and in the existing ROW will be utilized. Between the Howards Grove Substation and I-43, the new line will be constructed within existing but unused and unmaintained transmission line ROW. The line will then follow and share the I-43 ROW to the extent practical to the vicinity of the Erdman Substation where new ROW will be required to transition from the interstate ROW to the substation.

Alternative 1B (138 kV)

This proposed 138 kV route alternative will be constructed primarily as a single-circuit line on new ROW. New ROW will primarily be along and share ROW with existing roads. Small portions of the line will be constructed double-circuit with existing lines near the proposed Barnhart Substation and the Plymouth #4 Substation. The proposed line will also be constructed within new ROW between CTH Y and Dairyland Drive. New ROW will also be required near the Erdman Substation, west of I-43.

Project Alternative 2

Alternate 2 (345 kV)

The proposed 345 kV alternative would be constructed primarily as a single-circuit transmission line on new ROW. The majority of the line between the proposed Branch River Substation and I-43 will be constructed double-circuit with existing 345 kV and 69 kV transmission lines. Where double-circuited with the 345 kV line, no new ROW will be required. The ROW for the 69 kV transmission line will need to be expanded. A short segment of all new ROW will be required to transition from the 69 kV line to the I-43 ROW. Along I-43, the new line will share the interstate ROW to the extent practical and a portion will be constructed double-circuit with an existing 69 kV transmission line. Between I-43 and the proposed Barnhart Substation, a portion of the proposed line will utilize existing unused and unmaintained

transmission line ROW. For the remainder of the line, the existing 345/138 kV transmission line ROW between the Howards Grove tap and the proposed Barnhart Substation and the loop connection to Howards Grove would be expanded to accommodate the proposed 345 kV transmission line.

2.1.3 Transmission Studies

American Transmission Company routinely evaluates system performance as part of its planning process to identify existing and emerging concerns that affect the operation and reliability of its electric transmission system. Recent system changes in east central Wisconsin (sometimes called the "Fox Valley" area of the system) included reconfiguration of the Kewaunee Substation and changes at the Point Beach generating units that include an effective operational increase of more than 200 MW in generator capability (Midwest ISO Generator Interconnection Projects G833/J022 and G834/J023). The Fox Valley transmission system includes significant generation connected at the Point Beach, Kewaunee, Fox River, Cypress and Sheboygan Energy Center stations, but includes only four 345 kV outlets, two west to North Appleton Substation and one each south from Cypress and Sheboygan Energy Center substations. Such limited generation outlets as are now found in the Fox Valley transmission system can lead to stability issues, which are made worse under outage conditions. A one line diagram of the existing system is included in page 8 of the Planning Scope Document in Appendix C, Exhibit 1.

ATC studied the system with these recent changes for the Midwest ISO, using their generator interconnection process (See the Interconnection System Impact Study (ISIS), found in Appendix C, Exhibit 2.) The ISIS identified system upgrades necessary to ensure that the Point Beach generator units can be operated without stability limits and reliably deliver their output. The study also identified certain thermal overloads on the ATC system that would need to be addressed.

ATC determined that the required changes to the ATC system could not be implemented by the requested commercial operation of the changes at the Point Beach generators and conducted an interim operation study of the period between the expected commercial operation date and the expected in-service date of the required upgrades to identify the possible unit restrictions and/or additional system upgrades needed during this interim period. (See the Interim Operations and Impacts Re-Study Report, found in Appendix C, Exhibit 3.)

The Interim Operations Impacts and Re-Study Report identified short-term upgrades that would allow nearly full generator output most of the time. These upgrades, which have been placed in-service, include replacing breaker R-304 breaker at the North Appleton Substation, relay upgrades at the Point Beach Substation, a Cypress-Arcadian 345 kV line uprate and a Point Beach-Sheboygan Energy Center 345 kV line uprate. However, these upgrades are insufficient to permit full generator output under all required system conditions. The project ATC proposes is needed to address issues that exist after implementation of these short-term upgrades. The several issues that must be addressed to ensure long-term reliable output of the Point Beach generating units and other area generation without restriction include:

- Generator instability due to the isolation of a generator on a single line when a specific line is faulted during the outage of a specific breaker;
- Generator instability due to the outage of a certain line followed by a fault on second line; and
- Most significantly, limitations on Point Beach and Kewaunee generating units' reactive power output at all hours. Generator instability was identified for faults conditions when Point Beach and Kewaunee units produce relatively small reactive power output (over-excitation) or absorb reactive power from the transmission system (under-excitation). Reactive power output from a synchronous machine has an impact on unit transient stability. Typically, the lower the excitation on a generating unit, the less stable the unit tends to be under a fault condition. The results of the interim operation study (i.e., operation prior to completion of the project in this document) indicate that a certain level of reactive power output (over-excitation) needs to be maintained to ensure generator stability in anticipation of critical fault conditions. Until the proposed project is in service, units may not be allowed to reduce their MVAR output, which reduces their effectiveness in controlling system voltage.

The short-term upgrades addressed Fox Valley area thermal issues and some stability issues; the remaining area limitations to be addressed were stability related. However, the addition of the remaining stability related fixes described in this document created an additional thermal issue, which will require increasing the rating of the Barnhart to Cedarsauk 345 kV line (796L41).

To study the remaining stability limitations, simulations with Midwest ISO Generator Interconnection Requests G833/J022 & G834/J023, the Point

Beach Power System Stabilizers (PSSs) and the short-term system upgrades in-service were performed by ATC using the Dynamics Simulation and Power Flow modules of the Power System Simulation/Engineering (PSS/E) program.

ATC performed these dynamic simulations using a model representing 50% of system peak load with planned and proposed projects modeled. Two levels of system generation were modeled to simulate the different system dynamics due to varying levels of system inertia. In one model, all local and competing generators were dispatched at full output in accordance with ATC's generator interconnection study methodology. A second, low local generation model was created with the gas-fired Fox Energy, Sheboygan Energy and South Fond du Lac generators off-line.

Stability analysis was performed for various grid disturbance scenarios including the following:

1) Three-phase fault cleared in primary time with an otherwise intact system (NERC TPL-002 Category B);
2) Single line-to-ground fault on both circuits of a double-circuit structure with an otherwise intact system (NERC TPL-003 Category C);
3) Single line-to-ground fault on a bus with an otherwise intact system (NERC TPL-003 Category C);
4) Three-phase fault cleared in primary clearing time with a prior outage of any other transmission element (NERC TPL-003 Category C); and
5) Three-phase fault cleared in delayed clearing time (e.g., breaker failure condition) with an otherwise intact system (NERC TPL-004 Category D).

In general, for any of the grid disturbances described above, the proposed generation's dynamic response must not degrade system stability performance. Details on the study and existing limitations can be found in the Planning Scope Document in Section 3.2, included as Appendix C, Exhibit 1.

2.1.3.1 System Normal

There are no system normal (NERC Category A) issues (thermal or stability) to be addressed by this project as documented in the Interim Operation and Impact Re-Study Report (Appendix C, Exhibit 3).

2.1.3.2 Single Contingencies

TPL-002 Category B (N-1 conditions) were evaluated using the 50% of system peak load base case with both the high and low generation

scenarios described in Section 2.1.3. Thirteen faults (listed in Planning Scope Section 3.2.2, Table 3.2.2.1) were simulated as 3-phase faults cleared in primary time under intact system conditions. No stability issues were identified by these simulations. Previously discussed studies established that there are no single contingency thermal issues in this area due to the interconnection requests (see Table A.1 of the Interconnection System Impact Study dated October 2, 2009.) The addition of stability related fixes created a thermal issue requiring mitigation, which was addressed in both Alternative 1 and Alternative 2 by increasing the rating of the Barnhart to Cedarsauk 345 kV line.

In addition to single contingencies, multiple element contingency steady state and dynamic simulations were also performed for these Midwest ISO Generator Interconnection Requests. Stability limitations were identified for some of these contingencies. TPL-003 Category C.3 simulations (three-phase fault clearing in primary time under prior outage conditions) were simulated for the same 13 TPL-001 Category B faults under the prior outages listed in Table 3.2.3.1 of the Planning Scope. These simulations found two events that resulted in generator instability. The proposed project will eliminate these limitations. Other TPL-003 Category C events simulated (Categories C.5 and C.9) did not result in generator instability or limitations.

2.1.3.3 Alternative Network Solutions

Various options were considered when developing project alternatives, including reconfiguring the existing Point Beach Substation as ring bus. This was rejected from further consideration because a more robust long-term solution is needed to address generator instability due to a fault under a prior outage and to address required minimum excitation limits at Point Beach and Kewaunee generating units required for generator stability. These issues cannot be solved by reconfiguring Point Beach Substation because they are primarily a result of the limited number of 345 kV outlets in relation to the amount of generation in the Fox Valley transmission system.

As described in Appendix H.1 of the G833/J022 and G834/J023 ISIS report, Appendix C, Exhibit 2, various options were evaluated to develop project alternatives that would:

- Address generation instability issues under prior outage conditions;
- Provide a wider operating envelope for the local transmission system and interconnected generators by permitting generating unit operation at unity or under-excited conditions;

- Provide better maintenance and operations flexibility during planned or unplanned transmission outage conditions by tying together critical transmission elements in strategic locations and, possibly, providing an additional transmission outlet; and
- Relieve loadings under intact and contingency conditions on the existing 138 kV and 345 kV lines running from the Fox Valley area to the south by providing an additional transmission outlet.

ATC studied thirteen different "fixes," including the two eventually identified as alternatives. Alternatives #1 and #2 were selected because they address stability issues adequately, provide a wider operating range of MVAR output from the Point Beach and Kewaunee generating units, unload parallel facilities, and provide both route and system alternatives. Briefly, these options are:

1) Project Alternative 1 (essentially Fix 11) primarily requires constructing a new "Barnhart" 345/138 kV substation and a new "Branch River" 345 kV switching substation, converting an existing 138 kV line to 345 kV (~ 51 miles) and constructing a new 138 kV line (~18 miles); and
2) Project Alternative 2 (essentially Fix 5) primarily requires constructing new "Barnhart" and "Branch River" 345 kV switching stations with a new 345 kV line (~ 32 miles).

Sections 4.1 and 4.2 of the Planning Scope Document discuss in detail how each alternative addresses project needs. Section 2.2.1 of this document describes the 11 other alternatives that were studied, but not selected as alternatives, and why they were not selected to be alternatives.

2.1.3.3.1 Prior Relevant Regional Studies

This section is not applicable as no prior regional transmission network studies performed in this area looked at these issues. Studies related to Generator Requests G833/J022 and G834/J023 identified many of these issues and fixes. They are available on the Midwest Independent Transmission System Operator (Midwest ISO) website at:

https://www.midwestiso.org/Planning/GeneratorInterconnection/Pages/InterconnectionQueue.aspx

2.1.3.3.2 Reliability and Performance Benefits of Solutions

Based on the system performance analysis, the Project Alternative 1 and 2 were selected as viable long-term plans. Both alternatives:

- Address generator instability under prior outage conditions;
- Permit generating unit operation at unity or under-excited conditions;
- Tie together transmission elements in strategic locations and providing an additional transmission outlet to provide increase maintenance and operations flexibility during planned or unplanned transmission outage conditions; and
- Relieve loadings under intact and contingency conditions on the existing 138 kV and 345 kV lines running from the Fox Valley area to the south by providing an additional transmission outlet.

System Benefits of Project Alternative 1 over Project Alternative 2:

- Project Alternative 1 provides better loss savings than Project Alternative 2;
- With the new 138 kV transmission connection to the Sheboygan area, Project Alternative 1 provides significant contingency loading relief and voltage support to the existing Sheboygan area 138 kV and 69 kV systems under NERC TPL-003 Category C conditions for both Summer Peak and Off-Peak conditions. Project Alternative 2 does not provide this added benefit.

Project Alternative 1, the line conversion option, involves:

1) Constructing a new Barnhart 345/138 kV Substation with a new 345/138 kV (500/625 MVA SN/SE) transformer;
2) Constructing a new Branch River 345 kV Switching Station;
3) Converting the Forest Junction-Howards Grove (971K51) and part of the Howards Grove-Holland 138 kV line (HOLG21) to double-circuit 345 kV operation (~51 miles);
4) Constructing the Erdman-Howards Grove-Plymouth #4-Barnhart 138 kV line (~18 miles);
5) Looping the existing 345 kV lines 796L41 (Edgewater-Cedarsauk), W-1 (Edgewater-South Fond du Lac) and L-SEC31 (Sheboygan Energy Center-Granville) and terminating the converted line into the new Barnhart Substation;
6) Looping the existing 345 kV lines L-111 (Point Beach-Sheboygan Energy Center) and L-121 (Point Beach-Forest Junction) and the converted line into the new Branch River 345 kV Switching Station;

7) Looping the existing 138 kV line X-57 (South Sheboygan Falls-Mullet River) into the new Barnhart Substation;

8) Terminating the unconverted portion of the 138 kV line from Holland at the Barnhart Substation;

9) Rebuilding the existing Erdman 138 kV Substation to accommodate the new 138 kV line from Howards Grove;

10) Substation work at Howards Grove to terminate the new 138 kV line from Erdman;

11) Substation and line work at Forest Junction to terminate the converted 971K51 line;

12) Installing a new 345 kV breaker in series with the existing Q-303 breaker at the Point Beach Substation; and

13) Uprating the Barnhart-Cedarsauk 345 kV line to achieve a 960 MVA SE (1607 Amps) capability.

Project Alternative 1 improves system strength significantly and achieves a wide operating envelope for the local transmission system and the interconnected generators by permitting generating unit operation to unity or under-excited conditions. It will address the transient stability issue identified for faults under prior outage conditions. Project Alternative 1 also requires building a new 138 kV line from Howards Grove to Erdman to form the Barnhart-Plymouth #4-Howards Grove-Erdman 138 kV lines. The new 138 kV lines are needed to maintain network service to the Plymouth #4 and Howards Grove 138 kV substations after conversation of the existing 138 kV line serving Plymouth #4 and Howards Grove to 345 kV operation. In addition, the new 138 kV line to Erdman will improve maintenance and operations flexibility for planned and unplanned transmission outage conditions. Alternative 1 will also relieve the loading on the existing 138 kV and 345 kV lines running from Fox Valley area to the south under intact and contingency conditions by providing an additional transmission outlet.

Project Alternative 1 was developed by modeling items (1) through (12) above and evaluating whether project needs were addressed. After it was confirmed that they addressed all project needs, a steady-state analysis was conducted to identify any new thermal constraints created by Project Alternative 1. The steady-state analysis identified the Barnhart-Cedarsauk 345 kV line as a thermal constraint under a NERC TPL-002 Category B outage. Therefore,

item (13), uprating the Barnhart-Cedarsauk 345 kV line, was added to Project Alternative 1. Without item (13), the Barnhart-Cedarsauk 345 kV line would be overloaded by 18.4% (without 5% transmission planning margin) under the most severe N-1 contingency condition, particularly during the off-peak (70% load) condition.

Although no stability issues were found with Project Alternative 1 implemented in the system models, studies were conducted to measure the robustness of each alternative. The first type of analysis examined the critical clearing time improvement of the solution. The critical clearing time is the slowest fault clearing time at which no units will lose synchronism. Thus, a longer clearing time for an option represents a more robust system solution. As shown in Table 4.1.2 of the Planning Scope Document, Project Alternative 1 provides improved (longer) critical clearing times when compared to the existing system.

The second type of analysis examined the minimum allowable MVAR output (minimum excitation limit) from the Point Beach and Kewaunee generating units while maintaining synchronism. This was determined by varying the voltage schedule of these generators while simulating critical faults, which is a method for varying the excitation on the unit. As shown in Table 4.1.3 of the Planning Scope, the result of the analysis indicated that Project Alternative 1 allows generating unit operation with a close to unity or leading (i.e., under-excited) power factor for the Point Beach and Kewaunee generating units.

Project Alternative 2, the new right-of-way option, involves:

1) Constructing a new Barnhart 345 kV Switching Station;
2) Constructing a new Branch River 345 kV Switching Station;
3) Constructing a new 345 kV line from Barnhart to Branch River (~ 32 miles);
4) Looping the existing 345 kV lines 796L41 (Edgewater-Cedarsauk), W-1 (Edgewater-South Fond du Lac) and L-SEC31 (Sheboygan Energy Center-Granville) into the new Barnhart Switching Station;
5) Looping the existing 345 kV lines L-111 (Point Beach-Sheboygan Energy Center) and L-121 (Point Beach-Forest Junction) into the new Branch River Switching Station;

6) Installing a new 345 kV breaker in series with the existing Q-303 breaker at the Point Beach Substation; and

7) Uprating the Barnhart-Cedarsauk 345 kV line to achieve 1052 MVA SN/SE (1761 Amps).

Project Alternative 2 improves system strength significantly and achieves a wide operating envelop for the local transmission system and the interconnected generators by permitting generating unit operation to unity or under-excited conditions. It addresses transient stability issues identified for faults under prior outage conditions. This alternative also relieves the loadings on the existing 138 kV and 345 kV lines running from the Fox Valley area to the south under intact and contingency conditions by providing an additional transmission outlet.

Project Alternative 2 was developed similarly to Project Alternative 1. Initially, Project Alternative 2 items (1) through (6) were modeled and evaluated to confirm whether they addressed stability needs. After it was confirmed that they did, a steady-state analysis was performed to identify any new thermal constraints. As a result of the steady-state analysis, the Barnhart-Cedarsauk 345 kV line was identified as a thermal constraint under a NERC TPL-002 Category B outage. Therefore, work item (7), uprating the Barnhart-Cedarsauk 345 kV line, was added to Alternative 2 to mitigate this constraint. Without item (7), the Barnhart-Cedarsauk 345 kV line would be overloaded by 32.5% (without 5% transmission planning margin) under the most severe N-1 contingency condition during off-peak (70% load) conditions.

Similar to Project Alternative 1, additional studies were performed to determine the robustness of Project Alternative 2. Project Alternative 2 provides improved (longer) critical clearing times when compared to the existing system. Additional simulations determined the minimum allowable MVAR output (minimum excitation limit) from the Point Beach and Kewaunee generating units while maintaining synchronism for the critical faults by varying the voltage schedule (hence, the excitation) of these generators. The result of the analysis indicated that Project Alternative 2 allows generating unit operation at close to unity or leading (i.e., under-excited) power factor. These results can be found in Tables 4.2.2 and 4.2.3 in the Planning Scope document in Appendix C.

Additional Benefits: Project Alternatives 1 and 2 were evaluated to identify additional benefits that may be realized as a result of each alternative. These benefits are summarized and compared.

Potential Loading Relief and Voltage Support under Contingency Conditions

The 2021 Summer Peak (100% load) and 2021 Off-Peak (65% load with west-to-east bias) models built for the ATC 2011 Ten Year Assessment were used to identify and compare the benefits of each alternative from a steady-state power flow perspective. To do this, steady-state power flow analysis was performed for each model (1) with none of the alternatives in-service, (2) with Project Alternative 1 in service and (3) with Project Alternative 2 in-service. Details of the study results can be found in Appendix F (Alternative 1) and Appendix G (Alternative 2) of the Planning Scope Document, provided in Appendix C, Exhibit 1.

In summary, Project Alternative 1 provides significant voltage support to 138 kV substations when certain 138 kV line breakers are open. Moreover, primarily due to the new 138 kV transmission line from Howards Grove to Erdman, Project Alternative 1 provides significant contingency loading relief and voltage support to the existing 138 kV and 69 kV systems in the Sheboygan area under various NERC TPL-003 Category C contingencies for both Summer Peak and Off-Peak conditions. Project Alternative 2 does not provide these system benefits since Project Alternative 2 requires only building a new 345 kV line connecting the two new 345 kV switching stations. However, similar to Project Alternative 1, Project Alternative 2 relieves the contingency loadings on the existing 138 kV and 345 kV lines running from the Fox Valley area to the south under certain NERC TPL-002/-003 Category B and C contingencies, particularly during Off-Peak conditions. During Summer-Peak conditions, both alternatives relieve the contingency loadings associated with the transmission facilities located in the northern portion of the study area such as the Forest Junction, Lake Park, City Limits and Point Beach substations.

Voltage Flicker Associated with Charter Steel

The Charter Steel 138 kV Substation is currently fed from the Cedarsauk/Saukville 345/138 kV Substation via a 138 kV line that runs toward Holland, Plymouth #4 and Howards Grove substations, and continues to the Forest Junction 345/138 kV Substation. The

total length of the 138 kV lines from Saukville to Forest Junction is about 78 miles. Other than the Saukville and Forest Junction substations, which have 345/138 kV transformations, there is no other strong transmission source along these 138 kV lines. Charter Steel uses arc furnaces that may produce harmonics and voltage fluctuations (flicker). The existing transmission system can serve the Charter Steel 138 kV Substation without creating power quality problems as long as it is connected to the existing Saukville/Cedarsauk 345/138 kV Substation, its closest strong transmission source. Historically, any increase in load at the Charter Steel Substation has required a special voltage fluctuation study because the increase in load could increase harmonics and flicker to unacceptable levels.

Harmonics and flicker can be reduced by strengthening the transmission system. Project Alternative 1 constructs a new Barnhart 345/138 kV Substation, terminates the unconverted portion of the 138 kV line from Holland at Barnhart and installs a new 345/138 kV transformer at the Barnhart Substation, which will strengthen the existing Charter Steel, Holland and Plymouth substations under the outage of the Saukville-Charter Steel 138 kV line. This increase in system strength with Project Alternate 1, as demonstrated by an increase in short circuit current from 1249 A to 3242 A with the Charter Steel-Saukville 138 kV line out of service, will reduce the probability of power quality issues and will provide an opportunity to re-evaluate the feasibility of serving the load at Charter Steel via the 138 kV line from Holland when the existing Saukville-Charter Steel 138 kV line is out of service. Alternative 2 does not provide such benefit since the 138 kV system modifications described for Alternative 1 are not included as part of Alternative 2.

Exposure to Outage of Existing Key 345 kV lines

Both Project Alternatives 1 and 2 will reduce exposure to outages of the existing 345 kV lines because both alternatives require tying together the key 345 kV lines at the new Barnhart and Branch River stations. Table 4.4.6 of the Planning Scope summarizes the approximate reduction in outage exposure of the existing 345 kV lines that will be looped into the new stations.

Improvement in the Existing Point Beach Special Protection System (SPS)

The Point Beach SPS is designed to preserve system stability for the delayed clearing of certain types of faults on specific lines in close proximity to Point Beach Substation under certain system conditions. Under these conditions, the SPS is enabled by the ATC System Control Operators (See Section 7.5 of the Planning Scope for more information.) Since both Project Alternatives 1 and 2 require installing a new 345 kV breaker in series with the existing Q-303 breaker at the Point Beach Substation, a fault on Q-303 at the Point Beach Substation will be cleared in primary time without delay. Therefore, both alternatives will reduce the complexity of the Point Beach SPS because both of them require the Q-303 series breaker installation at the Point Beach Substation, which will permit retirement of the Q-303 portion of the SPS.

Benefit of Converting Forest Junction to Branch River from 138 kV to 345 kV as part of Alternative 1

Converting the 138 kV segment between the Forest Junction and Branch River substations, which is part of Project Alternative 1, will provide loading relief under normal and contingency conditions. Not converting (abandoning) the existing 138 kV segment between the Forest Junction and Branch River substations may result in heavy flow on the single 345 kV line between the Forest Junction and Branch River substations under double contingency conditions. The 2021 Summer Peak model and 2021 Off-Peak model with 65% load West-East bias model built for 2011 ATC Ten Year Assessment were used to evaluate the benefit of converting the 138 kV segment to 345 kV instead of abandoning the segment. Based on engineering judgment and the result of the steady-state power flow study done for each alternative, two severe double contingencies were selected and tested using the models. As a result of the simulations, it was found that the single Forest Junction-Branch River 345 kV line may experience an impending overload (99.4% of its emergency rating) under certain 345 kV line outages during summer peak conditions. In addition, the single Forest Junction-Branch River 345 kV line may also experience heavy flow (94% of its emergency rating) under certain 345 kV line outages when Sheboygan Energy Center is online during off-peak conditions. Therefore, having a double-circuit 345 kV line between Forest Junction and Branch River, instead of single-circuit, will avoid potential system overloads and provide

maintenance and operation flexibility during planned and unplanned outage conditions.

Possible Edgewater Special Protection System (SPS) Retirement

The Edgewater SPS protects the 138 kV lines from Edgewater to North Fond du Lac from overloads. The portion of this line from South Sheboygan Falls to Mullet River is tied into the Barnhart 138 kV bus as part of Project Alternative 1 (and not in Project Alternative 2). This eliminates the possibility of overloads on the lines to the west of Barnhart and the Barnhart-Mullet River-Ohmstead-Ledgeview-North Fond du Lac lines. Preliminary analysis has shown that Project Alternative 1 and a separate project, not included in this application, increase substation equipment ratings at South Sheboygan Falls and Edgewater can eliminate overloads on the 138 kV lines east of Barnhart, which could eliminate the need for the Edgewater SPS.

Summary Comparison of Project Alternatives 1 and 2

Table 4.4.7 of the Planning Scope presents a summary comparison of the benefits and merits for each of the two alternatives considered. Although both Project Alternatives 1 and 2 address system needs, they are not equivalent when overall performance is compared in terms of system loss reduction, construction cost and overall system benefits. In summary:

- Project Alternative 1 provides better loss savings than Project Alternative 2.
- Project Alternative 1 costs less than Project Alternative 2. (See Section 4.4 of the Planning Scope Document (Appendix C, Exhibit 1.)
- With the new additional 138 kV transmission connection to the Sheboygan area, Project Alternative 1 provides significant contingency loading relief and voltage support to the existing Sheboygan area 138 kV and 69 kV systems under NERC TPL-003 Category C conditions for both Summer Peak and Off-Peak conditions.
- With the new 138 kV transmission connection to the Sheboygan area and the Barnhart 138 k bus, Project Alternative 1 will improve the Edgewater Operator Instruction and Alliant Energy-owned SPS by relieving contingency loadings on the Edgewater

138 kV lines when the two Edgewater 345 kV lines are out of service. Additional projects to upgrade substation equipment at South Fond du Lac and Edgewater could result in the retirement of this SPS.

- With the new 345/138 kV transformation at the Barnhart Substation and the 138 kV line from Holland terminated at the Barnhart Substation, Project Alternative 1 provides significant voltage support to area substations such as Charter Steel, Holland and Plymouth #4.
- With the new or converted 345 kV line, both Project Alternative 1 and Project Alternative 2 relieve the contingency loadings on the existing 138 kV and 345 kV lines running from the Fox Valley area to the south under NERC Category TPL-002/-003 B and C contingency conditions, particularly during the Off-Peak conditions. During Summer Peak conditions, both Project Alternative 1 and Project Alternative 2 also relieve the contingency loadings associated with the transmission facilities located in the northern portion of the study area such as Forest Junction, Lake Park, City Limits and Point Beach.
- Project Alternative 1 will reduce the voltage fluctuations that occur at the substations close to Charter Steel since Project Alternative 1 strengthens the 138 kV transmission system near Charter Steel, improving the short-circuit strength at the Charter Steel Substation under both intact conditions and during the prior outage of the Saukville-Charter Steel 138 kV line.
- Both Project Alternatives 1 and 2 will require new right-of-way for new transmission lines. Project Alternative 1 minimizes the new ROW required.
- Both Project Alternatives 1 and 2 will reduce exposure to the outage of the key existing 345 kV lines because both alternatives require tying together the key existing 345 kV lines around the new Barnhart and Branch River stations.
- Since both Project Alternative 1 and 2 require installing a new 345 kV breaker in series with the existing Q-303 breaker at the Point Beach Substation, a fault on Q-303 at Point Beach will be cleared in primary time without delay. Therefore, both alternatives will improve the Point Beach SPS as a result of the Q-303 series breaker installation at Point Beach.

2.1.3.4 Electrical Losses

A transmission system loss analysis of the two alternatives compared the relative performance of the proposed alternatives. The 2021 summer peak planning model built for the 2011 Ten Year Assessment was used for the loss analysis. The reduction in losses was computed for the ATC system using the 2021 summer peak planning models with none of the alternatives in-service, with Alternative 1 in-service, and with Alternative 2 in-service. A summary of the ATC system loss reduction is provided in Table 2.1.3.4.1.

Table 2.1.3.4.1 Comparison of ATC Total System Losses

Project Alternatives	Base (without alternatives in-service)	Project Alternative 1	Project Alternative 2
ATC System Losses (MW)	346.3	342.4	343.7
Loss differential (MW) (Base – Alternative)	0	3.9	2.6

New lines can reduce losses throughout the year, but particularly during high load periods. As indicated above, the loss reductions at peak load were estimated using PSS/E power flow models. Lower losses will result in a lower peak load that will require less combustion turbine capacity be built to meet reserve margin requirements. This results in a “capacity cost” savings, which was calculated with combustion turbine capacity valued at $570/kW in 2007 dollars and escalated at 3.0% annually.

2.1.3.5 Generator Interconnection Short Circuit, Stability, and Thermal Analyses

Although near-term upgrades were installed to permit the interconnection and operation of the modified generation facilities at Point Beach, limitations and restrictions were placed on the Point Beach and Kewaunee generators to ensure the reliable operation of the transmission system. The proposed project is needed for the long-

term reliable operation of the transmission system as described in Sections 2.1.3 and 2.1.3.2 above.

More information regarding these analyses can be found in the G833/J023 and G834/J023 generator Interconnection System Impact Study (http://oasis.midwestiso.org/documents/ATC/G833-4_J022-3_Final_ISIS_Report.pdf) which is provided as Appendix C, Exhibit 2.

2.1.3.6 Distribution Substation Need and Alternatives

The Project is not required to address distribution substation needs. This section is not applicable.

2.1.3.7 Planning Simulation Data (PSSE/Power World)

Data files supporting the Project Scoping Document contained in Appendix C are being provided separately with a request for confidentiality.

2.1.4 Substation Facilities

Two new ATC substations, to be known as Barnhart (BHA) (functionally a switching station in Project Alternative 2), and Branch River (BRV), are proposed. ATC is proposing two locations for each substation, which are all in close proximity to the existing ATC 345 kV transmission lines. ATC's preferred locations are the Branch River South Substation Option and the Barnhart South Substation Option. These sites are the least environmentally and physically constrained providing more flexibility in the design of the substations and related facilities as well as line routing into the facilities.

Additionally, modifications will be required at the Forest Junction, Howards Grove, Erdman, Point Beach, Sheboygan Energy Center, Edgewater, South Sheboygan Falls, South Fond du Lac, Granville, Saukville/Cedarsauk, Holland, and Mullet River substations. All work at these substations, except for at the Point Beach and Howard's Grove substations, will occur within the existing substation fences. The Point Beach and Howard's Grove substations will be expanded beyond the existing substation fences but within the existing utility property to accommodate the new facilities.

Work at each of the Substations includes:

Barnhart Substation (BHA)

The Barnhart Substation would be located on one of two sites, the Barnhart North Substation Option and the Barnhart South Substation Option. The substation bus and equipment configuration of each site

option varies slightly with the Project Alternative and transmission line route chosen. Project Alternative 1 would include both 345 kV and 138 kV buses. Project Alternative 2 would only include a 345 kV bus.

The proposed facilities at the Barnhart Substation include:

- New 345 kV breaker-and-one–half bus with eight initial positions and four future positions. This design minimizes transmission line crossings. (Only seven initial positions would be needed for Project Alternative 2.)
- Fourteen 345 kV line steel dead-end structures.
- One 345/138 kV 500 MVA autotransformer. (Only needed for Project Alternative 1).
- Twelve 345 kV circuit breakers. (Project Alternative 2 will only need eleven breakers.)
- New 138 kV breaker-and-one-half bus with six initial positions and four future positions. This design minimizes transmission line crossings (only needed for Project Alternative 1).
- Eight 138 kV circuit breakers (only needed for Project Alternative 1).
- Ten 138 kV line steel dead-end structures (only needed for Project Alternative 1).
- Control building with protection and control equipment, batteries, and AC/DC panels.

The preliminary layouts of the Barnhart Substation for Project Alternative 1 (north and south substation options) are shown in Appendix B, Figures 12 and 13, respectively. The preliminary layouts of the Barnhart Substation for Project Alternative 2 (north and south substation options) are shown in Appendix B, Figures 14 and 15, respectively. The substation site properties and ownership are for the north and south site options are shown in Appendix A, Figures 19 and 20, respectively.

Additionally, a representative elevation drawing for a typical 345 kV substation is provided in Appendix B, Figure 24.

Branch River Substation (BRV)

The Branch River Substation would be located at one of two sites, the Branch River North Substation Option and the Branch River South Substation Option. The substation bus and equipment configuration of each option varies slightly with the alternative and route chosen.

The proposed facilities at the Branch River Substation include:

- New 345 kV breaker-and-one–half bus with six positions initially and four future positions. This design minimizes transmission line crossings. (Only five initial positions would be needed for Project Alternative 2.)
- Twelve (south substation option) or thirteen (north substation option) 345 kV line steel dead-end structures. (Alternative 2 will only need ten (south substation option) or eleven (north substation option) dead-end structures.)
- Ten 345 kV circuit breakers. (Alternative 2 will only need nine breakers.)
- Control building with protection and control equipment, batteries, and AC/DC panels.

The preliminary layouts of the Branch River Substation for Project Alternative 1 (north and south substation options) are shown in Appendix B, Figures 16 and 17, respectively. The preliminary layouts of the Branch River Substation for Project Alternative 2 (north and south substation options) are shown in Appendix B, Figures 18 and 19, respectively. The substation site properties and ownership are for the north and south site options are shown in Appendix A, Figures 15 and 16, respectively.

Additionally, a representative elevation drawing for a typical 345 kV substation is provided in Appendix B, Figure 24.

Forest Junction (FJT)

For both project alternatives, the 345 kV circuit 121 from Point Beach to Forest Junction will be split and re-terminated into the Branch River Substation. The associated existing relay scheme at the Forest Junction Substation for this line is not compatible with the new relays that will be installed at the Branch River Substation. Therefore the associated line relaying and communication scheme at the Forest Junction Substation will be upgraded.

Additional modifications for Forest Junction are only needed for Project Alternative 1.

- Circuit 121 will be relocated from its current line position #L21 to line position #L41 on the south section of the 345 kV ring bus. One 345 kV circuit breaker will be installed in the ring bus to accommodate this relocation.
- One (1) 345 kV line steel dead-end structure will be installed for position #L41.

- The existing 138 kV line position #K51 for the circuit 971K51 to Howards Grove will be disconnected and the circuit will be upgraded to 345 kV. The upgraded 345 kV circuit, 345-BRV-FJT from Branch River will be installed in the old 345 kV circuit 121 position.
- #L21 and the associated relaying and communication schemes will be upgraded.

The preliminary layout of the Forest Junction Substation for Project Alternative 1 is shown in Appendix B, Figure 20.

Howards Grove (HOG)

The modifications below for the Howards Grove Substation are only needed under Project Alternative 1 due to the proposed 138 kV transmission line changes.

The existing line position at the Howards Grove Substation for circuit 971K51 to the Forest Junction Substation will be disconnected. The 138 kV bus will be partially extended in a manner that will allow for a future ring bus configuration. The new 138 kV circuit from Howards Grove to Erdman, 138-HOG-ERD, will connect to this extended bus section. One 138 kV line steel dead-end structure will be installed for this new circuit. The existing relaying and communications for circuit 971K51 will be upgraded and used for the new 138 kV 138-HOG-ERD circuit to Erdman.

Additionally, the 138 kV circuit HOLG21 from Holland to Howards Grove will be split and re-terminated into the new Barnhart Substation. The associated existing relay scheme at the Howards Grove Substation for this line is not compatible with the new relays that will be installed at the Barnhart Substation. Therefore the associated line relaying and communication scheme at the Howards Grove Substation will be upgraded.

The preliminary layout of the Howards Grove Substation for Project Alternative 1 is shown in Appendix B, Figure 21.

Erdman (ERD)

The modifications below for the Erdman Substation are only needed under Project Alternative 1 due to the proposed 138 kV transmission line changes.

A new line position, including a new 138 kV circuit breaker, will be added at the Erdman Substation for a new 138 kV circuit between Howards Grove and Erdman. A second 138 kV bus will be created by rearranging the existing 138 kV bus, installing a 138 kV bus tie circuit breaker, and

installing a new 138 kV bus with associated equipment. Another 138 kV circuit breaker will be installed on the primary side of the 138/69 kV transformer. The existing 138/12 kV transformer will be moved to a position on the new bus. In order to accommodate the new circuit from the Howards Grove Substation, the existing 138 kV circuits will be moved to different locations on the Erdman 138 kV bus. 138 kV circuit X-64 from the 20th Street Substation will be relocated to the eastern line position. 138 kV circuit X-48 to the Lodestar Substation will be relocated to the new southern line position. The new Howards Grove circuit 138-HOG-ERD will be placed in the western line position. Two 138 kV line steel dead-end structures will be installed. Protection, control, and communication equipment will be installed for the new Howards Grove to Erdman circuit, the new bus, and the three new 138 kV circuit breakers.

The preliminary layout of the Erdman Substation for Project Alternative 1 is shown in Appendix B, Figure 22.

Point Beach

At the Point Beach Substation, a new 345 kV circuit breaker will be installed in series with the existing Q-303 line breaker. The existing Q-303 line termination equipment (dead-end, switch, arresters and CCVT) will need to be relocated to allow for the installation of the new breaker. Breaker control modifications will be required. The fence line will need to be extended to allow for the addition of the circuit breaker and the relocation of the line termination equipment.

345 kV circuit 111 from Point Beach to Sheboygan Energy Center will be split and re-terminated into the new Branch River Substation. 345 kV circuit 121 from Point Beach to Forest Junction will be split and re-terminated into the Branch River Substation. The associated existing protective relay schemes at the Point Beach Substation for these lines are not compatible with the new relays that will be installed at the Branch River Substation. Therefore, the associated line relaying and communication schemes at the Point Beach will be upgraded.

The preliminary layout of the Point Beach Substation is shown in Appendix B, Figure 23.

Sheboygan Energy Center

345 kV circuit L-SEC31 from the Granville Substation to the Sheboygan Energy Center Substation will be split and re-terminated into the new Barnhart Substation. 345 kV Circuit 111 from the Point Beach Substation to Sheboygan Energy Center Substation will be split and re-terminated into the Branch River Substation. The associated existing relay schemes

at the Sheboygan Energy Center Substation for these lines are not compatible with the new relays that will be installed at Branch River and Barnhart. Therefore the associated line relaying and communication schemes at Sheboygan Energy Center will be upgraded.

Edgewater

345 kV circuits 796L41 from the Cedarsauk Substation to the Edgewater Substation and W-1 from South Fond du Lac Substation to the Edgewater Substation will both be split and re-terminated into the new Barnhart Substation. The associated existing relay schemes at the Edgewater Substation for these lines are not compatible with the new relays that will be installed at the Barnhart Substation. Therefore, the associated line relaying and communication schemes at the Edgewater Substation will be upgraded.

South Sheboygan Falls

The modifications below for the South Sheboygan Falls Substation are only needed under Alternative 1 due to the proposed 138 kV transmission line changes.

138 kV circuit X-57 from South Sheboygan Falls to Mullet River will be split and re-terminated into the new Barnhart Substation. The associated existing relay scheme at the South Sheboygan Falls Substation for this line is not compatible with the new relays that will be installed at the Barnhart Substation. Therefore, the associated line relaying and communication scheme at the South Sheboygan Falls Substation will be upgraded.

South Fond du Lac

345 kV circuit W-1 from the South Fond du Lac Substation to the Edgewater Substation will be split and re-terminated into the new Barnhart Substation. The associated existing relay scheme at the South Fond du Lac Substation for this line is not compatible with the new relays that will be installed at the Barnhart Substation. Therefore, the associated line relaying and communication scheme at the South Fond du Lac Substation will be upgraded.

Granville

345 kV circuit L-SEC31 from the Granville Substation to the Sheboygan Energy Center Substation will be split and re-terminated into the new Barnhart Substation. The associated existing relay scheme at the Granville Substation for this line is not compatible with the new relays

that will be installed at the Barnhart Substation. Therefore, the associated line relaying and communication scheme at Edgewater will be upgraded.

Cedarsauk

345 kV circuit 796L41 from the Cedarsauk Substation to the Edgewater Substation will be split and re-terminated into the new Barnhart Substation. The associated existing relay scheme at the Cedarsauk Substation for this line is not compatible with the new relays that will be installed at the Barnhart Substation. Therefore, the associated line relaying and communication scheme at the Cedarsauk Substation will be upgraded.

Holland

The modifications below for the Holland Substation are only needed under Project Alternative 1 due to the proposed 138 kV transmission line changes.

138 kV circuit HOLG21 from the Holland Substation to the Howards Grove Substation will be split and re-terminated into the new Barnhart Substation. The associated existing relay scheme at the Holland Substation for this line is not compatible with the new relays that will be installed at the Barnhart Substation. Therefore, the associated line relaying and communication scheme at the Holland Substation will be upgraded.

Mullet River

Communication channels will be established between the South Fond du Lac and Barnhart substations by installing new OPGW. The OPGW will be installed from the Barnhart Substation through the Mullet River Substation on circuit X-57 and on to South Fond du Lac via circuits X-97, X-2, and X-25. This communication path will be required for both Project alternatives. The communication equipment at Mullet River will also need to be upgraded.

Additionally, for Project Alternative 1 only, the 138 kV circuit X-57 from South Sheboygan Falls Substation to the Mullet River Substation will be split and re-terminated into the new Barnhart Substation. The associated existing relay scheme at the Mullet River Substation for this line is not compatible with the new relays that will be installed at the Barnhart Substation. Therefore, the associated line relaying and communication scheme at the Mullet River Substation will be upgraded.

2.1.5 Contractual Agreements

There are no contractual agreements between ATC and other parties with respect to the construction, financing or ownership of the proposed project.

2.1.6 Transmission Service Agreements

ATC provides transmission service under the terms of the Midwest ISO Open Access Transmission and Energy Markets Tariff (OATT), which is administered by the Midwest ISO.

2.1.7 Transmission Costs

The proposed project includes a combination of 138 kV and 345 kV transmission line construction and related substation facilities. The project costs vary based on the selected transmission line alternatives, Barnhart Substation option and Branch River Substation option. Base estimates were created in current year (2012) dollars and escalated to accurately capture expected inflationary increases associated with material pricing, labor costs, and equipment rental rates. This escalation is forecast out to a date that factors in anticipated material acquisition order dates and the construction sequence schedule. Project costs for each possible combination are provided in Section 2.1.7.3 below.

2.1.7.1 Segment Cost Estimate

Generally, the alternatives presented in this application are not interchangeable, therefore segment cost estimates were not completed.

2.1.7.2 Route Cost Estimate

See Section 2.1.7.3 below.

2.1.7.3 Project Cost Components for 345 kV or greater

2.1.7.3.1 Transmission (material, labor, other)

The following tables provide the total cost of each project and route alternative and substation site combination.

Barnhart South Substation Option to Branch River South Substation Option				
	Project Cost Categories	**Project Alternative 1**		**Project Alternative 2**
345 kV		**Alternative 1A**	**Alternative 1B**	
Transmission Line	**Material**	17,306,000	17,294,000	34,014,800
	Labor	33,095,400	33,100,700	101,375,200
	Other	7,541,200	7,531,000	19,185,800
	Land Rights	449,700	448,900	11,942,800
	Distribution System Modifications	260,000	260,000	240,300
	Subtotal	**58,652,300**	**58,634,600**	**166,758,900**
138/69 kV		**Alternative 1A**	**Alternative 1B**	**Alternate 2**
Transmission Line	**Material**	6,245,900	7,728,400	846,700
	Labor	13,028,100	16,575,900	1,248,500
	Other	3,193,900	4,429,000	249,200
	Land Rights	2,704,800	4,259,500	6,000
	Distribution System Modifications	42,000	4,914,300	0
	Subtotal	**25,214,700**	**37,907,100**	**2,350,400**
796L41 Uprate		**Alternate 1A**	**Alternate 1B**	**Alternate 2**
	Material	276,700	276,700	442,700
	Labor	1,758,300	1,758,300	2,793,900
	Other	286,500	286,500	427,000
	Land Rights	6,300	6,300	9,500
	Subtotal	**2,327,800**	**2,327,800**	**3,673,100**
OPGW		**Alternate 1A**	**Alternate 1B**	**Alternate 2**
(In addition to those costs included in line construction above)	**Material**	2,813,200	2,846,600	1,723,900
	Labor	15,612,500	15,693,400	11,627,300
	Other	3,815,000	3,824,700	2,691,500
	Land Rights	54,800	55,400	40,500
	Subtotal	**22,295,500**	**22,420,100**	**16,083,200**

Barnhart South Substation Option to Branch River South Substation Option (cont'd)				
		Alternate 1A	**Alternate 1B**	**Alternate 2**
Other Project Costs	**Pre-certification**	7,647,000	7,647,000	7,647,000
	One-Time 5% Environmental Impact Fee	5,623,600	5,622,800	9,791,800
	Annual 0.3% Environmental Impact Fee (During Construction Only)	927,900	927,800	1,615,600
	Operation and Maintenance (Estimated During Construction Only)	0	0	0
	Subtotal Other Costs	**14,198,500**	**14,197,600**	**19,080,900**
Substation (Sect. 2.1.7.3.2 below)				
	Subtotal Substation Costs	**73,616,900**	**73,613,900**	**53,333,200**
Total Gross Project Cost		**$196,305,700**	**$209,101,100**	**$261,279,700**

Barnhart North Substation Option to Branch River South Substation Option				
	Project Cost Categories	**Project Alternative 1**		**Project Alternative 2**
345 kV		**Alternative 1A**	**Alternative 1B**	
Transmission Line	**Material**	16,510,800	16,510,800	33,500,700
	Labor	31,991,500	31,996,300	100,580,200
	Other	7,283,700	7,283,900	19,000,600
	Land Rights	397,900	397,900	11,876,200
	Distribution System Modifications	260,000	260,000	240,300
	Total Cost	**56,443,900**	**56,448,900**	**165,198,000**
138/69 kV		**Alternative 1A**	**Alternative 1B**	**Alternate 2**
Transmission Line	**Material**	5,987,600	7,797,200	1,067,400
	Labor	12,547,100	16,827,900	1,806,100
	Other	3,078,400	4,469,000	392,900
	Land Rights	2,681,700	4,286,000	33,300
	Distribution System Modifications	42,000	4,914,300	0
	Total Cost	**24,336,800**	**38,294,400**	**3,299,700**
796L41 Uprate		**Alternative 1A**	**Alternative1B**	**Alternative 2**
	Material	276,700	276,700	442,700
	Labor	1,758,300	1,758,300	2,793,900
	Other	286,500	286,500	427,000
	Land Rights	6,300	6,300	9,500
	Subtotal	**2,327,800**	**2,327,800**	**3,673,100**
OPGW		**Alternative 1A**	**Alternative 1B**	**Alternative 2**
(In addition to those costs included in line construction above)	**Material**	2,775,000	2,825,100	1,723,900
	Labor	15,530,500	15,644,100	11,627,300
	Other	3,801,700	3,819,800	2,691,500
	Land Rights	54,800	55,300	40,500
	Subtotal	**22,162,000**	**22,344,300**	**16,083,200**

Barnhart North Substation Option to Branch River South Substation Option (cont'd)				
		Alternative 1A	**Alternative 1B**	**Alternative 2**
Other Project Costs	**Pre-certification**	7,647,000	7,647,000	7,647,000
	One-Time 5% Environmental Impact Fee	5,523,300	5,523,500	9,720,900
	Annual 0.3% Environmental Impact Fee (During Construction Only)	911,300	911,400	1,603,900
	Operation and Maintenance (Estimated During Construction Only)	0	0	0
	Subtotal Other Costs	**14,081,600**	**14,081,900**	**18,971,800**
Substation (Sect. 2.1.7.3.2 below)	**Total Substation Costs**	**73,613,900**	**73,613,900**	**53,333,200**
Total Gross Project Cost		**$192,966,000**	**$207,111,200**	**$260,559,000**

Barnhart South Substation Option to Branch River North Substation Option				
	Project Cost Categories	**Project Alternative 1**		**Project Alternative 2**
345 kV		**Alternative 1A**	**Alternative 1B**	
Transmission Line	**Material**	17,600,500	17,588,500	34,183,000
	Labor	33,321,300	33,326,600	101,549,100
	Other	7,655,600	7,645,400	19,262,400
	Land Rights	475,400	474,400	11,986,200
	Distribution System Modifications	260,000	260,000	240,300
	Total Cost	**59,312,800**	**59,294,900**	**167,221,000**
138/69 kV		**Alternative 1A**	**Alternative 1B**	**Alternate 2**
Transmission Line	**Material**	6,245,900	7,728,400	846,700
	Labor	13,028,100	16,575,900	1,248,500
	Other	3,193,900	4,429,000	249,200
	Land Rights	2,704,800	4,259,500	6,000
	Distribution System Modifications	42,000	4,914,300	0
	Total Cost	**25,214,700**	**37,907,100**	**2,350,400**
796L41 Uprate		**Alternate 1A**	**Alternate 1B**	**Alternate 2**
	Material	276,700	276,700	442,700
	Labor	1,758,300	1,758,300	2,793,900
	Other	286,500	286,500	427,000
	Land Rights	6,300	6,000	9,500
	Subtotal	**2,327,800**	**2,327,500**	**3,673,100**
OPGW		**Alternate 1A**	**Alternate 1B**	**Alternate 2**
(In addition to those costs included in line construction above)	**Material**	2,814,300	2,847,700	1,723,900
	Labor	15,619,200	15,700,100	11,627,300
	Other	3,815,300	3,824,900	2,691,500
	Land Rights	54,800	55,400	40,500
	Subtotal	**22,303,600**	**22,428,100**	**16,083,200**

Barnhart South Substation Option to Branch River North Substation Option (cont'd)				
		Alternate 1A	**Alternate 1B**	**Alternate 2**
Other Project Costs	**Pre-certification**	7,647,000	7,647,000	7,647,000
	One-Time 5% Environmental Impact Fee	5,653,600	5,652,800	9,812,800
	Annual 0.3% Environmental Impact Fee (During Construction Only)	932,800	932,700	1,619,100
	Operation and Maintenance (Estimated During Construction Only)	0	0	0
	Subtotal Other Costs	**14,233,400**	**14,232,500**	**19,078,900**
Substation (Sect. 2.1.7.3.2 below)	**Total Substation Costs**	**73,613,900**	**73,613,900**	**53,333,200**
Total Gross Project Cost		**$197,006,200**	**$209,804,000**	**$261,739,800**

Barnhart North Substation Option to Branch River North Substation Option				
	Project Cost Categories	**Project Alternative 1**		**Project Alternative 2**
345 kV		**Alternative 1A**	**Alternative 1B**	
Transmission Line	**Material**	16,778,200	16,778,200	33,654,300
	Labor	32,168,200	32,173,000	100,750,300
	Other	7,371,900	7,372,000	19,065,400
	Land Rights	419,500	419,500	11,898,000
	Distribution System Modifications	260,000	260,000	240,300
	Total Cost	**56,997,800**	**57,002,700**	**165,608,300**
138/69 kV		**Alternative 1A**	**Alternative 1B**	**Alternate 2**
Transmission Line	**Material**	5,987,600	7,797,200	1,067,400
	Labor	12,547,100	16,827,900	1,806,100
	Other	3,078,400	4,469,000	392,900
	Land Rights	2,681,700	4,286,000	33,300
	Distribution System Modifications	42,000	4,914,300	-
	Total Cost	**24,336,800**	**38,294,400**	**3,299,700**
796L41 Uprate		**Alternate 1A**	**Alternate 1B**	**Alternate 2**
	Material	276,700	276,700	442,700
	Labor	1,758,300	1,758,300	2,793,900
	Other	286,500	286,500	427,000
	Land Rights	6,300	6,300	9,500
	Subtotal	**2,327,800**	**2,327,800**	**3,673,100**
OPGW		**Alternate 1A**	**Alternate 1B**	**Alternate 2**
(In addition to those costs included in line construction above)	**Material**	2,776,000	2,826,200	1,723,900
	Labor	15,537,100	15,650,800	11,627,300
	Other	3,801,900	3,820,100	2,691,500
	Land Rights	54,800	55,300	40,500
	Subtotal	**22,169,800**	**22,352,400**	**16,083,200**

Barnhart North Substation Option to Branch River North Substation Option (cont'd)				
		Alternate 1A	**Alternate 1B**	**Alternate 2**
Other Project Costs	**Pre-certification**	7,647,000	7,647,000	7,647,000
	One-Time 5% Environmental Impact Fee	5,548,400	5,548,700	9,739,500
	Annual 0.3% Environmental Impact Fee (During Construction Only)	915,500	915,500	1,610,000
	Operation and Maintenance (Estimated During Construction Only)	-	-	-
	Subtotal Other Costs	**14,110,900**	**14,111,200**	**18,996,500**
Substation (Sec. 2.1.7.3.2 below)				
	Total Substation Costs	**73,613,900**	**73,613,900**	**53,333,200**
Total Gross Project Cost		**$193,557,000**	**$207,702,400**	**$260,994,400**

2.1.7.3.2 Substation Costs (material, labor, other)

Substation construction costs are provided below for each project alternative and substation option and are also included in the project costs provided in Section 2.1.7.3.1.

Substation		Alternate 1A	Alternate 1B	Alternate 2
Branch River	**Material**	9,822,900	9,822,900	9,033,400
	Labor	9,851,000	9,851,000	9,240,800
	Other	4,600,500	4,600,500	4,399,700
	Land Rights	366,300	366,300	366,300
	Subtotal	**24,640,700**	**24,640,700**	**23,040,200**
Substation		**Alternate 1A**	**Alternate 1B**	**Alternate 2**
Barnhart	**Material**	18,313,400	18,313,400	10,854,300
	Labor	14,072,600	14,072,600	9,772,000
	Other	5,202,300	5,202,300	4,368,000
	Land Rights	1,037,800	1,037,800	1,037,800
	Subtotal	**38,626,100**	**38,626,100**	**26,032,100**
Substation		**Alternate 1A**	**Alternate 1B**	**Alternate 2**
Forest Junction	**Material**	810,300	810,300	71,500
	Labor	830,300	830,300	181,900
	Other	539,300	539,300	247,500
	Land Rights	-	-	-
	Subtotal	**2,179,900**	**2,179,900**	**500,900**

Substation		Alternate 1A	Alternate 1B	Alternate 2
Howards Grove	Material	259,000	259,000	-
	Labor	732,200	732,200	-
	Other	688,300	688,300	-
	Land Rights	8,400	8,400	-
	Subtotal	1,687,900	1,687,900	-
Substation		**Alternate 1A**	**Alternate 1B**	**Alternate 2**
Erdmann	Material	723,900	723,900	-
	Labor	1,318,900	1,318,900	-
	Other	672,300	672,300	-
	Land Rights	4,200	4,200	-
	Subtotal	2,719,300	2,719,300	-
Substation		**Alternate 1A**	**Alternate 1B**	**Alternate 2**
Point Beach	Material	515,700	515,700	515,700
	Labor	589,500	589,500	589,500
	Other	392,700	392,700	392,700
	Land Rights	0	0	0
	Subtotal	**1,497,900**	**1,497,900**	**1,497,900**
Substation		**Alternate 1A**	**Alternate 1B**	**Alternate 2**
Other	Material	336,000	336,000	336,000
	Labor	1,033,400	1,033,400	1,033,400
	Other	892,700	892,700	892,700
	Land Rights	0	0	-
	Subtotal	**2,262,100**	**2,262,100**	**2,262,100**
Total, Substation Costs		**$73,613,900**	**$73,613,900**	**$53,333,200**

2.1.7.3.3 Environmental Protection & Licensing Costs

2.1.7.3.3.1 Environmental Monitoring Services

2.1.7.3.3.1.1 Cost for Internal Environmental Monitors

Internal environmental monitors, who are directed by ATC environmental staff, are responsible for the inspection and monitoring of construction activities in accordance with the environmental permit requirements and regulations applicable to the project. They will work directly with ATC staff and ATC contractors, providing advice, consultation, and reports on environmental matters as they relate to construction activities. They will also communicate directly with agency staff, as required. The estimated cost of ATC internal environmental monitors is $455,000 (in 2015 dollars) for the routes. This estimate assumes that one monitor will work an average of three days a week for 130 weeks in addition to an average of $1,000 per mile for the OPGW installation separate from the transmission line alternatives. The estimate includes both active construction and a 60-day re-vegetation period.

2.1.7.3.3.1.2 Cost for Independent Environmental Monitors

American Transmission Company does not anticipate that independent monitors will be required for this project due to the amount of sharing with existing corridors for each alternative. The Commission did previously order the use of an independent monitor for ATC's Rockdale-West Middleton project (PSCW Docket No. 137-CE-147). The average full-time monthly independent-monitor cost for that project is approximately $16,000.

2.1.7.3.3.1.3 Agricultural Protection

ATC anticipates that Agricultural Protection Measures (also called Farm Disease Prevention) may be used in agricultural areas; however, the need and exact locations for these protection measures will be determined based on landowner discussions. For this estimate, ATC assumes that protection measures will only be necessary in areas that have livestock farming. According to field and air photo review there are 22 livestock parcels along transmission line route Alternative 1A, 28 along Alternative 1B, 14 along Alternative 2, and 5 livestock parcels along that portion of the project involved

with the OPGW installation only. According to field review as well as review of the 2010 Certified Organic Farm Mailing list provided by the Department of Agriculture Trade and Consumer Protection (DATCP) and United States Department of Agriculture (USDA) National Organic Program database, there are no known organic farms along the three project alternatives.

2.1.7.3.3.1.4 Environmental Protection Wetlands, etc.

A wetlands/accessibility factor was used to estimate the quantity of mats for the entire length of the line that traverses wetlands, using each mat twice. It was assumed that ROW access is required for the entire centerline length in wetlands. Mats are stacked two high with nominal mat dimensions of 4 feet x 12 feet.

2.1.7.3.3.2 Technical Support Services

The technical support services portion of the transmission line estimate summarizes costs associated with engineering and project management, including the payment of sales taxes. The estimated cost for technical support services for the three project alternatives is $31,000.

Costs outside the preparation of the Joint Application include costs to develop an Environmental Access Plan, Construction Mitigation Plan, and an environmental training plan. The total assumed cost for this work is $25,000.

Stormwater and Erosion Control plans and updated Wis. Admin. Code ch. NR 216 submittals will be needed prior to construction. ATC will also provide information to local governments. Total assumed cost for this work is $32,500 for both the transmission line and substation alternatives.

This project will require a United States Army Corps of Engineers Section 404 permit, regardless of the alternative selected. It is anticipated that a mitigation plan will be required. The estimated cost to prepare the permit submittal is $22,500. If mitigation bank credits are purchased for wetland fill and conversion, the cost could range from $100,000 to $350,000, depending on which transmission line and substation site alternative is chosen (and based on 2012 pricing for Northland Mitigation Bank credits).

Once a transmission line route is ordered, surveys for threatened and endangered species might be necessary based on the Endangered Resources Review of WDNR dated May 29, 2012 (Appendix I, Exhibit 2) (birds, amphibians, reptiles). The estimate includes $125,000 per alternative for surveys and coordination with the WDNR's Bureau of Endangered Resources.

Soil testing and appropriate disposal will be necessary related to ATC's existing facilities. Lattice towers painted with lead-based paint are located along the existing line proposed to be re-conductored (Alternative 1) as well as line 796L41 that will require a thermal uprate. Some towers will need to be replaced to support the re-conductor and uprate. Therefore, $72,500 has been included in the cost estimate for lead soil testing and proper disposal of excavated soil around the structures in Alternative 1A and 1B, if necessary. Only the uprate would apply for Alternative 2; therefore, $16,400 was included for lead assessment and proper disposal for this Alternative. Impacted-soil management is also assumed for soil excavated from within the fence of existing substation sites ($41,000).

The cost for Phase I Environmental Site assessments for the two new substation sites is estimated to be $3,500.

An archaeological field survey has been recommended by the Commonwealth Cultural Resources Group, Inc. (CCRG) (Appendix I, Exhibit 3), ATC's archaeological consultant, to determine the location and extent of a previously reported archaeological site on Project Alternative 2. A field survey with an estimated cost of $5,000 (in 2013 dollars) was estimated for Alternative 2.

2.1.7.3.3.3 Costs Listed as Licensing and Regulation

The cost of the WDNR Utility Permit is estimated to be $10,000. This cost assumes that the Utility Permit will include Water Quality Certification, *Wis. Stat*. Chapter 30 permits, and *Wis. Adm* Code ch. NR 216 coverage, and includes the cost of ATC and contractor time to prepare the Utility Permit Application.

2.1.7.3.4 Environmental Impact Fees Estimate [per Wis. Stat. § 196.491(3g)]

For purposes of determining the costs subject to the Environmental Impact Fees (EIF), ATC considered the cost of the 345 kV transmission lines, the Barnhart and Branch River substations, and

for Project Alternative 1 only, the modifications at the Forest Junction Substation. Excluded were the costs associated with the construction of lower voltage transmission lines, distribution, and modifications at all other substations. Also excluded were Operations and Maintenance expense, Pre-Certification expense and the EIF themselves. Additionally, the estimates do not cover the allowance for risk included in the project estimates. If the costs vary from the based estimate due to realization of risk or cost savings, adjustment (true up) of the fees will occur in accordance with *Wis. Admin. Code* Adm §§ 46.04(2) and 46.05(2).

2.1.7.4 Regional Midwest ISO Projects – Cost Benefit Analysis and Allocation Cost

The Project addresses reliability issues with the ATC system. The Project is not eligible for cost sharing with the Midwest ISO region.

2.1.7.5 Cost of Electrical Losses & Assumptions

New lines can reduce losses throughout the year but particularly during high load periods. As indicated above, the loss reductions at peak load were estimated using PSS/E power flow models. Lower losses will result in a lower peak load, which will require less combustion turbine capacity be built to meet reserve margin requirements. This results in a “capacity cost” savings, which was calculated with combustion turbine capacity valued at $570/kW in 2007 dollars and escalated at 3.0% annually.

An estimate of hourly loss reductions for the rest of the year (relative to the loss reduction on peak) is based on recent historical ATC Energy Management System (EMS) loss data. These hourly loss reductions were then valued at hourly ATC load-weighted Locational Marginal Prices (LMPs) and summed across the year to estimate the total annual “energy cost” savings. ATC’s hourly load-weighted LMPs were estimated for 2011 and 2016 using PROMOD. Energy cost savings between these years were interpolated. After 2016, the savings were held constant at the 2016 value. The “capacity” and “energy” loss savings were then combined to determine the total annual loss cost savings. The present value of these savings was then calculated assuming a 40-year life.

These savings are shown below in Table 2.1.7.5 for the ATC footprint.

Table 2.1.7.5 Comparison of ATC System Loss Savings

ATC System Loss Savings	Project Alternative 1 (proposed)	Project Alternative 2
Present Value of 40-Year Loss Savings (discounted to 2012)	$21,517,165	$14,344,777
Loss Penalty (compared to Alt #1)	$ 0	$ 7,172,388

Project Alternative 1 has higher loss savings than Alternative 2. The present value of 40 year loss savings in Table 2.1.3.4.2 were used in the Net Present Value Analysis section to compare the alternatives in terms of overall cost benefit. More details of the loss savings for the alternatives can be found in Appendix E of the Planning Scope Document (Appendix C, Exhibit 1).

2.1.8 Construction Schedule and Seasonal Construction Constraints

Barnhart-Branch River Alternative 1 Milestones

Begin 138 kV Transmission Line Construction	May 2015
Begin Substation Construction	July 2015
Begin 345 kV Transmission Line Conversion	Mar 2016
138 kV Line In-Service	Oct 2016
Project Fully In-Service	Apr 2018

Barnhart-Branch River Alternative 2 Milestones

Begin Substation Construction	Nov 2015
Begin Transmission Line Construction	Feb 2016
River Project Fully In-Service	Apr 2018

Generally, there are no seasonal construction constraints. However, some specific construction activities are dependent on obtaining required line outages or can only be accomplished during specific generating unit

outages. Therefore, these schedules are dependent on the availability of outages.

2.1.9 Transmission Tariffs

The capital costs incurred for the construction of the Project will be recovered in accordance with the provisions of the Open Access Transmission and Energy Markets Tariff of the Midwest ISO and the rules and regulations of the Federal Energy Regulatory Commission.

2.2 PROJECT DEVELOPMENT AND ALTERNATIVES CONSIDERED

2.2.1 Local Transmission-Level Alternatives

Eleven different "fixes," excluding the two project alternatives being pursued, were studied as part of this analysis. The two alternatives pursued were selected because they address stability issues adequately, provide a wider operating range of MVAR output from the Point Beach and Kewaunee generating units, unload parallel facilities and provide an alternate route. The geographical map and description of each option rejected can be found in Appendix H.1 of the G833/J022 and G834/J023 Interconnection System Impact Study (ISIS) report, Appendix C, Exhibit 2. In addition, the stability study results of each option rejected is detailed in Appendix H.2 of the ISIS report. Based on the ISIS report results, the following options were rejected from further consideration as follows:

1) Fix 1 (new West 345 kV switching station connecting Lines W-1 and L-CYP31): Does not address the stability issue under prior outage conditions. Generally, it does not provide better stability performance than Fix 2 (new Barnhart 345 kV Switching Station).
2) Fix 2 (new Barnhart 345 kV Switching Station): Does not provide a wider operating envelop for the local transmission system and the interconnected generators.
3) Fix 1 plus Fix 2 (new West and Barnhart 345 kV switching stations): Constructing Barnhart and a West 345 kV switching stations together does not significantly improve stability response.
4) Fix 3 (new West 345 kV Switching Station and a new 345 kV line from Forest Junction to West): In addition to constructing the new West switching station, this option requires a new 345 kV line (~ 42 miles) from the Forest Junction Substation to a new West Switching Station. It does not address the stability issue under a specific prior outage. In addition, this does not provide any significant improvement over the new Barnhart 345 kV Switching Station.
5) Fix 6 (a new second 345 kV line from North Appleton to Fox River): This option requires constructing a new second 345 kV line (~ 9.8 miles) from the North Appleton Substation to the Fox River Substation. It does not address the stability issue under a specific prior outage.
6) Fix 7 (new Barnhart 345/138 kV Substation and new Branch River 345 kV Switching Station and conversion of 971K51 and portion of existing 138 kV line HOLG21 to 345 kV): This option requires converting approximately 48 miles of existing 138 kV line to 345 kV

operation in addition to building new Barnhart 345/138 kV and Branch River 345 kV stations. It also requires constructing new 138 kV lines (~ 16 miles) to continue serving the existing 138 kV substations and installing a new 345/138 kV transformer at the Barnhart Substation. This option provides significant improvement in stability response. However, it is not selected for further analysis since this option does not provide better stability performance than Alternative 1 (Fix 7 plus 345 kV line L121, which is a Point Beach generating unit outlet, looped into Branch River Switching Station) for a specific line fault with breaker failure at Point Beach Substation.

7) Fix 8 (Alternative 2 plus 345/138 kV transformer at Branch River Substation, loop 971K51 into the Branch River 138 kV Substation): In general, this option does not provide significantly better stability response than Alternative 2 (new Branch River and Barnhart 345 kV line, ~ 32 miles) which was selected for further analysis. Installing a new 345/138 kV transformer at the Branch River Substation and looping the existing line 971K51 does not provide significant benefit from a stability perspective.
8) Fix 9 (Fix 8 plus converting Forest Junction-Branch River 138 kV line to 345 kV): In addition to implementing Fix 8, this option also requires converting the Forest Junction-Branch River 138 kV line (~ 16 miles) to 345 kV. For similar reasons described for Fix 8, it was not selected for further analysis.
9) Fix 10 (new Branch River Switching Station): This option requires constructing only the Branch River 345 kV Switching Station. It does not address the stability issue under a specific prior outage.
10) Fix 13 (new Barnhart 345 kV Switching Station and approximately 41 miles of new double-circuit 345/138 kV lines from Forest Junction to the Barnhart Switching Station): This option was considered but rejected from further consideration because it does not provide better reactive power operating range than Alternative 1 and the high level construction cost was significantly higher than the construction cost of the major work items in Alternative 1 (see page 83 of the ISIS report for more detail). In addition, this alternative needs relatively extensive new right-of-way for new 345 and 138 kV lines.
11) Fix 14 (Fix 7 without looping 796L41 (Edgewater-Cedarsauk 345kV circuit) into new Barnhart Switching Station): This option was tested to understand the impact of looping 796L41 into the new Barnhart Switching Station. No significant stability impact was identified due to 796L41 looped into the new Barnhart Switching Station for this particular configuration. However, looping 796L41 into the new Barnhart Switching Station reduces the exposure to the outage of the

existing Edgewater-Cedarsauk 345 kV line (~ 33 miles) and increases operational flexibility for planned and unplanned outage conditions.

2.2.2 Route Evaluation Factors

The proposed project is centrally located between Lake Winnebago and Lake Michigan in Manitowoc and Sheboygan Counties. The area is primarily rural agricultural and wooded wetland, with generally increased environmental sensitivities in the western and southwestern portions of the project area.

In the northern and western portions of the project area are the Brillion Wildlife Area, the Collins Marsh Wildlife Area and the Killsnake Wildlife Area. The southern and western portions of the area include the Sheboygan Marsh and Kiel Wildlife areas, and the northern unit of the Kettle Moraine State Forest.

The Manitowoc, Branch, Sheboygan, and Mullet rivers and their tributaries also traverse the area.

The city of Manitowoc is in the northeastern portion of the project area with the cities of Plymouth and Sheboygan in the southern portion of the area. The Sheboygan County Airport is in the south central portion of the project area. Numerous smaller urban areas are located throughout.

The near proximity of major ATC transmission lines in the north and the south was the primary determining factor in locating the new transmission substations, Barnhart and Branch River, proposed in this application. The proposed locations were identified based on minimizing the environmental impact of the station and minimizing the additional transmission line construction necessary to interconnect the substations with the existing lines, thus minimizing impact and cost.

With the endpoints established, existing linear features in the area such as transmission lines, pipelines and other utilities, roads and railroads, were identified and evaluated for possible transmission line routes, satisfying the routing and siting priorities identified in *Wis. Stat.* § 1.12(6) with consideration given to environmental impacts, engineering including design and constructability, economics and reliability of the transmission system.

ATC also consulted with the WDNR and PSCW as required by *Wis. Stat.* § 30.025(1m) and solicited public input for consideration as discussed in Section 2.2.4. The Wisconsin Department of Transportation (WisDOT) was also consulted.

Route corridor alternatives identified in the project area and the selection of the proposed alternatives is discussed in Section 2.2.3.

2.2.3 Route Corridor Alternatives

As discussed in Section 2.2.2, the proximity of the major transmission lines in Manitowoc and Sheboygan counties were the prime consideration in selection of the transmission line endpoints for the proposed project. These endpoints are centrally located between Lake Winnebago and Lake Michigan, which were used to establish the western and eastern bounds of the project area to be investigated for possible transmission line routes. Within this area, ATC identified existing state and county highways and investigated lesser roads, railroads and transmission lines and pipelines that could be utilized as opportunities to co-locate the proposed transmission lines with existing utility facilities.

As discussion in Section 2.2.1 significant wildlife areas and the Kettle Moraine State Forest exist east of Lake Winnebago. There are a number of existing transmission lines in this area, generally west of these sensitive areas. To utilize these western transmission line corridors for new lines, ATC would need to route lines east-west, adding a significant number of additional miles of transmission line, through or around these areas adding negative environmental impact and cost to the project for no real benefit. The lines are also remote from the proposed substation locations adding length and cost. Because of this ATC focused on the central and eastern portions of the project area.

In the eastern portion of the project area I-43 runs continuously from north to south. Additionally, existing ATC transmission lines running east-west in the northern portion of the project area, including 345 kV circuit 111 provide a convenient means for connecting with the I-43 corridor. The east-west portion of circuit 111 has the added advantage of being located within a double-wide ROW, with the existing transmission line occupying only half of the easement. (ATC subsequently decided to double-circuit with circuit 111 in Project Alternative 2, reserving the unoccupied portion of the ROW for future use.)

Alternatives to these primary routes for the 345kV line were also evaluated, including other state highway and county roads. These roads tended to go through a number of towns and villages, which required development of bypasses. In addition the significant wildlife and wetland areas further constrained the viability of those routes. In the southern portion of the project area, the developed urban areas within the town and city of Sheboygan limit east to west corridor opportunities particularly

for new 345 kV facilities. As a result the alternatives for the 345 kV line were narrowed to the existing 111 line and paralleling I-43.

In a similar manner the development of alternative routes for the proposed 138 kV lines explored many options and narrowed the options down to focusing on I-43, existing transmission lines and existing ATC easements.

2.2.4 Public Outreach

ATC conducted three rounds of public open houses for the Project. Ahead of the each of these rounds of open houses, ATC representatives took steps to reach out and directly engage local officials (and staff) at local units of government within the project study area and/or crossed by potential corridors or preliminary/proposed routes. These steps included mailings, phone calls/conversations, one-on-one meetings, and presentations to local officials and staff, as well as with other stakeholders or potentially affected interests (such as economic development organizations, environmental groups, and business, civic and community groups).

The Phase One open houses for the Project were conducted February 22-24, 2011, at the Cobblestone Creek Banquet Hall in Brillion, the Altona Supper Club in New Holstein and Amore in Plymouth. A broad study area within Manitowoc, Calumet and Sheboygan counties was created; 24,230 residences within the study area received an invitation to the open house, along with 256 local officials and 54 other potentially interested parties. The invitation packet included a letter, fact sheet and project area map with existing utility and transportation corridors identified. A news release announcing the open houses was issued on February 7, 2011. Copies of project mailings and information related to the Phase One open houses are provided in Appendix D, Exhibit 1.

More than 1,000 people attended the three Phase One open houses.

The Phase Two open houses to discuss preliminary routes were conducted July 12-14, 2011, at the Twin Fountains near Manitowoc, the Millhome Supper Club near Kiel and Amore in Plymouth. Residents whose property was within a 1,500-foot buffer of the preliminary routes received invitations, as did the property owners within two miles of the substation siting areas. The number of property owners in this universe totaled, 4,545. The invitation included a letter, project area map with corridors, and a localized municipality map. Non-affected property owners were mailed a postcard informing them their property was no longer under consideration and were asked to mail back a postage-paid reply card if

they wanted to remain on the mailing list. (About 390 households returned the cards.) The total mailing list (affected and non-affected) for this round was 24,100. A news release was issued June 20, 2011. Copies of project mailings and information related to the Phase Two open houses are provided in Appendix D, Exhibit 2.

Approximately 525 people attended the three Phase Two open houses.

The Phase Three open houses to discuss the preferred and alternate route options were conducted March 20-21, 2012, at the Twin Fountains near Manitowoc and Amore in Plymouth. This time, landowners who owned parcels within 500 feet on either side of an active centerline or within 1,500 feet of a potential substation (723 households) received invitations to open houses.

Between Phase Two and Phase Three, it was discovered that 47 landowners in the northern end of the study area in Calumet and Manitowoc counties erroneously had been informed in June 2011 that their property was no longer affected. They received a modified invitation to the Phase Three open houses explaining the communication error. Copies of project mailings and information related to the Phase Three open houses are provided in Appendix D, Exhibit 3.

The total mailing universe for Phase Three was 4,825. Approximately 250 people attended Phase Three open houses.

In addition to open house outreach, the project had its own web page at the www.atc-projects.com website, which included all project-related information as well as an interactive map. Direct mail pieces included references to the website as well as the ATC local relations contact for more information.

Written comments were encouraged throughout the outreach process. Written comments were received directly at the open houses as well as through the website, email, letters and other means. Public comments and feedback received are being provided on compact disc concurrent with this application.

Following the PSCW's decision on the Project (if approved), ATC plans to send a letter to the stakeholders summarizing the Order, the approved routes, and outlining the next steps. As part of this process, ATC will hold a pre-construction open house to describe the construction process and timeline and to respond to property owner questions.

2.3 GENERAL TRANSMISSION LINE SITING INFORMATION

All digital copies of the maps can be found in the GIS data discs provided concurrently with this filing. In addition to the specific maps referenced below, Appendix A also includes the following:

- 1" = 400' Scale Index Maps provided as Figure 2;
- 1" = 2000' Scale Index Maps provided as Figure 3;
- Existing land use maps provided as Figure 4;
- Airport Height Limitation for the Sheboygan and Manitowoc County airports provided as Figure 11;
- Confined Animal Operations and Distribution Facilities provided as Figure 12; and
- Orthophotography, including Wisconsin Wetland Inventory and delineated wetlands provided as Figure 13.

2.3.1 General Route Maps

The proposed routes are shown in Appendix A, Figure 1.

2.3.1.1 Topographic Maps

Topographic maps are provided in Figure 6.

2.3.1.2 Maps Showing Land Ownership By Parcel Boundaries

Tax parcel maps are provided as Figure 8.

2.3.1.3 Street Maps

Existing land use maps including street names are provided as Figure 4.

2.3.2 Aerial Photographs

Orthophotography for Project and route alternatives are provided as Figure 5.

2.3.3 GIS Data

All information required under Section 2.3.3 is being provided concurrently with this application on electronic media.

2.3.4 Zoning

2.3.4.1 Zoning Maps

Maps providing zoning information for all Project Alternatives and routes including the new Branch River and Barnhart substations are provided as Figure 7.

2.3.4.2 Zoning GIS Data

Zoning GIS data is provided concurrently on electronic media as described in Section 2.3.3.

2.3.5 Land Use Plans

Figures identifying current land-use plans along all Project and route alternatives are provided in Figure 10.

2.3.6 Floodplain Maps

Federal Emergency Management Agency floodplain information is found in Figure 9.

2.4 DETAILED ROUTE INFORMATION

The potential impacts resulting from the construction of new transmission line Alternatives 1/1A, 1/1B, and 2 are discussed and quantified below. Because of the number of transmission lines, varied line configurations, and route variations in close proximity to the proposed Barnhart and Branch River substations, the potential transmission line impacts in the area around each substation (between each substation and the first line segment nodes outside that substation) were evaluated in the aggregate and are provided as separate lines in the environmental impact tables provided in Appendix A. The first segment nodes out from each substation were chosen such that the same area is evaluated regardless of the substation site option, north or south, chosen.

2.4.1 General Route Impacts

The general impacts of constructing the proposed transmission line along Alternatives 1/1A, 1/1B, and 2 have been quantified and are presented in Appendix A, Tables 1 to 4. The results of the impact analysis are described below.

2.4.1.1 Route or Route Segment Information (Table 1A)

The general route impacts are compiled by transmission line alternative and segment in separate tables for the three alternatives and are included in Appendix A as Table 1A –Alternative 1/1A, Table 1A – Alternative 1/1B, and Table 1A – Alternative 2. The following information is provided in each table as described below:

2.4.1.1.1 Total Segment Length

The total lengths for each segment are shown in Table 1A. The total lengths for each alternative are set out below.

Alternative 1/1A with the following substation options:

BRV-North and BHA-North substations is 646,276 feet (or 122.4 miles).

BRV-North and BHA-South substations is 648,838 feet (or 122.9 miles).

BRV-South and BHA-North substation is 647,261 feet (or 122.6 miles).

BRV-South and BHA-South substations is 649,823 feet (or 123.1 miles).

For all of the above distances, 328,694 feet (or 62.3 miles) is construction consisting of only new OPGW.

Alternative 1/1B with the following substation options:

BRV-North and BHA-North substations is 698,815 feet (or 132.4 miles).

BRV-North and BHA-South substations is 699,134 feet (or 132.4 miles).

BRV-South and BHA-North substation is 699,800 feet (or 132.5 miles).

BRV-South and BHA-South substations is 700,119 feet (or 132.6 miles).

For all of the above distances, 326,416 feet (or 61.9 miles) is construction consisting of only new OPGW.

Alternative 2 with the following substation options:

BRV-North and BHA-North substations is 638,232 feet (or 120.9 miles).

BRV-North and BHA-South substations is 637,114 feet (or 120.7 miles).

BRV-South and BHA-North substation is 638,727 feet (or 121.0 miles).

BRV-South and BHA-South substations is 637,609 feet (or 120.8 miles).

For all of the above distances, 375,011 feet (or 71.0 miles) is construction consisting of only new OPGW.

2.4.1.1.2 Length (ft)

See Appendix A, Table 1A–Alternative 1/1A, Table 1A–Alternative 1/1B, and Table 1A–Alternative 2 for this information.

2.4.1.1.3 Total Width ROW

The proposed ROW widths for the Barnhart to Branch River Project were determined by considering the following factors: constructability, existing corridor widths, ATC's minimum ROW width requirements, maintainability, and existing land use. The total width of ROW required per segment for the three alternatives are detailed by segment in Appendix A, Table 1A–Alternative 1/1A, Table 1A–Alternative 1/1B, and Table 1A-Alternative 2.

Alternative 1/1A

The total ROW width required for line routes for Alternative 1/1A varies per segment. The segments in which an existing 138 kV line is replaced with the new 345 kV line resulting in a double-circuited 345 kV line (Segments 1-3, 2, and 14) will be 125 feet wide. The segments in which the new 138 kV line will be parallel to a double-circuited 345 kV line (Segments 15-1, 15-2, 15a-1, 15a-2, 16, and 17) will be 185 feet wide. The segment in which an existing 138 kV line will be replaced with two double-circuited 345 kV lines (Segment 4) will be 203 feet wide. The two segments directly out of the Erdman Substation in which the new 138 kV line will be constructed (Segments 54-1 and 54-2) will be 45 feet wide. The segments in which the new 138 kV line will be along I-43 (Segments 54a and 54b) will be 80 feet wide. The segments in which the new 138 kV line will be constructed along the existing unoccupied easements (Segments 12, 12a-1, and 12a-2) and where the new 138 kV line will be located along an existing double-circuited 138 kV line (Segments 13-1, 13-3, 13-4, and 13-5) will be 125 feet wide. Segment 1-1, located just outside of the Forest Junction Substation, is required to be 154 feet wide, and Segment 1-2 is the transition between Segment 1-1 and 1-3 and ranges from 125 to 154 feet wide. The OPGW segments will be either 80 feet wide (Segments 68, 68a, 72, 73, 74, 75, 76, and 77) or 125 feet wide (Segments 5 and 71).

Alternative 1/1B

The total ROW width required for line routes for Alternative 1/1B varies per segment. The segments in which an existing 138 kV line is replaced with the new 345 kV line resulting in a double-circuited 345 kV line (Segments 1-3, 2, 14, 15a-1, 15a-2, 16, and 17) will be 125 feet wide. The segments in which the new 138 kV line will be parallel to a double-circuited 345 kV line (Segments 15-1 and 15-2) will be 185 feet wide. The segment in which an existing 138 kV line will be replaced with two double-circuited 345 kV lines (Segment 4) will be 203 feet wide. The two segments directly out of the Erdman Substation in which the new 138 kV line will be constructed (Segments 54-1 and 54-2) will be 45 feet wide. The segments that will be 80 feet wide include the new 138 kV line along I-43 (Segment 54a), Dairyland Drive (Segments 51-1, 51-2, 51-3, 51-4, 51-5, 51-6, 51-7, 51-8), CTH Y and CTH FF (Segments 52a-1, 52a-2, 52a-3. 52a-4, 52a-5, 52a-6, and 52a-7), the Howards Grove

Substation access road (Segment 53), CTH A (Segment 59), Bridgewood Road (Segments 60-1, 60-2, 60-3, 60-4, 60-5, and 60-6), CTH M (Segments 63-1, 63-2, 63-3, 63-4, 67-1, 67-2, and 67-3), STH 23 (Segment 64), the existing Plymouth #4 Substation Tap (Segment 62), Hillside Road (Segment 65), and the greenfield segment between Hillside Road and CTH M (Segment 66). Similarly the segments that will be double-circuited with an existing 138 kV line (Segments 68 and 68a) will be 80 feet wide. The segments in which the new 138 kV line will be constructed along the existing unoccupied easements (Segment 12), a greenfield path crossing and east of I-43 (Segments 11a, 52), and where the new 138 kV line will be located along an existing double-circuited 138 kV line (Segments 13-1, 13-3, 13-4, and 13-5) will be 125 feet wide. Segment 1-1, located just outside of the Forest Junction Substation, is required to be 154 feet wide, and Segment 1-2 is the transition between Segment 1-1 and 1-3 and ranges from 125 to 154 feet wide. The OPGW segments will be either 80 feet wide (Segments 72, 73, 74, 75, 76, and 77) or 125 feet wide (Segments 5 and 71).

Alternative 2

The total ROW width required for Alternate Route 2 varies per segment. The segment in which an existing 138 kV line will be replaced with two double-circuited 345 kV lines (Segment 4) will be 203 feet wide. The segment in which the new 345 kV line will be double-circuited with an existing 345 kV line (Segment 5) will be 130 feet wide. The segment in which the new 345 kV line will be double-circuited with an existing 69 kV line (Segment 6) is required to be 120 feet wide. The segments where the new 345 kV line will be single-circuit along a greenfield path (Segment 7) or I-43 (Segments 8, 9, 11) will be 120 feet wide. The segment along I-43 where the new 345 kV line will be double-circuited with an existing 69 kV line will be 100 feet wide (Segment 10). The segments in which the new 345 kV line will be constructed along the existing unoccupied easements (Segments 12, 12a-1, and 13-2) will be 125 feet wide. The segments in which the new 345 kV line will be constructed parallel to an existing double-circuited 138 kV line (Segments 13-3, 13-4, and 13-5) will be 130 feet wide. The segments in which the new 345 kV line will be parallel to an existing 345 kV/138 kV double-circuited line (Segments 15-1, 15-2, 15a-1, 15a-2, 16, and 17) will be 120 feet wide. The OPGW segments will be either 80 feet wide (Segments 68, 68a, 72, 73,

74, 75, 76, and 77) or 125 feet wide (Segments 1-1, 1-2, 1-3, 2 and 71).

2.4.1.1.4 ROW Area Requirements

The total ROW area requirements for each segment are shown in Table 1A. The total area required for ROW for each alternative are set out below.

Alternative 1/1A with the following substation options:

BRV-North and BHA-North	1,684.04 acres
BRV-North and BHA-South	1,700.98 acres
BRV-South and BHA-North	1,681.96 acres
BRV-South and BHA-South	1,698.90 acres

Alternative 1/1B with the following substation options:

BRV-North and BHA-North	1,707.17 acres
BRV-North and BHA-South	1,696.85 acres
BRV-South and BHA-North	1,705.08 acres
BRV-South and BHA-South	1,694.77 acres

Alternative 2 with the following substation options:

BRV-North and BHA-North	1,593.73 acres
BRV-North and BHA-South	1,591.19 acres
BRV-South and BHA-North	1,592.88 acres
BRV-South and BHA-South	1,590.34 acres

2.4.1.1.5 Type of Existing ROW

The following is a general summary of existing ROW that would be shared by the proposed new transmission line ROW. Refer to Table 1A (Appendix A) for a more-detailed summary of ROW sharing for each transmission line alternative and segment.

All transmission line alternatives (Alternative 1/1A, Alternative 1/1B, and Alternative 2) share existing transmission line ROW. The three alternatives also share ROW with roadways.

The following summarizes the type of existing ROW to be shared with other corridors by alternative:

Alternative 1/1A shares existing 345 kV and 138 kV transmission line ROW, roadway ROW, and electric distribution line ROW.

Alternative 1/1B shares existing 345 kV and 138 kV transmission line ROW, road ROW, and electric distribution line ROW.

Alternative 2 shares existing 345 kV, 138kV, and 69kV transmission line ROW, road ROW, and electric distribution line ROW.

The location and extent of areas within segments that contain multiple corridor sharing are identified in Appendix A, Figure 1 and Appendix A, Table 1A-Alternative 1/1A, Table 1A-Alternative 1/1B, and Table 1A-Alternative 2.

2.4.1.1.6 Shared Existing ROW Metrics

2.4.1.1.6.1 Shared ROW length

The following summarizes the length of existing ROW to be shared by alternative:

Alternative 1/1A with the following substation options:

BRV-North and BHA-North	621,328 feet (96.1%)
BRV-North and BHA-South	624,387 feet (96.2%)
BRV-South and BHA-North	621,232 feet (96.0%)
BRV-South and BHA-South	624,291 feet (96.1%)

Alternative 1/1B with the following substation options:

BRV-North and BHA-North	673,524 feet (96.4%)
BRV-North and BHA-South	673,481 feet (96.3%)
BRV-South and BHA-North	673,494 feet (96.2%)
BRV-South and BHA-South	673,452 feet (96.2%)

Alternative 2 with the following substation options:

BRV-North and BHA-North	612,350 feet (95.9%)
BRV-North and BHA-South	611,915 feet (96.0%)
BRV-South and BHA-North	612,947 feet (96.0%)
BRV-South and BHA-South	612,256 feet (96.0%)

2.4.1.1.6.2 Existing ROW Width

Alternative 1/1A

The existing transmission ROWs is 125 feet wide for the segments in which the existing 138 kV line will be displaced by the new 345 kV line (Segments 1-1, 1-2, 1-3, 2, 4, 14, 15-1, 15-2, 15a-1, 15a-2, 16, and 17). The existing transmission line ROW is 45 feet wide for the first segment of the new 138 kV line out of the Erdman Substation (Segment 54-1). The existing road ROW width for the segments located along I-43 (Segments 54a and 54b) was estimated using GIS to be approximately 275 feet wide. The existing 138 kV transmission line ROW is 125 feet wide that will be used for the new 138 kV line (Segments 13-1, 13-3, 13-4, and 13-5). The existing transmission line ROW width of the segments that will include only new OPGW are either 80 feet (Segments 68, 68a, 72, 73, 74, 75, 76, and 77) or 125 feet (Segments 2 and 71). Additionally, Segments 12, 12a-1, and 12a-2 are along existing unoccupied ATC easements 125 feet in width.

Alternative 1/1B

The existing transmission ROW is 125-feet wide for the segments in which the existing 138 kV line will be displaced by the new 345 kV line (Segments 1-1, 1-2, 1-3, 2, 4, 14, 15-1, 15-2, 15a-1, 15a-2, 16, and 17). The existing transmission line ROW is 45 feet wide for the first segment of the new 138 kV line out of the Erdman Substation (Segment 54-1). The existing road ROW width for the segment located along I-43 (Segment 54a) was estimated using GIS to be approximately 275 feet wide. The existing road ROW width for the segment crossing I-43 (Segment 11a) was estimated using GIS to be approximately 325 feet wide. Segment 11a is wholly within road ROW. The existing road ROW is 66 feet wide along the following roadways that will be used for the new 138 kV line segments (Segments 52a-1 through 52a-7, 59, 60-1 through 60-6, 63-1 through 63-4, 65, and 67-1 through 67-3): Green Valley Road, CTH FF, CTH A, Bridgewood Road, CTH M, and Hillside Road. The existing road ROW along Dairyland Drive used for new 138 kV line segment 51-2 through 51-8 is 125 feet. The existing 138 kV transmission line ROW width that will be used for the new 138 kV line is either 125 feet (Segments 13-1, 13-3, 13-4, and 13-5) or 80 feet (Segment 62, 68 and 68a). The existing road ROW width for the

segment of new 138 kV line that will be located along STH 23 (Segment 64) was measured with GIS to be approximately 240 feet wide. The existing transmission line ROW width of the segments that will include only new OPGW are either 80 feet (Segments 72, 73, 74, 75, 76, and 77) or 125 feet (Segments 5 and 71). Additionally, Segment 12 is along existing unoccupied ATC easements 125 feet in width.

Alternative 2

The existing transmission ROW where the new 345 kV line will be built parallel to the existing 138 kV/345 kV double-circuit transmission line (Segments 4, 15-1, 15-2, 15a-1, 15a-2, 16, and 17) is 125 feet wide. The existing 345 kV transmission line ROW is 130 feet wide for the segment that will be built as a double-circuited 345 kV line (Segment 5). The existing 69 kV transmission line ROW is 24 feet wide for the segment that will be built as a double-circuited 345 kV/69 kV line (Segment 6). The existing road ROW width of the segments parallel to I-43 were estimated using GIS to be either approximately 340 feet wide (Segment 8) or approximately 325 feet wide (Segments 9, 10, and 11). The existing road ROW width for the segment crossing I-43 (Segment 11a) was estimated using GIS to be approximately 125 feet wide. The existing double-circuited 138 kV transmission line ROW is 125 feet wide where the new 345 kV line will be built parallel (Segments 13-3, 13-4, and 13-5). The existing transmission line ROW width of the segments that will include only new OPGW are either 80 feet (Segments 68, 68a, 72, 73, 74, 75, 76, and 77) or 125 feet (Segments 1-1, 1-2, 1-3, 2, and 71). Additionally, Segments 12, 12a-1, and 13-2 are along existing unoccupied ATC easements 125 feet in width.

2.4.1.1.6.3 Width of Existing Shared ROW

Alternative 1/1A

The width of existing ROW that would be shared along Alternative 1A, Segments 1-1, 1-2, 1-3, 2, 4, 14, 15-1, 15-2, 15a-1, 15a-2, 16, and 17 is 125 feet. The width of existing ROW that would be shared for Segment 54-1 is 45 feet. The width of existing ROW that would be shared along Segments 13-1, 13-3, 13-4, and 13-5 is 125 feet. The width of existing ROW of I-43 that would be shared along Segments 54a and 54b varies from 0 to 80 feet. The existing ROW width that would be shared along

OPGW only Segments 68, 68a, 72, 73, 74, 75, 76, and 77 is 80 feet. The width of existing ROW that would be shared by OPGW only Segments 5 and 71 is 125 feet. Additionally, Segments 12, 12a-1, and 12a-2 share 125 feet of existing unoccupied ATC easements.

Alternative 1/1B

The width of existing ROW that would be shared along Alternative 1/1B, Segments 1-1, 1-2, 1-3, 2, 4, 14, 15-1, 15-2, 15a-1, 15a-2, 16, and 17 is 125 feet. The width of existing ROW that would be shared for Segment 54-1 is 45 feet. The width of existing ROW of I-43 that would be shared along Segment 54a varies from 0 to 80 feet. The width of existing ROW of I-43 that would be shared along Segment 11a would be 125 feet. 35 feet existing ROW width would be shared along Segments 51-2, 51-4, 51-6, 51-8, 52a-1, 52a-3, 52a-5, 52a-7, 59, 60-2, 60-4, 60-6, 63-1, 63-3, 64, 65, 67-1, and 67-3. The width of existing ROW shared varies from 35 to 80 feet along Segments 51-3, 51-5, 51-7, 52a-2, 52a-4, 52a-6, 60-1, 60-3, 60-5, 63-2, 63-4, and 67-2. The width of existing ROW that would be shared along Segments 13-1, 13-3, 13-4, and 13-5 is 125 feet. The width of existing ROW that would be shared along Segments 62, 68, and 68a is 80 feet. The existing ROW width that would be shared along OPGW only Segments 72, 73, 74, 75, 76, and 77 is 80 feet. The width of existing ROW that would be shared by OPGW only Segments 5 and 71 is 125 feet. Additionally, Segment 12 shares 125 feet of existing unoccupied ATC easements.

Alternative 2

The width of existing ROW that would be shared along Alternative 2, Segment 4 is 125 feet. The width of existing ROW that would be shared along Segment 5 is 130 feet. The width of existing ROW that would be shared along Segment 6 is 24 feet. The width of existing ROW width that would be shared along Segments 8, 9, 10, and 11 varies from 0 to 120 feet. The width of existing ROW of I-43 that would be shared along Segment 11a would be 125 feet. The width of existing ROW that would be shared along Segments 13-3 and 13-5 is 60 feet. The width of existing ROW that would be shared along Segment 13-4 varies from 60 to 125 feet. The width of existing ROW that would be shared along Segments 15-1, 15a-2, 16, and 17 is 42 feet. The width of existing ROW that would be shared along Segments 15-

2 and 15a-1 varies from 42 to 103 feet. The existing ROW width that would be shared along OPGW only Segments 68, 68a, 72, 73, 74, 75, 76, and 77 is 80 feet. The width of existing ROW that would be shared by OPGW only Segments 1-1, 1-2, 1-3, 2 and 71 is 125 feet. Additionally, Segments 12, 12a-1, and 13-2 share 125 feet of existing unoccupied ATC easements.

2.4.1.1.6.4 Area of Existing Shared ROW

The following summarizes the acreage of existing ROW that would be shared by alternative:

Alternative 1/1A with the following substation options:

BRV-North and BHA-North	1,511.24 acres
BRV-North and BHA-South	1,516.73 acres
BRV-South and BHA-North	1,510.76 acres
BRV-South and BHA-South	1,516.25 acres

Alternative 1/1B with the following substation options:

BRV-North and BHA-North	1,561.12 acres
BRV-North and BHA-South	1,558.83 acres
BRV-South and BHA-North	1,560.64 acres
BRV-South and BHA-South	1,558.35 acres

Alternative 2 with the following substation options:

BRV-North and BHA-North	1,239.41 acres
BRV-North and BHA-South	1,238.42 acres
BRV-South and BHA-North	1,239.95 acres
BRV-South and BHA-South	1,237.96 acres

2.4.1.1.7 New (additional) ROW Required

The following summarizes the additional ROW required by alternative:

Alternative 1/1A would require additional ROW at the locations described in more detail in Section 2.4.1.1.7.1 below. For Segments 1-3, 2, 14, 13-1, 13-3, 13-4, and 13-5, the line would be constructed as a double-circuit line on the existing centerline with no additional ROW required. Segments 12, 12a-1, and 12a-2 along existing unoccupied ATC easements would require no additional

ROW width. Segment 54-1 is an existing transmission ROW, no new ROW will be required. The segments that would only add OPGW to the existing lines would also not require additional ROW.

The Alternative 1/1B would require additional ROW at the locations described in more detail in Section 2.4.1.1.7.1 below. For Segments 1-3, 2, 14, 15a-1, 15a-2, 16, 17, 13-1, 13-3, 13-4 and 13-5, the line would be constructed as a double-circuit line on the existing centerline with no additional ROW required. Segment 12 along existing unoccupied ATC easements would require no additional ROW width. The segments that would only add OPGW to the existing lines would also not require additional ROW.

Alternative 2 would require additional ROW as described in Section 2.4.1.1.7.1 below. For Segment 5, the line would be constructed as a double-circuit line on the existing centerline with no additional ROW required. Segments 12, 12a-1, and 13-2 along existing unoccupied ATC easements would require no additional ROW width. The segments that would only add OPGW to the existing lines would also not require additional ROW.

2.4.1.1.7.1 Width (ft)

The following summarizes the width of the additional ROW required by alternative:

Alternative 1/1A

The width of new ROW that would be required along Alternative 1/1A, Segment 1-1 is 29 feet. Segment 1-2 would require additional ROW varying from 0 to 29 feet wide. The width of new ROW width that would be required for Segment 4 is 78 feet. The width of new ROW that would be required along Segments 15-1, 15-2, 15a-1, 15a-2, 16, and 17 is 60 feet. The width of new ROW that would be required along Segment 54-2 is 45 feet. The width of new ROW that would be required along Segments 54a and 54b varies from 0 to 80 feet. The width of the unoccupied ROW that would be used for Segments 12, 12a-1, and 12a-2 is 125 feet.

Alternative 1/1B

The width of new ROW that would be required along Alternative 1B, Segment 1-1 is 29 feet. Segment 1-2 would require additional ROW varying from 0 to 29 feet wide. The width of new ROW width that would be required for Segment 4 is 78 feet. The

width of new ROW that would be required along Segments 15-1, 15-2 is 60 feet. The width of new ROW width required for Segment 54-2 and 53 is 45 feet. The width of new ROW that would be required along Segment 54a varies from 0 to 80 feet. The width of new ROW that would be required along Segment 51-1 and 66 is 80 feet. New ROW 45 feet in width would be required along Segments 51-2, 51-4, 51-6, 51-8, 52a-1, 52a-3, 52a-5, 52a-7, 59, 60-2, 60-4, 60-6, 63-1, 63-3, 64, 65, 67-1, and 67-3. The width of new ROW that would be required along Segments 51-3, 51-5, 51-7, 52a-2, 52a-4, 52a-6, 60-1, 60-3, 60-5, 63-2, 63-4 and 67-2 varies from 0 to 45 feet. The width of new ROW required along Segment 52 is 125 feet. Segment 12 will be within the existing unoccupied 125 feet wide ROW. No new ROW is required along segments 54-1, 11a, 62, 68, and 68a.

Alternative 2

The width of new ROW that would be required along Alternate Route 2, Segment 4 is 78 feet. The width of new ROW that would be required along Segment 6 is 96 feet. The width of new ROW that would be required along Segment 7 is 120 feet. The width of new ROW width that would be required along Segments 8, 9, 10, and 11 varies from 0 to 120 feet. Segments 12 and 12a-1 will be within the existing 125 feet wide unoccupied ROW. and 13-2 is 125 feet. The width of new ROW that would be required along Segments 13-3 and 13-5 is 70 feet. The width of new ROW that would be required along Segment 13-4 varies from 0 to 65 feet. The width of new ROW that would be required along Segments 15-1, 15a-2, 16, and 17 is 78 feet. The width of new ROW that would be required along Segments 15-2 and 15a-1 varies from 17 to 78 feet.

2.4.1.1.7.2 Area (acres)

The following summarizes the area of new ROW required for each alternative:

Alternative 1/1A with the following substation options:

BRV-North and BHA-North	173.96 acres
BRV-North and BHA-South	185.41 acres
BRV-South and BHA-North	172.36 acres
BRV-South and BHA-South	183.81 acres

Alternative 1/1B with the following substation options:

BRV-North and BHA-North	145.98 acres
BRV-North and BHA-South	137.95 acres
BRV-South and BHA-North	144.37 acres
BRV-South and BHA-South	136.35 acres

Alternative 2 with the following substation options:

BRV-North and BHA-North	356.10 acres
BRV-North and BHA-South	354.55 acres
BRV-South and BHA-North	355.71 acres
BRV-South and BHA-South	354.16 acres

2.4.1.1.8 Corridor Sharing

Alternative 1/1A

Segments 1-1, 1-2, 1-3, and 2 share corridor with the double-circuited 345/138 kV transmission line circuits 121 and 971K51. Segment 4 shares corridor with the 138 kV transmission line 971K51. Segment 14 shares corridor with the double-circuited 345/138 kV transmission lines 111 and 971K51. Segments 15-1, 15-2, 15a-1, 15a-2, and 16 share corridor with the existing double-circuited 345/138 kV transmission lines 111 and HOLG21. Segment 17 shares corridor with the double-circuited 345/138 kV transmission lines L-SEC31 and HOLG21. Segment 54-1 shares corridor with the 138 kV transmission line X-64. Segments 54a and 54b share corridor with I-43. Segments 13-1, 13-3, 13-4, and 13-5 share corridor with the double-circuited 138 kV transmission lines 971K51 and HOLG21. OPGW only Segments 5 and 71 share corridor with 345 kV transmission line 111. OPGW only Segment 72 shares corridor with 138 kV transmission line X-1. OPGW only Segments 68, 68a, 73, and 74 share corridor with 138 kV transmission line X-57. OPGW Segment 75 shares corridor with 138 kV transmission line X-97. OPGW Segment 76 shares corridor with 138 kV transmission line X-2. OPGW Segment 77 shares corridor with 138 kV transmission line X-25. Additionally, Segments 12, 12a-1, and 12a-2 share a corridor with existing unoccupied ATC easements.

Alternative 1B

Segments 1-1, 1-2, 1-3, and 2 share corridor with the double-circuited 345/138 kV transmission line 121 and 971K51. Segment 4 shares corridor with the 138 kV transmission line 971K51. Segment 14 shares corridor with the double-circuited 345/138 kV transmission lines 111 and 971K51. Segments 15-1, 15-2, 15a-1, 15a-2, and 16 share corridor with the existing double-circuited 345/138 kV transmission lines 111 and HOLG21. Segment 17 shares corridor with the double-circuited 345/138 kV transmission lines L-SEC31 and HOLG21. Segment 54-1 shares corridor with the 138 kV transmission line X-64. Segment 54a shares corridor with I-43. Segments 51-2, 51-3, 51-4, 51-5, 51-6, 51-7, and 51-8 share a corridor with Green Valley Road, Dairyland Drive and electric distribution lines. Segment 11a shares corridor with I-43. Segments 52a-1, 52a-2, 52a-3, 52a-4, 52a-5, 52a-6, and 52a-7 share corridor with CTH Y, CTH FF, and electric distribution lines. Segments 13-1, 13-3, 13-4, and 13-5 share with existing double-circuited 138 kV transmission circuits 971K51 and HOLG21. Segment 59 shares corridor with CTH A and electric distribution lines. Segments 60-1, 60-2, 60-3, 60-4, 60-5, and 60-6 share corridor with Bridgewood Road and electric distribution lines. Segment 62 shares corridor with the double-circuited loop of HOLG21 in and out of the Plymouth #4 Substation. Segments 63-1, 63-2, 63-3, and 63-4 share corridor with CTH M and electric distribution lines. Segment 64 shares corridor with STH 23. Segment 65 shares corridor with Hillside Road and electric distribution lines. Segments 67-1, 67-2, and 67-3 share corridor with CTH M and electric distribution lines. Segments 68 and 68-a share corridor with 138 kV transmission line X-57. OPGW only Segments 5 and 71 share corridor with 345 kV transmission circuit 111. OPGW only Segment 72 shares corridor with 138 kV transmission line X-1. OPGW only Segments 73 and 74 share corridor with 138 kV transmission line X-57. OPGW only Segment 75 shares corridor with 138 kV transmission line X-97. OPGW only Segment 76 shares corridor with 138 kV transmission line X-2. OPGW only Segment 77 shares corridor with 138 kV transmission line X-25. Additionally, Segment 12 shares a corridor with existing unoccupied ATC easements.

Alternative 2

Segment 4 shares corridor with existing 138 kV transmission circuit 971K51. Segment 5 shares corridor with the 345 kV transmission line 111. Segment 6 shares corridor with the 69 kV transmission line R-44. Segments 8, 9, 10, 11, and 11a share corridor with I-43, plus Segment 10 also shares a corridor with transmission line A-101. Segments 13-3, 13-4, and 13-5 share corridor with the existing double-circuited 138 kV transmission lines 971K51 and HOLG21. Segments 15-1, 15-2, 15a-1, 15a-2, and 16 share corridor with the existing double-circuited 345/138 kV transmission lines 111 and HOLG21. Segment 17 shares corridor with the existing double-circuited 345/138 kV transmission lines L-SEC31 and HOLG21. OPGW only Segments 1-1, 1-2, 1-3, and 2 share corridor with existing double-circuited 345/138 kV transmission line 121 and 971K51. OPGW only Segment 71 shares corridor with 345 kV transmission line 111. OPGW only Segment 72 shares corridor with 138 kV transmission line X-1. OPGW only Segments 68, 68a, 73, and 74 share corridor with 138 kV transmission line X-57. OPGW only Segment 75 shares corridor with 138 kV transmission line X-97. OPGW only Segment 76 shares corridor with 138 kV transmission line X-2. OPGW only Segment 77 shares corridor with 138 kV transmission line X-25. Additionally, Segments 12, 12a-1, and 13-2 share a corridor with existing unoccupied ATC easements.

The values required in Sections 2.4.1.1.8.1 through 2.4.1.1.8.4 were calculated for each segment and are outlined in Appendix A, Table 1A.

2.4.1.1.8.1 Percent of new shared ROW length

This information is provided in Appendix A, Table 1A.

2.4.1.1.8.2 New ROW width shared

This information is provided in Appendix A, Table 1A.

2.4.1.1.8.3 Percent of existing shared ROW width

This information is provided in Appendix A, Table 1A.

2.4.1.1.8.4 Percent of new shared project ROW width

This information is provided in Appendix A, Table 1A.

2.4.1.2 Railroad & Pipeline Corridor Sharing

While all of the project alternatives cross railroad and pipeline ROW in several locations, none of the alternatives share ROW with railroads or pipeline corridors.

2.4.1.3 Interstate or State Highway Corridor Sharing

Placement of structures within interstate or state highway ROW will only be possible where sufficient space exists between the clear zone (the distance from the edge of the outside traffic lane that must be maintained clear of obstructions as determined by WisDOT) and the edge of the ROW owned by the WisDOT.

In addition to the need to maintain the proper clear zone on highway ROW, placement of structures within the ROW will depend on a number of factors, including but not limited to the following:

- Existing structures and other obstructions both within and adjacent to the road ROW;
- Environmental conditions (such as wetlands, streams, threatened and endangered species, and archeological or historical resources) both within and adjacent to the ROW;
- Easements or other legal restrictions existing on the adjacent private property;
- Landowner input; and
- The existence and location of bridges over the highways and bridge decks carrying the highways.

Shared ROW by transmission line alternative and segment follows, excluding portions where the segment only crosses a highway.

Alternative 1A: Portions of Segments 54a and 54b will be located within Interstate Highway 43 ROW.

Alternative 1B: Portions of Segment 54a and all of Segment 11a will be located within I-43 ROW.

Alternative 2: Portions of Segments 8, 9, 10, 11, all of 11a will be located within I-43 ROW.

A constructability report has been prepared for Wisconsin Department of Transportation. The report is provided in Appendix G, Exhibit 4. The WisDOT response indicating that construction within I-43 ROW is permittable is provided in Appendix G, Exhibit 5

2.4.1.4 Land Use and Zoning (Table 1B)

The number of buildings at various distances from the centerlines of each alternative was quantified by collecting the location of each building during field reconnaissance, then calculating the distance to the centerlines using GIS. The distances were confirmed by the ESRI ArcMap program. The results of the building survey are summarized in Appendix A in tables for each alternative (Table 1B-Alternative 1/1A, Table 1B-Alternative 1/1B, Table 1B-Alternative 2, Table 4-Alternative 1/1A, Table 4-Alternative 1/1B, and Table 4-Alternative 2) and are set forth below. There are no buildings within the proposed ROW widths of the three alternatives. ATC will meet all applicable National Electric Safety Code (NESC) and Wis. Admin. Code clearances to buildings.

2.4.1.4.1 Buildings

There are no buildings within the proposed ROW widths. The number and type of each building were reviewed within the following distance categories, as estimated from the centerline: 0-25 feet, 26-50 feet, 51-100 feet, 101-150 feet, and 151-300 feet. Brief descriptions of the results are provided below.

2.4.1.4.1.1 Homes

Alternative 1/1A has 257 single-family residences located within 300 feet of the centerline. Of these, 211 are along segments affected only by OPGW installation. No residences are located within 25 feet from the centerline. These 257 residences include eight single-family residences located within 26 and 50 feet of the centerline (which are affected only by OPGW only), 45 single-family residences located between 51 and 100 feet of the centerline (of these, 41 are affected only by OPGW installation), 51 single-family residences located between 101 and 150 feet of the centerline (of these, 38 are affected only by OPGW installation), and 153 single-family residences located between 151 and 300 feet from the centerline (of these, 124 are affected only by OPGW installation).

Alternative 1/1B has 309 single-family residences located within 300 feet of the centerline. Of these, 213 are along OPGW only segments. These 309 residences include one single-family residence located within 25 feet from the centerline, nine single-family residences located within 26 and 50 feet of the centerline (of these, eight are on OPGW only segments), 53 single-family residences located between 51 and 100 feet of the centerline (of

these, 41 are along OPGW only segments), 65 single-family residences located between 101 and 150 feet of the centerline (38 are along OPGW only segments), and 181 single-family residences located between 151 and 300 feet from the centerline (of these, 102 are along OPGW only segments).

Alternative 2 has 245 single-family residences located within 300 feet of the centerline. Of these, 207 are along OPGW only segments. No residences are located within 25 feet from the centerline. These 245 residences include eight single-family residences located within 26 and 50 feet of the centerline (all are on OPGW only segments, none are impacted by new transmission line construction), 47 single-family residences located between 51 and 100 feet of the centerline (of these, 41 are along OPGW only segments), 45 single-family residences located between 101 and 150 feet of the centerline (of these, 40 are along OPGW only segments), and 145 single-family residences located between 151 and 300 feet from the centerline (of these, 115 are along OPGW only segments).

2.4.1.4.1.2 Apartments (# units)

Alternative 1/1A has 19 apartment buildings located within 300 feet of the centerline. All are OPGW only segments. No apartment buildings are within 300 feet of new transmission line construction. These 19 apartment buildings include no apartment buildings that are located within 50 feet from the centerline, seven apartment buildings with two to four units located within 51 and 100 feet of the centerline, seven apartment buildings with two to four units located between 101 and 150 feet of the centerline, and five apartment buildings with two to four units located between 151 and 300 feet from the centerline.

Alternative 1/1B has 19 apartment buildings located within 300 feet of the centerline. All are on OPGW only segments. No apartment buildings are within 300 feet of new transmission line construction. These 19 apartment buildings include no apartment buildings that are located within 50 feet from the centerline, seven apartment buildings with two to four units located within 51 and 100 feet of the centerline, seven apartment buildings with two to four units located between 101 and 150 feet of the centerline, and five apartment buildings with two to four units located between 151 and 300 feet from the centerline.

Alternative 2 has 22 apartment buildings located within 300 feet of the centerline. All are on OPGW only segments. No apartment buildings are within 300 feet of new transmission line construction. Of these 22 apartment buildings, none are located within 50 feet of the centerline, seven apartment buildings with two to four units located between 50 and 100 feet of the centerline, ten apartment buildings, including seven with two to four units and three with five to 16 units, are located between 101 and 150 feet, and five apartment buildings with two to four units are located between 151 and 300 feet from the centerline.

2.4.1.4.1.3 Schools

No schools were field observed within 300 feet of the centerline of any segment along the three alternatives.

2.4.1.4.1.4 Daycare Centers

Information regarding the location of registered day care providers was obtained from the Wisconsin Department of Workforce Development.

Based on the review of this information, in conjunction with field observations, there is one operating daycare center located within 101 to 150 feet of the centerline of Segment 54-2 along Alternative 1A and Alternative 1B. There are no operating daycare centers located within 300 feet of Alternative 2.

2.4.1.4.1.5 Hospitals

No hospitals were identified within 300 feet of the centerline of any segment along the three alternatives.

2.4.1.4.1.6 Commercial/Industrial Buildings

Appendix A, Table 1B identifies buildings within 100 feet of the centerline. Alternative 1A has five commercial/industrial buildings located within 100 feet (of these, 3 are along OPGW only segments). Alternative 1B has eight commercial/industrial buildings located within 100 feet (of these, five are along OPGW only segments), and Alternative 2 has nine commercial/industrial buildings located within 100 feet (of these, five are along OPGW only segments).

2.4.1.5 Changes to Existing Easements

2.4.1.5.1 Existing Easement Review

Existing easements for Segments 1, 2, 4, 12, 12a, 14, 15, 15a, 16, and 17 were reviewed in November and December 2010 and January 2011 to determine if existing rights were adequate for the Alternative 1 conversion of the 138 kV line for operation at 345 kV. See Section 2.4.1.5.3 for additional information.

2.4.1.5.2 New/Revised Easements

2.4.1.5.2.1 Modernization

ATC is not proposing to revise existing easements strictly to update easement provisions to conform to *Wis. Stat*. § 182.017(7).

2.4.1.5.2.2 Easement Size

Portions of the Alternative 2 345 kV route and Alternative 1A and 1B 138 kV routes parallel existing transmission lines. The easements across these parcels will need to be revised to reflect the increase in easement width. The required expansion is identified in the segment descriptions in Section 2.1.1. Parcels affected can be identified in Appendix A, Figure 8.

2.4.1.5.2.3 Other

For Segments 1, 2, 4, 14, 15, 15a, 16, and 17, some of the existing ATC easements specify the clearance of the transmission lines and structure heights (e.g., 30-foot minimum line-to-ground clearance). Preliminary line design and configurations do not satisfy these conditions so ATC will procure supplemental or new high-voltage easements.

For Segments 12 and 12a, ATC owns an unused (i.e., no facilities) easement corridor it acquired from WE Energies during the formation of ATC. That 125-foot wide easement corridor meets existing project needs with the exception of adequate structure rights (for example, an easement may specify one structure and ATC needs to place two structures on the parcel) and conductor-to-ground clearance specifications. ATC will procure additional structure and clearance rights as needed from landowners in Segments 12 and 12a.

2.4.2 Detailed Route Impacts by Existing Land Cover

The potential impacts to existing land cover types resulting from the construction of a new transmission line along Alternative 1/1A, Alternative 1/1B, and Alternative 2 are discussed below.

The land cover along all routes was identified using field observations and aerial photography. Fieldwork on existing ROW included wetland delineations and direct land cover observations completed in the fall of 2010 and summer and fall of 2011. Areas that did not contain existing transmission ROW were field checked to the extent possible from roads or other public ROW. Aerial photography that was used included the National Agriculture Imagery Program (NAIP) aerials from 2010. The extent of existing land cover along the project alternatives was measured by using ESRI ArcMap.

Appendix A, Table 2 shows length and area values by route segment of the necessary easement widths required to construct the proposed transmission line along the transmission line alternatives. Land cover impacts were not calculated for the portion of the proposed ROW that overlaps roadways or gravel or railroad tracks from the bottom of the toe of slope to the bottom of the toe of slope on the opposite side of the feature.

The land cover present on the routes and identified in Table 2 includes agricultural lands (Section 2.4.2.1.7.1), non-agricultural lands (Section 2.4.2.1.7.2), and developed lands (Section 2.4.2.1.7.3) as described in more detail below.

2.4.2.1 Detailed Route Summary Table (Table 2)

The detailed land cover information is compiled by segment in separate tables in Appendix A for each transmission line alternative (Table 2–Alternative 1/1A, Table 2–Alternative 1/1B, and Table 2–Alternative 2). The following information is provided in each table:

2.4.2.1.1 Existing/New ROW Width

This information is provided in Table 2.

2.4.2.1.2 Existing ROW Width

This information is provided in Table 2.

2.4.2.1.3 New ROW Width

This information is provided in Table 2.

2.4.2.1.4 Total Segment Length

This information is provided in Table 2.

2.4.2.1.5 Length (ft. in each row)

This information is provided in Table 2.

2.4.2.1.6 Segment Length Shared w/Existing Corridor

This information is provided in Table 2.

2.4.2.1.7 Land Cover Impacts

This information is provided in Table 2.

2.4.2.1.7.1 Agricultural Land Cover Types

Agricultural land cover includes active fields, pastures, recently fallow fields (old field), and farmlot operations. Fields or other areas with no evidence of recent tillage or agricultural production were not included as agricultural land. A detailed discussion of these lands is included in Section 2.4.5.

2.4.2.1.7.1.1 Crop Land (row crops, hay)

The project alternatives cross lands under hay, corn, or soybean production. The following summarizes the acreage of cropland within each transmission line alternative.

Alternative 1/1A with the following substation options:

BRV-North and BHA-North	843.23 acres existing, 145.84 acres new
BRV-North and BHA-South	843.23 acres existing, 160.32 acres new
BRV-South and BHA-North	843.23 acres existing, 141.98 acres new
BRV-South and BHA-South	843.23 acres existing, 156.46 acres new

Alternative 1B with the following substation options:

BRV-North and BHA-North	853.27 acres existing, 143.74 acres new
BRV-North and BHA-South	853.27 acres existing, 153.56 acres new

BRV-South and BHA-North	853.27 acres existing, 139.87 acres new
BRV-South and BHA-South	853.27 acres existing, 149.69 acres new

Alternative 2 with the following substation options:

BRV-North and BHA-North	519.24 acres existing, 275.13 acres new
BRV-North and BHA-South	519.24 acres existing, 272.52 acres new
BRV-South and BHA-North	519.24 acres existing, 272.46 acres new
BRV-South and BHA-South	519.24 acres existing, 269.85 acres new

2.4.2.1.7.1.2 Pasture

The transmission line alternatives cross lands used as pasture for cattle, horses, and sheep. The following summarizes the acreage of pasture along each alternative. The acreage is the same within an alternative regardless of the substation options selected.

Alternative 1/1A: 22.49 acres on existing ROW only

Alternative 1/1B: 25.59 acres on existing ROW only

Alternative 2: 16.26 acres on existing ROW and 5.80 acres on new ROW

2.4.2.1.7.1.3 Old Field

The alternatives cross lands that have been used for row crops in the past, but have been fallow for only a few years. These lands are classified as old field. The following summarizes the acreage of old field along each alternative.

Alternative 1/1A with the following substation options:

BRV-North and BHA-North	253.88 acres existing, 8.29 acres new
BRV-North and BHA-South	253.88 acres existing, 8.27 acres new
BRV-South and BHA-North	253.88 acres existing, 8.13 acres new

BRV-South and BHA-South	253.88 acres existing, 8.11 acres new

Alternative 1/1B with the following substation options:

BRV-North and BHA-North	256.16 acres existing, 6.71 acres new
BRV-North and BHA-South	256.16 acres existing, 6.78 acres new
BRV-South and BHA-North	256.16 acres existing, 6.55 acres new
BRV-South and BHA-South	256.16 acres existing, 6.62 acres new

Alternative 2 with the following substation options:

BRV-North and BHA-North	205.10 acres existing, 16.10 acres new
BRV-North and BHA-South	205.10 acres existing, 15.10 acres new
BRV-South and BHA-North	205.10 acres existing, 15.94 acres new
BRV-South and BHA-South	205.10 acres existing, 14.94 acres new

2.4.2.1.7.1.4 Specialty

The project alternatives cross two types of specialty crops, tree farms, which consist of red pine plantations, and a mink farm. The following sections summarize the acreage of specialty crops along each alternative.

2.4.2.1.7.1.4.1 Ginseng

No ginseng crop was observed within the ROW of the alternatives.

2.4.2.1.7.1.4.2 Tree Farm

The alternatives cross red pine tree farms along several segments. The following summarizes the acreage of tree farms along each alternative. The acreage is the same within an alternative regardless of the substation options selected.

Alternative 1/1A: 1.58 acres of existing ROW only

Alternative 1/1B: 1.71 acres of existing ROW and 1.96 acres of new ROW

Alternative 2: 1.50 acres existing ROW and 0.69 acres new ROW

2.4.2.1.7.1.4.3 Orchard

No orchards were observed within the ROW of the alternatives.

2.4.2.1.7.1.4.4 Cranberry Bog

No cranberry bogs were observed within the ROW of the alternatives.

2.4.2.1.7.1.4.5 Mink Farm

The three alternatives cross a mink farm along Segment 74. The acreage of mink farm that is affected by Segment 74 consists of 1.27 acres of existing ROW.

2.4.2.1.7.2 Non-Agricultural Land Cover Types

The non-agricultural lands along the transmission line alternatives include upland grasslands, upland forest, and wetlands.

2.4.2.1.7.2.1 Upland

The uplands identified along the routes include prairie/grassland and upland forest, as described below.

2.4.2.1.7.2.1.1 Prairie/Grassland

Grasslands identified along the alternatives consist primarily of open fields (dominated by herbaceous vegetation) not in agricultural production and upland road ROW. The following summarizes the acreage of upland prairie/grassland within each route. The acreage is the same within an alternative regardless of the substation options selected.

Alternative 1/1A: 12.95 acres existing ROW and no new ROW

Alternative 1/1B: 2.11 acres existing ROW and no new ROW

Alternative 2: 115.96 acres existing ROW and no new ROW

2.4.2.1.7.2.1.2 Upland Forest

The upland forest areas identified along the alternatives include those adjacent to roads and transmission lines and those areas not located adjacent to any existing ROW. A detailed discussion of forested lands, including the criteria used to identify forested areas, is included in Section 2.4.6.

The following summarizes the acreage of upland forest areas within each route.

Alternative 1/1A with the following substation options:

BRV-North and BHA-North	9.59 acres existing, 8.20 acres new
BRV-North and BHA-South	9.59 acres existing, 8.56 acres new
BRV-South and BHA-North	9.59 acres existing, 8.20 acres new
BRV-South and BHA-South	9.59 acres existing, 8.56 acres new

Alternative 1/1B with the following substation options:

BRV-North and BHA-North	10.45 acres existing, 3.43 acres new
BRV-North and BHA-South	10.45 acres existing, 3.79 acres new
BRV-South and BHA-North	10.45 acres existing, 3.43 acres new
BRV-South and BHA-South	10.45 acres existing, 3.79 acres new

Alternative 2 with the following substation options:

BRV-North and BHA-North	9.69 acres existing, 20.82 acres new
BRV-North and BHA-South	9.69 acres existing, 21.18 acres new
BRV-South and BHA-North	9.69 acres existing, 20.82 acres new
BRV-South and BHA-South	9.69 acres existing, 21.18 acres new

2.4.2.1.7.2.1.3 Other

There were no other non-agricultural upland cover types noted along the alternatives.

2.4.2.1.7.2.2 Wetland

The wetlands identified along the alternatives include forested and non-forested wetland types. The wetlands are described further in Section 2.4.13, including the methods used to identify the presence of these features.

2.4.2.1.7.2.2.1 Forested Wetland

A detailed discussion of forested wetlands, including the criteria used to identify forested areas is located in Section 2.4.6. The following summarizes the acreage of forested wetland areas within each route:

Alternative 1A with the following substation options:

BRV-North and BHA-North	5.83 acres existing, 8.42 acres new
BRV-North and BHA-South	5.83 acres existing, 8.42 acres new
BRV-South and BHA-North	5.83 acres existing, 8.72 acres new
BRV-South and BHA-South	5.83 acres existing, 8.72 acres new

Alternative 1B with the following substation options:

BRV-North and BHA-North	4.47 acres existing, 5.22 acres new
BRV-North and BHA-South	4.47 acres existing, 5.22 acres new
BRV-South and BHA-North	4.47 acres existing, 5.52 acres new
BRV-South and BHA-South	4.47 acres existing, 5.52 acres new

Alternative 2 with the following substation options:

BRV-North and BHA-North	7.66 acres existing, 14.22 acres new
BRV-North and BHA-South	7.66 acres existing, 14.22 acres new
BRV-South and BHA-North	7.66 acres existing, 14.52 acres new
BRV-South and BHA-South	7.66 acres existing, 14.52 acres new

2.4.2.1.7.2.2.2 Non-forested Wetland

All other non-forested wetlands (i.e. wet meadow, shrub-carr, and shallow marsh) are included in this category. The following summarizes the acreage of non-forested wetland areas within each route.

Alternative 1/1A with the following substation options:

BRV-North and BHA-North	200.35 acres existing, 7.10 acres new
BRV-North and BHA-South	200.35 acres existing, 8.93 acres new
BRV-South and BHA-North	200.35 acres existing, 8.51 acres new
BRV-South and BHA-South	200.35 acres existing, 10.34 acres new

Alternative 1/1B with the following substation options:

BRV-North and BHA-North	201.42 acres existing, 5.32 acres new
BRV-North and BHA-South	201.42 acres existing, 7.14 acres new
BRV-South and BHA-North	201.42 acres existing, 6.73 acres new
BRV-South and BHA-South	201.42 acres existing, 8.55 acres new

Alternative 2 with the following substation options:

BRV-North and BHA-North	153.60 acres existing, 12.54 acres new
BRV-North and BHA-South	153.60 acres existing, 13.30 acres new
BRV-South and BHA-North	153.60 acres existing, 13.95 acres new
BRV-South and BHA-South	153.60 acres existing, 14.71 acres new

2.4.2.1.7.3 Developed Land

The developed lands located along the routes include residential and commercial/industrial lands.

2.4.2.1.7.3.1 Residential

The residential lands along the alternatives are comprised of scattered residences. The residential acreage includes the extent of lawns and any outbuildings associated with residences. The following summarizes the acreage of residential areas within each route:

Alternative 1/1A with the following substation options:

BRV-North and BHA-North	33.78 acres existing, 2.93 acres new
BRV-North and BHA-South	33.78 acres existing, 2.98 acres new
BRV-South and BHA-North	33.78 acres existing, 2.93 acres new

BRV-South and BHA-South	33.78 acres existing, 2.98 acres new

Alternative 1/1B with the following substation options:

BRV-North and BHA-North	34.41 acres existing, 5.15 acres new
BRV-North and BHA-South	34.41 acres existing, 5.20 acres new
BRV-South and BHA-North	34.41 acres existing, 5.15 acres new
BRV-South and BHA-South	34.41 acres existing, 5.20 acres new

Alternative 2 with the following substation options:

BRV-North and BHA-North	30.50 acres existing, 5.88 acres new
BRV-North and BHA-South	30.50 acres existing, 5.88 acres new
BRV-South and BHA-North	30.50 acres existing, 5.88 acres new
BRV-South and BHA-South	30.50 acres existing, 5.88 acres new

2.4.2.1.7.3.2 Commercial/Industrial

The commercial/industrial lands identified along the alternatives are comprised of individual businesses and adjacent grounds. The following summarizes the acreage of commercial/industrial areas that will be affected by each alternative. The acreage is the same within an alternative regardless of the substation options selected.

Alternative 1/1A: 25.53 acres existing ROW and 2.56 of new ROW.

Alternative 1/1B: 26.09 acres existing ROW and 3.99 acres of new ROW

Alternative 2: 14.52 acres existing ROW and 5.47 acres of new ROW

2.4.3 Impacts by Land Ownership – Public & Tribal Lands

The estimated potential impacts to public lands are compiled by alternative and segment in separate tables located in Appendix A as Table 3. The following information is provided in each table as described below.

2.4.3.1 Land Impact Ownership (Table 3) (by route & route segment)

The estimated potential impacts to public lands are compiled by segment in Table 3 of Appendix A for Alternative 1/1A, Alternative 1/1B, and Alternative 2. The segment lengths and ROW information contained within this table reflects information included in the General Route Impacts (Section 2.4.1.1). For the purposes of this section, road ROW owned by the WisDOT, county, or local government was not considered public land. The following information is provided in Table 3:

2.4.3.1.1 Existing ROW width

This is the same value reported in Section 2.4.1.1.6.3.

2.4.3.1.2 New ROW Width Required

This is the same value reported in Section 2.4.1.1.7.1.

2.4.3.1.3 Total Segment Length

This is the same value reported in Section 2.4.2.1.4.

2.4.3.1.4 Length

This is the same value reported in Section 2.4.2.1.5.

2.4.3.1.5 Length of Proposed Line Passing through following ownership types

2.4.3.1.5.1 Federal Land

Alternative 1/1A, Alternative 1/1B, and Alternate 2 do not cross any federally-owned lands.

2.4.3.1.5.2 State Properties

Alternative 1/1A, Alternative 1/1B, and Alternative 2 cross the state-owned lands described as follows.

####### 2.4.3.1.5.2.1 Wildlife Area

Alternative 1/1A, Alternative 1/1B, and Alternate 2 do not cross any state wildlife areas.

2.4.3.1.5.2.2 Fisheries Area

Alternative 1/1A, Alternative 1/1B, and Alternate 2 do not cross any state fisheries areas.

2.4.3.1.5.2.3 State Forest

The OPGW-only Segment 75 of Alternative 1/1A, Alternative 1/1B, and Alternative 2 crosses through the Kettle Moraine State Forest. The acreage of ROW that is within the State Forest boundaries is approximately 33.32 acres. This portion of the project will not require any new ROW in the Kettle Moraine State Forest.

2.4.3.1.5.2.4 State Natural Area

Alternative 1/1A, Alternative 1/1B, and Alternate 2 do not cross any state natural areas.

2.4.3.1.5.2.5 Park

Alternative 1/1A, Alternative 1/1B, and Alternate 2 do not cross any state parks.

2.4.3.1.5.2.6 Trail/Bike Path

The OPGW-only Segment 71 of Alternative 1 and Alternative 2 crosses through the Devil's River State Trail. The acreage of ROW that crosses the State Trail is approximately 0.38 acres. This portion of the project new OPGW and will not require any new ROW across the Devil's River State Trail.

The OPGW-only Segment 77 of Alternative 1 and Alternative 2 crosses through the Wild Goose State Trail. The acreage of ROW that crosses the State Trail is approximately 0.29 acres. This portion of the project will not require any new ROW across the Wild Goose State Forest.

2.4.3.1.5.2.7 Other

The OPGW-only Segment 75 of Alternative 1 and Alternative 2 crosses through the Onion River Streambank Restoration Area. The state-owned acreage of ROW that is within the restoration area boundaries is approximately 1.80 acres. This portion of the project will not require any new ROW in the Onion River Streambank Restoration Area.

The OPGW Segments 76 and 77 of Alternative 1 and Alternative 2 cross through two vacant parcels along the USH

151 bypass of Fond du Lac. The acreage of ROW that is within the two vacant lots is approximately 2.54 acres. This portion of the project will not require any new ROW within the vacant lots.

2.4.3.1.5.3 County-owned Land

Alternative 1/1A, Alternative 1/1B, and Alternative 2 cross the county-owned lands described as follows.

2.4.3.1.5.3.1 Park

Alternative 1/1A, Alternative 1/1B, and Alternate 2 do not cross any county parks.

2.4.3.1.5.3.2 County Forest

Alternative 1/1A, Alternative 1/1B, and Alternate 2 do not cross any county forests.

2.4.3.1.5.3.3 Trail/Bike Path

Alternative 1/1A, Alternative 1/1B, and Alternate 2 do not cross any county-operated trails or bike paths.

2.4.3.1.5.3.4 Office/Garage

Alternative 1/1A, Alternative 1/1B, and Alternate 2 do not cross any county-owned properties that are used for offices or garages.

2.4.3.1.5.3.5 Other

The OPGW-only Segment 75 of Alternative 1 and Alternative 2 cross through property owned by Sheboygan County that is related to the Onion River Streambank Restoration Area. The acreage of ROW that is within the county-owned portion of the restoration area boundaries is approximately 1.11 acres. This portion of the project will not require any new ROW in the Onion River Streambank Restoration Area.

2.4.3.1.5.4 Village, City or Town

Alternative 1/1A, Alternative 1/1B, and Alternative 2 cross municipal-owned lands described as follows.

2.4.3.1.5.4.1 Park

The OPGW-only Segment 74 of Alternative 1 and Alternative 2 crosses through South River Park in the City of Plymouth. The acreage of ROW that is within the park is approximately

0.02 acres. This portion of the project will not require any new ROW in South River Park.

The OPGW only Segment 75 of Alternative 1 and Alternative 2 crosses through the H.M. Meyers City Park in the City of Plymouth. The acreage of ROW that is within the park is approximately 1.84 acres. This portion of the project will not require any new ROW in South River Park.

2.4.3.1.5.4.2 School Forest

Alternative 1/1A, Alternative 1/1B, and Alternate 2 do not cross any school forests.

2.4.3.1.5.4.3 Office/Garage

Alternative 1/1A, Alternative 1/1B, and Alternate 2 do not cross any municipal-owned properties that are used for offices or garages.

2.4.3.1.5.5 Tribal land and Native American Reservations

Alternative 1/1A, Alternative 1/1B, and Alternative 2 do not cross any tribal lands or Native American reservations.

2.4.4 Route Summary Table (Table 4)

Information for Sections 2.4.4.1 through 2.4.4.7 is provided in Appendix A, Table 4, which summarizes characteristics of the transmission line alternatives, and is described by alternative in Sections 2.4.1 and 2.4.2. Tables 1A, 1B, and 2 (Appendix A) provide further detail of these parameters for each alternative and segment.

2.4.4.1 Total Route Length (ft) (from Table 1A)

The following summarizes the total length of each route in feet:

Alternative 1/1A with the following substation options:

BRV-North and BHA-North 646,276 feet

BRV-North and BHA-South 648,838 feet

BRV-South and BHA-North 647,261 feet

BRV-South and BHA-South 649,823 feet

Alternative 1/1B with the following substation options:

BRV-North and BHA-North 698,815 feet

BRV-North and BHA-South 699,134 feet

BRV-South and BHA-North 699,800 feet

BRV-South and BHA-South 700,119 feet

Alternative 2 with the following substation options:

BRV-North and BHA-North 638,232 feet

BRV-North and BHA-South 637,114 feet

BRV-South and BHA-North 638,727 feet

BRV-South and BHA-South 637,609 feet

2.4.4.2 Route Length (miles)

The following summarizes the total length of each route in miles.

Alternative 1/1A with the following substation options:

BRV-North and BHA-North 122.4 miles

BRV-North and BHA-South 122.9 miles

BRV-South and BHA-North 122.6 miles

BRV-South and BHA-South 123.1 miles

Alternative 1/1B with the following substation options:

BRV-North and BHA-North 132.4 miles

BRV-North and BHA-South 132.4 miles

BRV-South and BHA-North 132.5 miles

BRV-South and BHA-South 132.6 miles

Alternative 2 with the following substation options:

BRV-North and BHA-North 120.9 feet

BRV-North and BHA-South 120.7 feet

BRV-South and BHA-North 121.0 feet

BRV-South and BHA-South 120.8 feet

2.4.4.3 Area of Agricultural Impact (acres) (from Table 2)

The following summarizes the acreage of agricultural land located within each route.

Alternative 1/1A with the following substation options:

BRV-North and BHA-North 1,276.6 acres

BRV-North and BHA-South 1,291.0 acres

BRV-South and BHA-North 1,272.6 acres

BRV-South and BHA-South 1,287.0 acres

Alternative 1/1B with the following substation options:

BRV-North and BHA-North 1,290.4 acres

BRV-North and BHA-South 1,300.3 acres

BRV-South and BHA-North 1,286.4 acres

BRV-South and BHA-South 1,296.3 acres

Alternative 2 with the following substation options:

BRV-North and BHA-North 1,041.1 acres

BRV-North and BHA-South 1,037.5 acres

BRV-South and BHA-North 1,038.3 acres

BRV-South and BHA-South 1,034.6 acres

2.4.4.4 Non-agricultural Upland Impact (from section 2.4.2.1.7.2.1.1 and Table 2)

The following summarizes the acreage of non-agricultural land located within each route. The acreage is the same within an alternative regardless of the substation options selected.

Alternative 1/1A: 13.0 acres

Alternative 1/1B: 2.1 acres

Alternative 2: 116.0 acres

2.4.4.5 Area of Upland Forest (acres)

2.4.4.5.1 Existing ROW (from Table 2)

The following summarizes the acreage of upland forest, typically located within and near the edge of the existing ROW, for each route that will need to be cleared in accordance with existing easement provisions. The acreage is the same within an alternative regardless of the substation options selected.

Alternative 1/1A: 9.6 acres

Alternative 1/1B: 10.5 acres

Alternative 2: 9.7 acres

2.4.4.5.2 New ROW (from Table 2)

The following summarizes the acreage of upland forest located within new ROW for each route.

Alternative 1/1A with the following substation options:

BRV-North and BHA-North	8.2 acres
BRV-North and BHA-South	8.6 acres
BRV-South and BHA-North	8.2 acres
BRV-South and BHA-South	8.6 acres

Alternative 1/1B with the following substation options:

BRV-North and BHA-North	3.4 acres
BRV-North and BHA-South	3.8 acres
BRV-South and BHA-North	3.4 acres
BRV-South and BHA-South	3.8 acres

Alternative 2 with the following substation options:

BRV-North and BHA-North	20.8 acres
BRV-North and BHA-South	21.2 acres
BRV-South and BHA-North	20.8 acres
BRV-South and BHA-South	21.2 acres

2.4.4.6 Area of Wetland (acres) (from Table 2)

2.4.4.6.1 Forested Wetlands

The following summarizes the acreage of forested wetland located within the ROW for each route.

Alternative 1/1A with the following substation options:

BRV-North and BHA-North	14.2 acres
BRV-North and BHA-South	14.2 acres
BRV-South and BHA-North	14.5 acres
BRV-South and BHA-South	14.5 acres

Alternative 1/1B with the following substation options:

BRV-North and BHA-North	9.7 acres
BRV-North and BHA-South	9.7 acres

BRV-South and BHA-North	10.0 acres
BRV-South and BHA-South	10.0 acres

Alternative 2 with the following substation options:

BRV-North and BHA-North	21.9 acres
BRV-North and BHA-South	21.9 acres
BRV-South and BHA-North	22.2 acres
BRV-South and BHA-South	22.2 acres

2.4.4.6.1.1 Existing ROW

The following summarizes the acreage of forested wetland, typically located within and near the edge of the existing ROW, for each route. The acreage is the same within an alternative regardless of the substation options selected.

Alternative 1/1A: 5.8 acres

Alternative 1/1B: 4.5 acres

Alternative 2: 7.7 acres

2.4.4.6.1.2 New ROW

The following summarizes the acreage of forested wetlands located within new ROW for each route.

Alternative 1/1A with the following substation options:

BRV-North and BHA-North	8.4 acres
BRV-North and BHA-South	8.4 acres
BRV-South and BHA-North	8.7 acres
BRV-South and BHA-South	8.7 acres

Alternative 1/1B with the following substation options:

BRV-North and BHA-North	5.2 acres
BRV-North and BHA-South	5.2 acres
BRV-South and BHA-North	5.5 acres
BRV-South and BHA-South	5.5 acres

Alternative 2 with the following substation options:

BRV-North and BHA-North	14.2 acres
BRV-North and BHA-South	14.2 acres

BRV-South and BHA-North	14.5 acres
BRV-South and BHA-South	14.5 acres

2.4.4.6.2 Non-forested Wetlands – Existing and New ROW Combined (from Table 2)

The following summarizes the acreage of non-forested wetlands located within existing and new ROW for each route.

Alternative 1/1A with the following substation options:

BRV-North and BHA-North	207.4 acres
BRV-North and BHA-South	209.3 acres
BRV-South and BHA-North	208.9 acres
BRV-South and BHA-South	210.7 acres

Alternative 1/1B with the following substation options:

BRV-North and BHA-North	206.7 acres
BRV-North and BHA-South	208.6 acres
BRV-South and BHA-North	208.1 acres
BRV-South and BHA-South	210.0 acres

Alternative 2 with the following substation options:

BRV-North and BHA-North	166.1 acres
BRV-North and BHA-South	166.9 acres
BRV-South and BHA-North	167.6 acres
BRV-South and BHA-South	168.3 acres

2.4.4.7 Distance to Residences and Apartments (from Table 1B)

This information is provided in Section 2.4.1.4.1.

2.4.5 Agricultural Information by Segment and Route (Table 2)

Agricultural land uses were identified by field observations and through aerial photograph interpretation in areas where access was not available. NAIP aerials from 2010 were used for photo interpretation. Fieldwork was conducted in the fall of 2010 and summer and fall of 2011 for areas along existing ATC and road ROW. Areas that do not contain existing transmission line ROW were field checked to the extent possible from road or other public ROW.

Property classified as being in agricultural use includes active cropped fields, pastures, recently fallow fields (old field), farm lot operations, pine plantations, and a mink farm. Fields or other areas with no evidence of recent tillage or agricultural production were not included as agricultural land.

The amount of agricultural acreage along Alternative 1/1A, Alternative 1/1B, and Alternative 2 was measured by using EARI ArcMap. The measurements were compiled and summarized in Appendix A, Table 2 - Alternative 1/1A, Table 2 - Alternative 1/1B, and Table 2 - Alternative 2.

The three alternatives would traverse across land that is presently dominated by agricultural use for crops, pasture, and old field. Alternative 1/1A crosses approximately 1272.6 to 1291.0 acres of agricultural land, depending on the substation options selected. Alternative 1/1B crosses approximately 1286.4 to 1300.3 acres of agricultural land, depending on the substation options selected. Alternative 2 crosses approximately 1034.6 to 1041.1 acres of agricultural land, depending on the substations options selected. Additional information regarding project affects to agricultural land is presented in the following sections.

2.4.5.1 Type of Farming

The primary farming practice along the transmission line alternatives is row crops, generally hay, corn, and soybeans. Lands used for pasture and fallow fields are also located along the alternatives. Other specialty crops such as red pine plantations and one mink farm are also located along the alternatives.

2.4.5.2 Potentially Affected Farming Practices

Potential agricultural impacts of the proposed project will be mostly short-term and include temporary construction-related impacts, such as loss of crops. ATC will minimize these potential impacts by restoring agricultural lands to the extent practicable and also by providing compensation for lost crops where necessary. Permanent impacts will occur where new structures will be placed in agricultural fields.

Many of the route segments in agricultural areas are located along existing transmission lines, roadways, and fence lines, or between fields. Where the project segments are located along I-43, the new structures will be placed in road ROW wherever possible to avoid impacts to agricultural fields. Where the segments are along local road ROW, the proposed structures would be located along the edge of the ROW and the farm field, where practicable. These route siting practices should minimize the loss of tillable land and any problems

associated with use of agricultural equipment. If these conflicts occur, ATC will work with property owners during real estate acquisition to accommodate property owner needs to the greatest extent practicable.

Many of the agricultural fields along the transmission line alternatives contain drain tile. ATC will make an effort to discuss the location of the tile with the property owner prior to the start of construction activities in order to avoid damaging the tile to the extent practical. If tile damage from construction vehicles' travel does occur, ATC will either compensate the landowner or restore the tiles to pre-construction conditions.

Based on field observations along accessible routes and aerial photography no center pivot irrigation was identified adjacent to any route.

2.4.5.3 Project Affected Parcels Enrolled in Farmland Preservation Program

There are no parcels enrolled in the Farmland Preservation Program along any of the proposed route alternatives.

2.4.5.4 Proximity to Farm Buildings (by Segment and Route)

Farm buildings located within 100 feet of the proposed centerline were identified for each route. These buildings were identified in a similar fashion to the buildings enumerated in Section 2.4.1.4.

2.4.5.4.1 Building used to house animals

Alternative 1/1A has one building housing animals located within 100 feet of the proposed centerline. Alternative 1/1B has two buildings housing animals located within 100 feet of the proposed centerline. Alternative 2 has two buildings housing animals within 100 feet of the proposed centerline. The location of Confined Animal Feeding Operations (CAFO) in the project area is shown in Appendix A, Figure 12.

2.4.5.4.2 Metal sheds or equipment storage buildings

Alternative 1/1A has one wood storage building located within 100 feet of the proposed centerline. Alternative 1/1A has one wood storage building located within 100 feet of the proposed centerline. Alternative 1/1B has one wood storage building located within 100 feet of the proposed centerline. Alternative 2 has two metal and one wood storage buildings within 100 feet of the proposed centerline.

2.4.5.4.3 Provide map of all farm building locations or GIS shape file

Farm buildings located within 100 feet of the proposed centerlines are provided as a GIS shapefile concurrent with this Joint Application on electronic media as described in Section 2.3.3. This shapefile includes an attribute table that identifies the type of building, the segment along which it was identified, and the distance measured from the route centerline. Farm buildings within 100 feet of the proposed transmission line centerlines are shown in Appendix A, Figure 12.

2.4.6 Forest Land Segment and Route Summaries (Table 2)

Forested lands were identified by field observations and through aerial photograph interpretation in areas where access was not available. NAIP aerials from 2010 were used for photo interpretation. Fieldwork was conducted in the fall of 2010 and summer and fall of 2011 for areas along existing ATC and road ROW. Areas that do not contain existing transmission line ROW were field checked to the extent possible from road or other public ROW.

Forested lands were defined as areas dominated by trees (>20% canopy cover) and consisting of at least 1 acre in total size.[1] Narrow tree lines or windbreaks were generally not quantified as forested cover. A summary of forested lands on existing ROW for each of the transmission line alternatives is included in Appendix A, Table 2 and Table 4. The following generally summarizes the type of forest land along each route. A quantitative evaluation of woodland impacts is provided in Section 2.4.2.1.7.2.

In general, forested uplands along the transmission line alternatives are comprised of trees such as red oak (*Quercus rubra*), sugar maple (*Acer saccharum*), and green ash (*Fraxinus pennsylvanica*). Forested wetlands along these alternatives are typically dominated by species such as boxelder (*Acer negundo*) and green ash.

In instances where forest land occurs within the ROW of the alternatives, tree removal will be required in portions where trees extend into the

[1] This size is more conservative than the 5-acre minimum size of a forest as defined in the United States Forest Service Silvicultural Handbook (FSH 2409.26d), and the canopy coverage is based on the EPA, NRCS, and USDA guidelines for defining land cover (http://www.epa.gov/mrlc/Implmnt_plan.htm#Def).

proposed ROW. In such areas, certain low-growing vegetation will be allowed to reestablish after construction is complete.

2.4.6.1 Managed Forest Law Lands

2.4.6.1.1 Property Enrolled

ATC obtained information from the WDNR identifying quarter-quarter (40 acre) sections in which all or some portion of the land is enrolled in the Managed Forest Land (MFL) or the Forest Crop Law (FCL) programs. The quarter-quarter sections potentially impacted by the alternative transmission line routes are identified in Appendix A, Figure 8.

The proposed Alternative 1 345 kV line passes through or adjacent to 20 quarter-quarter sections on existing ROW with land enrolled in the MFL program.

The proposed Alternative 1A 138 kV line passes through or adjacent to nine quarter-quarter sections with land enrolled in the MFL program. Of these, two are along new and unused ROW, three are along existing ROW, and four are along existing ROW that will be expanded. These four are also counted under the 20 quarter-quarter sections along the Alternative 1 345 kV line.

The proposed Alternative 1B 138 kV line passes through or adjacent to nine quarter-quarter sections with land enrolled in the MFL program. Of these, four are along new and unused ROW, four are along existing ROW, and one is along existing ROW that will be expanded. This one is also counted under the 20 quarter-quarter sections along the Alternative 1 345 kV line.

The proposed Alternative 2 345 kV line passes through or adjacent to 24 quarter-quarter sections with land enrolled in the MFL program.

2.4.6.1.2 Affect on Participation

The extent to which program participation may be affected cannot be determined based on the information available to ATC. The extent to which a property is enrolled in the MFL program will be identified during the easement negotiation process. If any landowner would be unable to continue participation, ATC will compensate the landowner for the costs of withdrawal and any adverse tax consequences.

2.4.6.2 Forest Crop Law Lands

Information obtained by ATC from the WDNR did not identify any parcels as enrolled under the Forest Crop Law.

2.4.7 Conservation Easements

ATC has not identified any parcels with conservation easements, nor have any private conservation easements been brought to ATC's attention during its public outreach, along any of the transmission line alternatives.

2.4.8 Endangered, Threatened, or Special Concern Species and Natural Communities

Through coordination with WDNR Bureau of Endangered Resources (BER), information concerning the presence of rare species (threatened, endangered or special concern) within the project area was assessed through a review of the Wisconsin Natural Heritage Inventory (NHI) database. The NHI database notes the presence of 24 plant species, 31 mussels, fish, and aquatic invertebrate species, six bird species, four reptile and amphibian species, and three land snail species that are listed as either threatened, endangered or special concern species, and 14 different natural communities within the project area.

During field surveys in the fall of 2010 and summer and fall of 2011, AECOM biologists conducted surveys for the presence of protected plant species. Each protected plant was searched for in its preferred habitat. AECOM conducted these surveys throughout the growing season due to the different phenology of the protected plants, depending on the optimum season to observe each plant in the field. Surveys were focused on areas of the two routes where potential habitat existed for the rare plants. Results of the rare plant surveys indicated that none of the 24 plants listed in the project area were identified along any of the three transmission line alternatives.

In the spring and early summer of 2012, Raptor Services, LLC surveyed for protected raptor species in the project area. Surveys were performed by broadcasting the call of each protected species during the nesting season and listening for call backs. One active nest site was found along Alternative 1A and Alternative 1B. The nest site is common to both alternatives.

On March 23, 2012, an Endangered Resource Review Request was submitted to the WDNR BER(Appendix I, Exhibit 1). The WDNR BER provided its review on May 29, 2012 (Appendix I, Exhibit 2).

A report describing the methods and results of the protected species surveys will be submitted to the WDNR Office of Energy for review and comment, with a copy sent to the Commission.

During the BER review process, the WDNR determined that, based on existing habitat types found during field surveys along the three alternatives, additional species surveys would be required after a route is ordered by the PSCW.

The WDNR indicated that in order to avoid impacts to mussels, fish, and aquatic invertebrate species, ATC should employ the most conservative erosion control techniques to avoid disturbance of waterways. If streambed impacts will occur, the work should be done outside of the spawning season and only in areas where the protected species are not found.

The AECOM habitat surveys indicated that the habitat of protected land snails is not present along the alternatives; therefore no further action is required for land snail protection.

For protected raptor species, WDNR indicated that once a route is selected by the PSCW, ATC should consult with WDNR to determine if more surveys are deemed necessary.

For other bird species, WDNR requests that bird surveys be completed. Bird surveys should be completed for the protected birds known to occur within the project area that were identified by WDNR, as well as other protected birds known to occur within Manitowoc, Sheboygan, Calumet, and Fond du Lac counties. Once a route is selected, ATC will consult with WDNR to determine any additional surveys required.

For reptile and amphibian species, WDNR requests that additional surveys be completed. Surveys should be completed for the protected reptiles and amphibians that were identified by WDNR. ATC will submit a protected species report indicating the locations of suitable habitat for each species, including photographs, so that WDNR can assess the likelihood of the presence of the reptiles and amphibians. Once a route is selected, ATC will consult with WDNR to determine any additional surveys required.

For protected plants, WDNR indicated that the field assessment conducted by AECOM determined that suitable habitat for protected plants is present along the three alternatives, but subsequent surveys did not result in locating any of the protected plants. Therefore, additional plant surveys are not required.

Once a route has been selected, and if necessary, ATC may implement avoidance measures if it is determined that a species may be impacted. If, after consultation with the WDNR, avoidance measures cannot be implemented, ATC will provide the supplemental information required for the issuance of an Incidental Take Authorization.

2.4.9 Archaeological and Historic Resources

Commonwealth Cultural Resources Group, Inc. conducted an archaeological and historical resources literature review of the project area. To assess the potential effects of the project on archaeological and cemetery/burial sites and architectural/historic resources, the Archaeological Site Inventory , the Architecture and History Inventory and associated site files, and the national and state registers of historic places were reviewed.

A review of the Wisconsin Historical Society Bibliography of Archaeological Reports database revealed that 30 previous archaeological surveys have occurred within portions of the project area. Many of these surveys resulted in the formal documentation of cemetery sites and the identification of new archaeological sites. Two of these surveys resulted in the identification of archaeological sites that were considered potentially eligible for the National Register of Historic Places. Neither of these sites is included within the project area.

A total of 21 previously reported archaeological and cemetery/burial sites are located within 100 feet of the three transmission line alternatives, including one un-cataloged cemetery/burial site, which is located along Alternative 2. No previously reported archaeological or cemetery/burial sites are identified within 100 feet of the four potential substation sites.

A total of 33 previously identified architectural/historic resources are located within 0.25 miles of areas of new ROW for the three alternatives. There are no previously identified resources adjacent to the proposed substation sites.

Commonwealth Cultural Resources Group, Inc.'s report is included in Appendix I, Exhibit 5.

2.4.10 Project Affected Airports

Two airports in the project area in proximity to one or more routes were identified. These are the Manitowoc County Airport and the Sheboygan County Airport. All structures proposed for this project along all route alternatives will remain within the applicable height limitations. Appendix

A, Figure 11, shows the Federal Aviation Administration height limitations associated with each airport.

2.4.11 Off ROW Construction Access Issues

For all segments, ATC is proposing to directly access the ROW from public roads or ATC ROW unless the construction contractor hired by ATC is able to arrange for alternative access that minimizes environmental impacts.

A preliminary Environmental Features and Access Plan for each of the routes is presented in Appendix A, Figure 13 and Figures 23 through 26 for the areas surrounding each proposed substation option.

Upon approval of a transmission line route, the preliminary access plan may be amended based on negotiations with local landowners and/or contractor requirements. For all alternatives, off-ROW access will be pursued to minimize potential environmental impacts associated with temporary stream crossings, wetland crossings, or other sensitive resources.

2.4.12 Waterway Permitting Activities

A summary of all waterways intersecting the transmission line alternatives is presented in the Environmental Inventory Table, Attachment G to ATC's WDNR Utility Permit Application-Part 1. The Utility Permit Application-Part 1 is included as Appendix E. ATC anticipates needing permit approval (*Wis. Stat.* § 30.123) to temporarily cross streams along all three alternatives. ATC is seeking approval to cross these streams with Temporary Clear Span Bridges (TCSB). This regulated activity is listed in Appendix E, Utility Permit Application-Part 1, Attachment F (Supplement to Form 3500-53).

Proposed temporary stream crossings have been minimized by utilizing access from either side of the stream or by using existing public road ROW. ATC will work with private landowners to identify alternate access routes to further minimize the use of stream crossings, if possible. However, ATC has requested the issuance of a permit for all potential crossings needed to access the entire ROW of all alternatives in the event that avoidance is not possible. Permitted TCSBs would be constructed using construction mats and would span from top of bank to top of bank of the waterway. Truck trailer beds or engineered beams may be used to span wider waterways.

Construction along Alternative 1/1A would utilize up to 117 TCSB crossings. Construction along Alternative 1/1B would utilize up to 122 TCSB crossings. Construction along Alternative 2 would utilize up to 109

TCSB crossings. See Appendix E, Utility Permit Application-Part 1, Attachment F (Table 5) for a list of the waterways that would require TCSBs for each alternative.

2.4.13 Wetlands and Wetland Crossings

2.4.13.1 Wetland Maps using WDNR WWI Information

ATC's environmental consultant, AECOM, completed wetland delineations within existing transmission line and road ROW along the transmission line alternatives, primarily in October and November of 2010 and between June and October of 2011. The wetland delineations were completed in the field using the criteria and methods outlined in: the United States Army Corps of Engineers (USACE) Wetland Delineation Manual (USACE 1987); the Interim Regional Supplement to the Corps of Engineers 1987 Wetland Delineation Manual: Northcentral/Northeast Region (2008); subsequent guidance documents (USACE 1991, 1992); the Guidelines for Submitting Wetland Delineations in Wisconsin to the St. Paul District Corps of Engineers (USACE 1996); and the Basic Guide to Wisconsin's Wetlands and their Boundaries (Wisconsin Department of Administration Coastal Management Program 1995).

The field delineated wetland boundaries were mapped using a Trimble GeoXH global positioning system (GPS) unit (sub-meter accuracy). Field delineated wetlands are shown in yellow on the Environmental Features and Access Plans in Appendix A, Figure 13 and Figures 23 through 26. The Wetland Delineation Report is available under separate cover.

2.4.13.2 Alternative Wetland Identification Methods

Field access was limited to the existing transmission and road ROW along the alternatives. In areas that were visible, the wetland boundaries were extended beyond these existing corridors where additional ROW is required. For areas extending outside the existing ROW, the wetland boundaries were conservatively estimated by interpretation of aerial photographs (NAIP 2010 aerial photographs), county soil survey mapped hydric soils, Wisconsin Wetland Inventory (WWI) maps, and field observations. Off ROW wetland boundaries were field identified by using offset points with the GPS unit for mapping purposes. These wetlands are labeled as "visually observed" and shown in yellow and red within the Environmental Features and Access Plans in Appendix A, Figure 13 and Figures 23 through 26. Visually observed wetlands include wetlands that could not be

delineated due to access restrictions; however, due to their proximity to existing transmission and road ROWs, their presence was confirmed through field observations.

For areas not visible from existing transmission or road ROW, wetlands were identified by aerial photograph interpretation. Aerial photographs (NAIP 2010) were examined in addition to WWI and soils survey maps to determine potential wetland locations. Areas that were identified as wetlands on WWI maps and mapped as hydric soils were examined on aerial photographs (NAIP 2010) for wetland signatures or evidence that they were dominated by hydrophytic vegetation. The boundary of areas that were determined to be wetlands were digitized in GIS and labeled as "aerial photo interpreted" wetlands. The boundaries of aerial photo interpreted wetlands could not be confirmed in the field due to the lack of access. Their boundaries were defined using available remote resources as described above. These wetlands are shown in yellow and red within the Environmental Features and Access Plans (Appendix A, Figure 13 and Figures 23 through 26).

2.4.13.3 Wetland Crossings

Wetlands exist along the three transmission line alternatives that would need to be crossed during construction. The preliminary Environmental Features and Access Plans are discussed in Section 2.4.11 and provided in Appendix A, Figure 13 and Figures 23 through 26. The anticipated structure locations and length of wetland crossings are summarized in an Environmental Inventory Table for each route alternative (Appendix E, Utility Permit Application-Part 1, Attachment G). The table includes the characteristics of wetlands along both routes, including the WWI index, and presence and dominance of invasive species.

Based on preliminary route designs, 23 to 25 new structures along Alternative 1/1A would need to be placed in wetlands. Depending on the substation options selected five to seven of these structures would be 345 kV double-circuit structures and 18 would be 138 kV single-circuit structures. Alternative 1/1B would include 29 to 31 new structures that would need to be placed in wetlands and depending on the substation options selected, four to six would be 345 kV double-circuit structures and 25 would be 138 kV single-circuit structures. Alternative 2 would include 33 to 35 structures that would need to be placed in wetlands. Depending on the substation options selected, five to seven would be 345 kV double-circuit structures, seven would be 345/69 kV double-circuit structures, and 21 would be 345 kV single-

circuit structures. Preliminary designs were developed to minimize impacts to wetlands to the extent possible by increasing or decreasing span lengths. Because of span length requirements and ROW limitations, some impacts to wetlands are unavoidable.

2.4.13.4 Sensitive Wetlands

The majority of wetlands located along the alternatives are low quality emergent /wet meadow wetlands. These wetlands have formed as a direct result of the historic disruption of natural drainage as a result of farming practices and road construction activities. Vegetation within these wetlands consists primarily of fast growing adventitious species, such as reed canary grass (Phalaris arundinacea) and native red-osier dogwood (*Cornus stolonifera*). Several wetlands along the alternatives are higher quality forested wetlands, dominated by green ash, box elder, and silver maple. Specific characteristics of wetlands along the alternatives are summarized in the Environmental Inventory Table, Appendix E, Utility Permit Application-Part 1, Attachment G. Sensitive wetlands located along the alternatives are described in the following sections.

2.4.13.4.1 Cold Water Community (as defined in Wis. Adm. Code, § NR 102.04(3)(a))

The OPGW only installation for each of the alternatives crosses the Onion River, which is listed as a Trout Stream by the WDNR.

2.4.13.4.2 Lake Michigan and Superior and the Mississippi River

Lake Michigan, Lake Superior and the Mississippi River will not be impacted by this Project.

2.4.13.4.3 State- or Federally-designated Wild and Scenic River

There are no state or federally designated Wild and Scenic Rivers along the alternatives.

2.4.13.4.4 State-designated riverway

There are no state-designated riverways along the alternatives.

2.4.13.4.5 State-designated urban waterway

There are no state-designated urban waterways along the alternatives.

2.4.13.4.6 Environmentally sensitive area or environmental corridor identified in an area-wide water quality management plan, special area management plan, special wetland inventory study, or an advanced delineation and identification study.

The Onion River Streambank Protection area is located along the OPGW only Segment 75 for all alternatives.

2.4.13.4.7 Calcareous fen

There are no calcareous fens along the alternatives.

2.4.13.4.8 State park, forest, trail or recreational area

There is one State Forest, the Kettle Moraine State Forest, and two State Trails, the Devil's River State Trail and the Wild Goose State Trail, located along all alternatives. The OPGW only Segment 75 crosses the Kettle Moraine State Forest. The OPGW only Segment 71 crosses the Devil's River Trail. The OPGW only Segment 77 crosses the Wild Goose Trail.

2.4.13.4.9 State and Federal fish and wildlife refuges and fish and wildlife management area

The Onion River Streambank Restoration Area is located along OPGW only Segment 75 along all alternatives.

2.4.13.4.10 State- or federally-designated wilderness area

There are no state or federally-designated wilderness areas along the alternatives.

2.4.13.4.11 State-designated or dedicated natural area (SNA)

There are no stated-designated or dedicated natural areas along the alternatives.

2.4.13.4.12 Wild rice water listed in Wisc. Admin. Code § NR 19.06

There is no wild rice water as listed in *Wis. Admin. Code* § NR 19.06 along the alternatives.

2.4.13.4.13 Outstanding or Exceptional Resource Waters

All alternatives cross several Outstanding and Exceptional Resource Waters at locations that currently have existing transmission line crossings.

Alternative 1 will cross Outstanding and Exceptional Resource Waters three times, including the Branch River (345 kV line) twice, and the Onion River (OPGW installation only).

Alternative 2 will cross Outstanding and Exceptional Resource Waters two times, including the Branch River and the Onion River (both for OPGW installation only).

2.4.13.4.14 Other sensitive wetlands

See Appendix E, Utility Permit Application-Part 1, Attachment G (Environmental Inventory Table) for additional descriptions of wetlands along the alternatives.

2.4.14 Mapping Wetland and Waterway Crossings

Wetland and waterway crossing maps for the transmission line alternatives, containing the information requested in Sections 2.4.14.1 through 2.4.13.3, are provided in Appendix A.

2.4.14.1 Recent Air Photo (line & ROW only)

Recent aerial photography with only the proposed transmission line routes and ROW is included in Appendix A, Figure 5.

2.4.14.2 Topographic Map showing line and ROW

A topographic map showing the showing the proposed transmission line routes is included in Appendix A, Figure 6.

2.4.14.3 Recent Air Photo with the following items

Maps of the alternatives, including the information required under Section 2.4.14.3.1 through Section 2.4.14.3.10 of the transmission line Application Filing Requirements is provided in the Environment Access Plans in Appendix A, Figure 13 and Figure 23 through 26.

2.5 CONSTRUCTION METHODS

2.5.1 General Construction Information

The following describes ATC's practices and procedures 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 proposed project either replaces the 138 kV circuit of a double-circuit 345/138 transmission with a new 345 kV circuit and constructs a new 138 kV transmission line (Project Alternative 1) or constructs a new primarily single-circuit 345 kV transmission line (Project Alternative 2).

Steel monopole structures are proposed for the Project. Tables identifying the existing or proposed structure type by Alternative and route segment are provided in Section 2.1.2.

Foundations for all steel structures will be concrete caisson, unless an equally suitable, more economical foundation type is feasible given the prevailing soil conditions. Foundations are required for 345 kV structures to provide the strength necessary for the structures to resist the large overturning reactions due to the heavy conductor loads. 138 kV structures may be constructed on foundations or direct imbed depending on the type of structure (tangent, angle, dead-end) and soil conditions.

2.5.1.2 Disposition of Existing Structures

There will be up to four different types of transmission line structures removed under the three transmission line alternatives: steel lattice structures, steel monopoles, wooden H-frames, and wood monopoles.

Steel lattice structures may be coated with lead-based paint and require special handling to contain the paint during removal and disposal. Steel lattice structures will be disposed of at an appropriate landfill or recycling facility.

Steel monopole structures will either be recycled or reused if possible.

Wooden H-frames and monopole structures will be disposed of by the construction contractor by either leaving them with the property owner or other private landowner, if requested, or in an appropriate landfill.

2.5.1.3 Method of Structure Placement

For direct-embedded poles (no foundation required), a hole is excavated to the appropriate depth. The base of the structure is placed into the excavated hole, and the area around the pole is backfilled with clean granular fill (typically gravel) to within one foot of the surface. The balance (top 12 inches) of the excavation is backfilled with native soils.

For structures requiring a foundation, the required hole is excavated. Concrete caissons are formed by placing a rebar cage and anchor bolts into the excavation. The excavation is then filled with concrete to a point where the rebar cage and anchor bolts are covered leaving only the threaded bolts exposed. The complete caisson is allowed to cure for approximately one week to develop the necessary strength. After the caisson is cured, the steel pole structure is assembled in sections, with the bottom section put in place with a crane and mounted to the caisson using the exposed bolts. In general the excavated holes will range from 4 to12 feet in diameter and may be 20 to 40 feet in depth, or greater.

For both direct-embedded and structures requiring a foundation, the next sections are lifted in place with a crane and fastened to the base. The insulator strings are either installed on the top section before it is placed on the base or are installed just prior to conductor installation.

2.5.1.4 Concrete Foundation Type (size & depth)

The method of installation, diameter and depth of the excavation will vary depending on the soil capability and structure loadings. Excavation is required for all structures, whether direct-embedded or requiring a foundation. The depth of the excavated hole (and therefore, the amount of excavated material) depends on the soil conditions encountered at the proposed structure location. Spoils from excavations will be disposed of in accordance with ATC practices. Wetland spoils will be contained on tarps in order to avoid unintentional filling of wetlands before being removed from wetland areas. In any area where conditions may be conducive to erosive losses (erodible soils, slopes, wetlands or streams adjacent to site), appropriate erosion control measures as described in the WDNR Construction Site Best Management Practices will be installed and maintained until final restoration and re-vegetation is complete.

2.5.1.5 Types of Construction Machinery

Construction equipment typically used in transmission line construction is expected to be utilized on this project, including digger and bucket trucks, cranes (small and large), a high-pressure drill rig, mat trucks, backhoe, dump trucks, dozers, line puller, line tensioner pick-up trucks, utility trailers (small and large), semi-tractor and trailers and related equipment.

2.5.1.6 Width of Construction Disturbance Zone

Construction will be confined to the ROW and along access routes. ATC will utilize existing roads, ROW, and/or arranged access locations where roadways are not present. Most disturbances will likely occur in the area immediately surrounding transmission line structures. The size of this area will vary based on the scope of work at each structure and the size of the structure and, therefore, the size of the equipment needed to complete the work, but typically will be an approximately 60-foot by 60-foot work space area surrounding the structure location. In areas where access cannot be gained from existing roads, some disturbance from vehicular traffic may also occur. Disturbance in the construction areas may include clearing of vegetative cover, soil compaction, vehicular tracking, and some topsoil disturbance. An access path of approximately 16 feet will be needed; however, there may be areas where a greater width (up to 40 feet) is needed to allow for two lanes of construction traffic.

2.5.1.7 Staging Areas

ATC has selected six laydown yards located across the entire project area as its designated laydown or staging areas. The six laydown yards include the following:

- Gravel pit located at 1990 Cedar Road, Eden, WI.
- Parking lot located at 314 County Road PP, Hilbert, WI.
- Gravel parking area located at 2216 Spancrete Road, Valders, WI.
- Parking lot located at 4348 Playbird Road, Sheboygan, WI.
- Gravel pit located at 12319 Mineral Springs Road, Newton, WI.
- Parking lot located at W4916 County Road U, Plymouth, WI.

These laydown yards are shown in Appendix B, Figure 14. Additional description of the environmental impacts in laydown areas is located in Section 2.5.7.

Additionally, ATC may use substation property at the proposed Barnhart and Branch River substations and the existing Howards Grove, Forest Junction, Erdman and Point Beach substations.

2.5.1.8 Construction Methods

ATC will work cooperatively with the construction contractor to develop a final Environmental Features and Access Plan (EAP). The purpose of this EAP is to serve as a guidance document for persons working on the project to ensure understanding of and compliance with permit conditions, CPCN Order Points, ATC requirements, landowner agreements, and any other applicable federal or state requirements.

The EAP will provide site-specific information regarding the implementation methods used to minimize impacts and comply with regulatory and other requirements. The EAP may include maps indicating structure locations, ATC approved access routes and construction techniques, as well as landowner information as appropriate. The EAP will address sensitive resources described in Section 2.4 as appropriate, and will be developed using information provided in applicable portions of Sections 2.4, 2.5, 2.6, and Appendix E of this Joint Application. For example, the EAP may address standard construction techniques in wetlands and around waterways and waterway crossing locations, protected species protocols, archaeological resource protection methods, and erosion control techniques, as applicable to the project. In addition, this document may incorporate plans for construction activities, including materials management, invasive species management, dewatering, and the type of field marking and staking used for the project, restoration, waste management, and spill prevention and contaminant cleanup plans as applicable to this project.

Site-specific information and permit requirements are needed to fully develop the EAP. Consequently, it will be developed after a final route has been selected and prior to construction. The primary purpose of the EAP is to provide guidance to field personnel. However, it can be made available to PSCW and WDNR upon request.

2.5.1.8.1 Agricultural lands

Agricultural areas are the primary land use along all alternatives. In agricultural areas, ATC will use general upland construction procedures utilizing standard construction equipment. These construction practices will conform to Best Management Practices to minimize impacts (e.g., soil erosion). The EAP provided in Appendix

A, Figure 13, has been designed to reduce impacts to wetlands and waterways; however, ATC will work with landowners to minimize impacts to agricultural lands where possible. For example, ATC will strive to access structure locations using the ROW and public roads. Landowners will be compensated for crop and other damages arising from construction activity consistent with the terms in the property easements.

ATC anticipates that Agricultural Protection measures may be required for construction in livestock containment areas along all of the three alternatives. A review of the 2010 Certified Organic Farm Mailing list provided by the Department of Agriculture Trade and Consumer Protection and the United States Department of Agriculture National Organic Program database confirmed there are no organic farms along any of the alternatives. ATC will work with potentially affected agricultural landowners to ensure that, in the event farm disease mitigation is currently practiced by the landowners, mitigation plans will be adhered to during construction of the transmission line.

Costs associated with farm disease mitigation practices vary widely depending on the practices employed. Some assumptions about the cost of farm disease mitigation were included in Section 2.1.7.3.3; however, these may need to be reviewed and updated based on discussions with individual landowners after a route is selected.

2.5.1.8.2 Forestlands

To accommodate transmission line construction, vegetation will be cleared for the full width of the ROW. This allows safe ingress and egress of construction equipment, and ensures safe clearances between vegetation and the transmission line once construction is complete.

Vegetation will be cut at or slightly above the ground surface. Root stocks will 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 ROW or the placement of structures. Re-growth of tall-growing species under the transmission line will not be allowed. Where permission of the landowner has been obtained, stumps of tall-growing species will be treated with a herbicide to discourage re-growth. The disposition of trees of commercial or other value will be negotiated with the landowner prior to the commencement of land clearing.

Vegetation clearing will be completed in accordance with the Commission restrictions on oak tree cutting and pruning as specified in *Wis. Admin. Code* § PSC 113.0511.

2.5.1.8.3 Surface waters and wetlands

Construction activities typically will not take place on the stream banks or close to the water, other than cutting or trimming trees that exceed the maximum height limit and the placement of TCSB. In-stream use of heavy equipment will not be required on this Project.

Waterways

To the extent practicable, temporary stream crossings will be avoided by utilizing existing bridges or culvert crossings or by accessing riparian areas from nearby roads on either side of a stream. Where necessary and authorized by the WDNR, TCSB crossings will be placed to avoid in-stream disturbance. (See the Environmental Access Plans, Appendix A, Figures 13, and 23 through 26, for anticipated locations of TCSB crossings.) Each typical TCSB will consist of construction mats placed to span the stream banks. Mats will be laid parallel to the channel on each stream bank followed by mats laid perpendicular to the channel. If a ramp onto the bridge is needed, wood logs or similar materials will be used. It is anticipated that no off-site fill will be used for the construction of access ramps. Preparation for setting the bridge may include minor blading and excavation confined to the minimum area necessary for safe TCSB installation. The bridge will be anchored to the ground or a nearby tree to prevent the potential transport of the bridge downstream during flood flows. All equipment used to install the TCSB will be properly sized to minimize the amount of sediment that can escape into the water. In addition, it is not anticipated that the equipment used to place the TCSB will be used below the banks of the waterway. Truck trailer beds or engineered beams could potentially be used to construct TCSBs needed to span wider waterways. The *Wis. Admin. Code* § NR 320.06(1)(c)15 requirements to prevent the spread of invasive species and viruses will be implemented as necessary. The removal of trees, shrubs and other shoreline vegetation above the ordinary high water mark will be minimized to the greatest extent possible and accumulated brush, debris or other obstructions that are trapped in or underneath the TCSB will be regularly removed to

prevent upstream flooding and to maintain the integrity of the TCSB. A TCSB cross-section drawing is located in Appendix E.

TCSB construction shall be conducted in a manner which minimizes disturbances to the extent practicable and which meets or exceeds Construction Site Erosion and Sediment Control Technical Standards and ATC's Construction Standards, as applicable. Proper erosion control measures will be maintained during and after the utilization of the temporary crossing.

Wetlands

No permanent fill placement is proposed for wetland access routes. When wetland access is required, disturbance to wetlands will be reduced by implementation of several specialized construction techniques, which may include timing wetland construction during dry or frozen conditions and the use of low ground pressure tires, specialized track vehicles, and/or matting materials to help minimize soil and vegetation disturbances. Large foundation auguring equipment, concrete trucks, heavily loaded trucks, cranes, and specialized line construction equipment must access structure locations. If necessary, pre-fabricated construction mats would be used to spread the concentrated axle loads from this equipment over a much larger surface area thereby reducing the bearing pressure on fragile soils.

2.5.2 Underground Construction Details

No underground transmission line construction is proposed as part of this project. All proposed transmission lines will be above ground.

2.5.3 Stream / River Crossings

2.5.3.1 Crossing Method

Temporary bridge crossings are proposed to cross streams as identified in Section 2.4.12 and Attachments F and G to the Utility Permit Application-Part 1, included as Appendix E. Drawings of a typical crossing method are also provided in Appendix E. Refer to Section 2.5.1.8.3 for a further discussion of TCSB crossing methods.

2.5.3.2 Excavated Materials (area & volume)

Except for minor blading that may be required to properly stabilize the bridge, excavation is not anticipated to be required for the waterway crossings.

2.5.3.3 Access Roads

Temporary bridge crossings will be located within the ROW or other areas with proper permission. Construction access to the bridge locations will be gained in the same manner as access within the ROW, as described in Section 2.4.11.

2.5.3.4 Boring Pits (underground construction only)

This section is not applicable as no underground construction is planned for the Project.

2.5.4 Wetland Crossings

2.5.4.1 Methods

Wetlands occur along the three alternatives. Access through many of these wetlands will be required during transmission line construction. Methods that may minimize the impact associated with access include, but are not limited to: ice roads, low ground pressure equipment, construction mats, temporary access roads, and restricting the length and width of the access path. The locations and access within these wetlands is discussed in Section 2.4.12.

The following summarizes construction techniques that can be utilized for crossing wetlands. The construction technique identifiers (i.e., CT-2, CT-3) are used to indicate the crossing method in the Environmental Inventory Table provided in Appendix E, Utility Permit Application-Part 1, Attachment G.

CT-2: Unstable Soil Conditions

If saturated or unstable soil conditions exist at a construction location, several construction techniques may be implemented to reduce the effects on wetland soil structure and dependent functions, including hydrology and the wetland's capacity for re-vegetation of native species. These techniques include the use of the following: construction during frozen conditions, the use of ice roads, construction mats, low ground pressure or tracked vehicles in areas where the soils are saturated or not frozen, and TCSBs installed in wetlands that contain cross-cut channels.

CT-3: Stable Soil Conditions

If the wetland to be crossed has drier, stable, and cohesive soils or is frozen, construction will proceed in a manner similar to upland construction. If the wetland soils are not saturated at the time of construction and can support both tracked and/or rubber-tired

equipment, ATC will construct in that area using construction mats only when needed to minimize impacts.

CT-4W: Wire Handling/Stringing - Wetlands

Wire handling and stringing will still be necessary in wetlands where heavy equipment crossing is restricted. This method would be used for wetlands identified as having special resources needing additional protection and where access across the wetland would be available from the existing ROW. For CT-4W wetland crossings, use of heavy equipment will be restricted. Smaller vehicles, such as a small tracked vehicle or an all-terrain vehicle may be used to pull the line through the wetland. Construction traffic will be limited, and in addition, construction mats will be used if necessary.

2.5.4.1.1 Crossing structures

See Section 2.5.4.1 above.

2.5.4.1.2 Access roads

See Section 2.5.4.1 above.

2.5.4.2 Methods for preventing spread of invasive species

ATC will follow the *Wis. Admin. Code* ch. NR 40 invasive species rule and implement WDNR Best Management Practices (BMPs) to comply with the applicable rules.

If it is evident that transmission line construction activities could spread invasive plant species to new areas, appropriate BMPs will be implemented. These measures might include the following: avoidance of infested areas, removal or control of small populations of plants, scheduling construction activities during an invasive plant's dormant period, covering invasive plants while construction is occurring in the area, and cleaning of equipment prior to accessing un-infested areas. Woody invasive species remnants that cannot be spread on site per landowner request will be transported to an appropriate landfill facility in compliance with NR 40.

2.5.4.3 Estimated quantity of excavated materials from wetlands

Alternative 1/1A: The following unavoidable wetland impacts for structure placement would occur along Alternative 1A. Excavated materials from wetlands would vary dependent on which substation option is selected for the Barnhart and Branch River Substations.

If the BHA-North and BRV-North substation options are built, there would be twenty-seven (27) structures located within or immediately adjacent to wetlands, as shown in Appendix E, Utility Permit Application-Part 1, Attachment G. The estimated permanent wetland impact associated with the installation of the transmission line structures is approximately 2,176 square feet or 0.050 acres.

If the BHA-North and BRV-South substation options are built, there would be twenty-seven (27) structures located within or immediately adjacent to wetlands, as shown in Utility Permit Application-Part 1, Attachment G. The estimated permanent wetland impact associated with the installation of the transmission line structures is approximately 2,176 square feet or 0.050 acres.

If the BHA-South and BRV-North substation options are built, there would be twenty-nine (29) structures located within or immediately adjacent to wetlands, as shown in Utility Permit Application-Part 1, Attachment G. The estimated permanent wetland impact associated with the installation of the transmission line structures is approximately 2,506 square feet or 0.058 acres.

If the BHA-South and BRV-South substation options are built, there would be twenty-nine (29) structures located within or immediately adjacent to wetlands, as shown in Utility Permit Application-Part 1, Attachment G. The estimated permanent wetland impact associated with the installation of the transmission line structures is approximately 2,506 square feet or 0.058 acres.

Alternative 1/1B: The following unavoidable wetland impacts for structure placement would occur along Alternative 1B. Excavated materials from wetlands would vary dependent on which substation option is selected for the Barnhart and Branch River substations.

If the BHA-North and BRV-North substation options are built, there would be thirty-four (34) structures located within or immediately adjacent to wetlands, as shown in Utility Permit Application-Part 1, Attachment G. The estimated permanent wetland impact associated with the installation of the transmission line structures is approximately 2,522 square feet or 0.058 acres.

If the BHA-North and BRV-South substation options are built, there would be thirty-five (35) structures located within or immediately adjacent to wetlands, as shown in Utility Permit Application-Part 1, Attachment G. The estimated permanent wetland impact associated

with the installation of the transmission line structures is approximately 2,635 square feet or 0.060 acres.

If the BHA-South and BRV-North substation options are built, there would be thirty-six (36) structures located within or immediately adjacent to wetlands, as shown in Utility Permit Application-Part 1, Attachment G. The estimated permanent wetland impact associated with the installation of the transmission line structures is approximately 2,852 square feet or 0.065 acres.

If the BHA-South and BRV-South substation options are built, there would be thirty-seven (37) structures located within or immediately adjacent to wetlands, as shown in Utility Permit Application-Part 1, Attachment G. The estimated permanent wetland impact associated with the installation of the transmission line structures is approximately 2,965 square feet or 0.068 acres.

Alternative 2: The following unavoidable wetland impacts for structure placement would occur along Alternative 2. Excavated materials from wetlands would vary dependent on which substation option is selected for the Barnhart and Branch River substations.

If the BHA-North and BRV-North substation options are built, there would be thirty-six (36) structures located within or immediately adjacent to wetlands, as shown in Utility Permit Application-Part 1, Attachment G. The estimated permanent wetland impact associated with the installation of the transmission line structures is approximately 3,691 square feet or 0.085 acres.

If the BHA-North and BRV-South substation options are built, there would be thirty-eight (38) structures located within or immediately adjacent to wetlands, as shown in Utility Permit Application-Part 1, Attachment G. The estimated permanent wetland impact associated with the installation of the transmission line structures is approximately 3,691 square feet or 0.085 acres.

If the BHA-South and BRV-North substation options are built, there would be thirty-six (36) structures located within or immediately adjacent to wetlands, as shown in Utility Permit Application-Part 1, Attachment G. The estimated permanent wetland impact associated with the installation of the transmission line structures is approximately 4,022 square feet or 0.092 acres.

If the BHA-South and BRV-South substation options are built, there would be thirty-eight (38) structures located within or immediately adjacent to wetlands, as shown in Utility Permit Application-Part 1,

Attachment G. The estimated permanent wetland impact associated with the installation of the transmission line structures is approximately 4,022 square feet or 0.092 acres.

For structures placement in wetlands, the estimated depth of excavation ranges from 25 to 30 feet, depending on the location of the structure. The volume of excavated material will range from about 40 to 185 cubic feet at each structure location, dependent on the size of the foundation and structure. Material not required for backfilling will be spread in an upland area within the ROW or placed in an upland location off site. If there is a large amount of excess soil, other appropriate disposal methods will be evaluated.

2.5.4.4 Methods and discharge locations for site dewatering, and locations for stockpile of fill materials

The presence of groundwater at or near the ground surface can impact construction procedures when auguring holes for new structures. If groundwater flow into excavations results in the excavation becoming unstable, it is often necessary to support the walls of the excavation and/or dewater the excavation site. Dewatering of groundwater will be done in a method that meets the requirements of the WDNR Utility Permit. Refer to Section 2.5.8 for further discussion of dewatering methods.

The only fill required in wetlands for which ATC seeks authorization will be for the structures and backfilling excavations after structure placement and for substation construction, depending on the substation options ordered. In wetlands, spoils and backfill material will be stockpiled temporarily on geotextile fiber on either stable ground or wood matting. Permanent fill will not be required in wetlands to provide access.

Excess soils and backfill materials will be stockpiled in upland locations using appropriate erosion control measures as described in the most recent WDNR BMPs. See Section 2.5.1.4 for additional information.

2.5.5 Re-vegetation

The need for and approach to site restoration and re-vegetation will be based on the degree of disturbance caused by construction activities, the ecological setting of each site, and the need to reflect and satisfy the requirements of the property owner. If construction can be accomplished without creating appreciable soil disturbance, restoration may not require re-vegetation efforts. Restoration activities will be implemented following

the completion of construction activities. These activities will begin as soon as practical and as allowed by seasonal conditions.

2.5.5.1 Re-vegetation & Site Restoration Plan & Schedule

A restoration plan for disturbed sites will be developed based on the level of ground disturbance and the ecological setting. 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. Re-vegetation in disturbed areas may be facilitated by native seed banks. 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 assessment will be made and, if necessary, an appropriate seed will be brought in and properly applied. ATC will monitor the sites that were seeded to ensure growth occurs.

2.5.5.2 Post-Construction Monitoring Plans

2.5.5.2.1 Post project monitoring plans

Site restoration will be completed as described in Section 2.5.5. Restoration will be dependent on post construction site conditions and landowner concerns. A post-construction monitoring plan will be developed once construction is complete and an assessment of environmental impacts has been conducted. The monitoring plan will focus on the following: wetlands, waterway crossings, and areas where special site specific erosion controls were implemented. Areas will be monitored until 70% re-vegetation of original vegetative cover has occurred.

2.5.5.2.2 Operation phase monitoring plan (include invasive species management and post project corrections)

Wetland delineation and habitat characterization have been conducted to identify large populations of adventitious and invasive species along the project alternatives. The adventitious reed canary grass (*Phalaris arundinacea*) is prevalent throughout most of the wetlands along the three transmission line alternatives with scattered populations of invasive common reed (*Phragmites australis*) also present. The invasive common buckthorn (*Rhamnus cathartica*), glossy buckthorn (*Rhamnus frangula*), honeysuckle (*Lonicera* sp.), and multi-flora rose (*Rosa multiflora*) as well as spotted knapweed (*Centaurea stoebe*), wild parsnip, (*Pastinaca sativa*), and Canada thistle (*Cirsium arvense*) were present in the upland areas along all alternatives. Appropriate BMPs, as described

in Section 2.5.4.2, will be implemented if it is determined that construction activities may potentially contribute to the spread of invasive species.

2.5.6 Erosion Control Plan (sites greater than 1 acre)

The proposed transmission lines and substations are subject to WDNR requirements for construction site erosion control. The WDNR permit requirements for construction site erosion control and long-term stormwater management are specified in *Wis. Admin. Code* ch. NR 216. Under NR 216, permits are required for construction sites that disturb greater than 1 acre of land, which the proposed project will exceed.

NR 216 authorizes WDNR to issue a General Wisconsin Discharge Elimination System (WPDES) Permit, after review of a Notice of Intent submittal, except where the Department determines that stormwater runoff is a significant source of pollution, where previously issued general permit conditions have not been complied with, where technology changes have occurred, or where specific effluent limitations apply. None of these exceptions apply to the proposed transmission line; therefore, the Notice of Intent submittal is expected to result in the issuance of a General WPDES Permit for the project.

Performance standards for stormwater discharges authorized under NR 216 are specified in NR 151. Additionally, WDNR has developed guidance criteria for design of erosion control measures to meet these standards, also known as Technical Standards or Conservation Practice Standards.

NR 151 specifies that erosion control plans include:

> *Best Management Practices that, by design, achieve, to the maximum extent practicable, a reduction of 80% of the sediment load carried in runoff, on an average annual basis, as compared with no sediment or erosion controls, until the construction site has undergone final stabilization. No person shall be required to exceed 80% sediment reduction to meet the requirements of this paragraph. Erosion and sediment control BMPs may be used alone or in combination to meet the requirements of this paragraph. Credit toward meeting the sediment reduction shall be given for limiting the duration or area or both of land disturbing construction activity, or other appropriate mechanism.* (*Wis. Admin. Code §* NR 151.11(6)(a))

This standard indicates that all site erosion control plans, regardless of disturbance area or erosion potential of the site, need to design for 80% reduction in sediment load. Discussions with WDNR staff on previous

transmission line projects indicate that the intent of the criterion is to encourage temporary and permanent restoration, as soon as possible, after disturbance and to focus on more robust perimeter controls for larger sites. The intent behind this approach is recognizing that the primary focus in erosion control is preventing total sediment loss from a given area rather than a percentage reduction from a given area. Establishing a performance objective that meets this intent involves setting a maximum acceptable soil loss rate for the entire project.

County and local ordinances for stormwater, erosion control, and shoreland zoning exist within the project area. It is ATC's general practice to meet county and local requirements whenever practicable.

Erosion Control Plan Approach

Once a transmission line route has been selected, ATC will finalize the Erosion Control Plan. For most of the transmission line corridor, the erosion control plan will consist of decision flow charts that are prepared to specify the location and types of BMPs that can be utilized to meet the maximum soil loss standard outlined above. The decision flow charts will be assembled based on construction activity, site conditions (soils, slopes, etc.), time of year, and nature and length of disturbance. To aid in appropriate decisions in the field, the Erosion Control Plan will include base maps with the necessary data such as contours, slopes, soils, natural resource features, and construction information that can be used to select the required BMP or set of BMPs.

2.5.6.1 Erosion Control Methods and Materials

Best Management Practices and erosion control methods will vary depending on the construction activity, time of year, and site soil and slope conditions at the time of construction.

2.5.6.1.1 Soil and slope stabilization

Vegetative cover will be maintained during construction to the maximum extent practicable.

2.5.6.1.2 Seeding and mulching

ATC will seed, mulch, and/or apply polymer as necessary to stabilize areas disturbed by construction activities.

2.5.6.1.3 Matting, tracking pads, silt fences stockpile locations

Low ground pressure equipment, ice roads, construction matting, or other applicable methods will be used, as necessary, to support heavy construction equipment in unstable areas.

Tracking pads will be installed at strategic access points to reduce offsite migration of sediment. Silt fence, silt socks, or similar perimeter controls will be installed, as necessary, to prevent migration of sediment to sensitive resource areas or offsite.

2.5.6.1.4 Dewatering-related erosion control

Perimeter sediment control practices such as vegetated buffers, silt fence, or silt socks will be implemented as necessary to ensure that silt generated from dewatering activities is contained and prevented from migrating into sensitive resource areas or offsite.

2.5.6.1.5 Channel protection

Channel or gully erosion will be prevented using stone check dams or temporary ditch checks, as necessary.

2.5.6.1.6 Any other appropriate erosion control measures

ATC will treat water recovered during dewatering operations via on-site filtration, on-site infiltration, or off-site disposal.

2.5.6.1.7 Erosion control methods details and drawings

Erosion control detail drawings will be included with the Erosion Control Plan.

Other BMPs will be utilized as conditions warrant. BMPs will be implemented in accordance with ATC's typical construction practices and WDNR Technical Standards for Construction Site Erosion and Sediment Control. When applicable, only materials identified on the Wisconsin Department of Transportation's Product Acceptability List will be used for implementation of the Erosion Control Plan.

2.5.6.2 Erosion Control Measure Site Plan

Site maps showing items identified as Sub-Sections 2.5.6.2.1 through 2.5.6.2.10 of the transmission line route along with construction information, natural resource features, site physical features and erosion control information, will be prepared and included in the Erosion Control Plan once a route is ordered.

2.5.6.2.1 Construction site boundary

2.5.6.2.2 Location of erosion control measures

2.5.6.2.3 Location of stockpiled soil

2.5.6.2.4 Vehicle and equipment access sites

2.5.6.2.5 Areas of disturbance

2.5.6.2.6 Drainage area configuration

2.5.6.2.7 Surface water diversion measures

2.5.6.2.8 Topography

2.5.6.2.9 Existing floodplains and wetlands

2.5.6.2.10 Location of trees and unique vegetation

2.5.6.3 Sequence of Erosion Control Measures

Anticipated sequencing for the transmission line construction along with minimum construction-time erosion control practice description includes:

- Surveying and Staking of ROW – These activities are not considered to be land disturbing activities; thus, erosion control measures are not required.
- Development of ROW Access – Silt fence, vehicle tracking pads, and other applicable erosion control measures will be installed as ROW access is gained. Disturbance of the access path may be intermittent. In some cases, the anticipated time interval in between disturbance-causing activities may be more than one month, and it is not feasible to complete permanent restoration. In these areas, an assessment will be made and, if necessary, temporary erosion control measures (erosion control mats, seeding or mulching) will be placed on the access path. Installation of temporary erosion control measures will be weather dependent.
- Temporary Staging and Materials Storage Areas – Staging and storage areas which are constructed and result in ground disturbance will have perimeter sediment controls placed on the down slope side of the site. If access to the storage area is off a permanent road, a vehicle-tracking pad will be placed at the intersection, if field conditions require.
- Cleanup and Restoration of ROW – Cleanup and permanent restoration will occur as described below.

Tree clearing will be necessary within the proposed ROW. Tree debris will be either hauled off site or ground into wood chips and spread within the ROW, in accordance with landowner requests. Wood chips will not be stockpiled within wetlands, though woody debris may fall and be left in wetland areas. Disposal of logs, branches and other vegetation shall be done in a manner that does not disrupt drainage patterns or stream flows and is otherwise acceptable to ATC and the property owner and is consistent with ATC Vegetation Management specifications. Woody invasive species will be managed as described in Section 2.5.5.2.2.

Restoration of the ROW following tree clearing, construction, and construction access will be accomplished through monitoring, seeding, mulching, matting and repair of any significant rutting that may impact groundwater flow, vegetation establishment, or other restoration, activities. Disturbed areas will not be considered restored until 70% of original vegetative cover is achieved following restoration efforts.

2.5.6.4 Off-site Diversion Methods

It is not anticipated that off-site diversion methods will be used as a construction-time erosion control practice for the proposed transmission line or substation construction. Should the need arise, any construction site diversions will utilize BMPs based on WDNR technical standards for construction site erosion and sediment control.

2.5.6.5 Provisions for Inspection and Maintenance

To comply with applicable regulations during active construction, qualified ATC staff or representatives will inspect erosion and sediment control practices once per week and within 24 hours following a rainfall of 0.5 inches or more in accordance with *Wis. Admin. Code* ch. NR 216 and the WPDES general permit conditions. Written documentation of the inspection will be maintained by the ATC Environmental Monitor and/or Construction Coordinator and will describe any corrective measures taken, if applicable. All corrective action will be taken within 24 hours of inspection unless soil conditions are such that taking the corrective action will cause excessive erosion, soil disturbance, or environmental impact. The decision on the timing of the corrective action will be made by qualified ATC staff or its representatives with documentation provided to the appropriate agencies.

2.5.6.5.1 Inspection

2.5.6.5.1.1 Who will perform inspections

Qualified ATC staff, environmental monitors, and construction contractor staff will perform regular inspections.

2.5.6.5.1.2 When will inspections occur

To comply with State regulations, during active construction, qualified ATC staff or representatives will inspect erosion and sediment control practices a minimum of once per week.

2.5.6.5.1.3 Special circumstances initiating an inspection

ATC staff or representatives will also inspect erosion and sediment control practices within 24 hours following a rainfall of 0.5 inches or more in accordance with *Wis. Admin. Code* ch. NR 216 and the WPDES General Permit Conditions.

2.5.6.5.2 Regular maintenance of all erosion control efforts

2.5.6.5.2.1 Who is responsible for maintenance

The construction contractor and/or sub-contractors will be responsible for maintenance of all BMPs installed.

2.5.6.5.2.2 Corrective action plan

Written documentation of the inspection will be maintained by the ATC's Environmental Monitor and/or Construction Coordinator and will describe any corrective measures taken, if applicable. All corrective action will be taken within 24 hours of inspection unless soil conditions are such that taking the corrective action will cause excessive erosion, soil disturbance, or environmental impact. The decision for the timing of the corrective action will be made by the qualified ATC staff or its representatives with documentation provided to the appropriate agencies.

2.5.7 Materials Management Plan

A materials management plan under *Wis. Stat*. ch. 30 and *Wis. Admin. Code* ch. NR 216 will be required for this project. However, a detailed materials management plan cannot be prepared until a route is chosen and final design of the project is complete. The following is a general summary of ATC's Best Management Practices. The following discussion addresses the applicable portions of Sections 2.5.7.1 through 2.5.7.4.

2.5.7.1 Access Point Locations

The Access Plan Map for the proposed line route is located in Appendix A, Figure 13. Separate plans have been developed for the areas surrounding the proposed Barnhart and Branch River substation options due to the complexity of the line routing in these areas. These plans are provided in Appendix A, Figures 23 through 26.

Access to the transmission line ROW will be from public roads and will follow the existing utility ROW.

ATC and its contractor will strive to arrange for alternate access with landowners, such as commercial areas, driveways, and parking lots to avoid impacts to sensitive areas. See Section 2.4.11 for additional information.

2.5.7.2 Haul Routes

Materials hauled to and from the construction locations will utilize public roads or the ROW, and/or arranged access locations where roadways are not present. Access will be managed as described in Section 2.4.11.

2.5.7.3 Stockpile Areas

Temporary stockpiles of excavated soils and woody debris resulting from ROW clearing and construction will be required throughout the course of construction. While specific locations have not been verified, it is anticipated that minor soil piles may be required adjacent to excavations for the new transmission line structures, within the substation properties, and within the laydown yard. Any stockpiles will be placed in upland locations, and prevented from entering any wetlands or waterways by the use of proper erosion control methods including, but not limited to, silt fence or wattles.

2.5.7.4 Equipment Staging Areas

Construction materials, transmission line structures, cables, equipment and vehicles, and related materials will be stored on the ROW and at a temporary staging areas or laydown yards. Construction laydown yards are anticipated to be required throughout construction for the storage and staging of construction equipment and materials. Based on the construction requirements of the project, proximity to work areas, landowner impacts and the criteria discussed above, ATC has identified six potential sites located throughout the project area that can be utilized as laydown yards for the project. A map of the laydown

yards separate from the existing and proposed substation sites is provided in Appendix A, Figure 14.

A review of wetlands, waterways, natural features, grading and clearing requirements, threatened and endangered resources, and cultural or archaeological resources at the proposed laydown yards was conducted. No additional cultural resources or threatened and endangered resources will be impacted by utilizing the sites. The proposed laydown yards, separate from the substation sites, range from approximately 1 to 15 acres and are comprised of gravel pits, inactive areas of industrial sites, or parking lots. The sites are flat with minimal vegetation and have areas of existing hard surfaces. The sites were selected to minimize the amount of disturbance and preparation required to provide suitable surfaces for temporary storage and staging of construction materials and equipment, as well as access to those materials. Site grading will either not be necessary or will be minimal. Appropriate erosion control measures will be implemented to prevent off-site impacts as necessary.

If it becomes necessary for ATC or its contractor to secure additional areas near the project to temporarily store construction materials, ATC will follow a similar selection process. In accordance with *Wis. Admin. Code* § PSC 112.073, ATC will notify the PSCW of those locations and demonstrate that the use of those laydown areas will not affect any threatened or endangered species, historic resources, wetlands, waterways or other sensitive resources.

ATC will require all contractors to have in place a spill control and prevention plan that addresses both the contractor's equipment and construction activities.

2.5.7.5 Field Screening Protocol for Contaminant Testing

If contaminated materials are encountered, ATC will develop a specific contaminated materials management plan, which will list and describe what contaminants are present and what measures will be taken including:

- Methods of isolating the contaminated materials;
- Methods of analyzing the contaminated materials;
- Where the materials will be tested;
- Methods of removing the contaminated materials from the site; and

- Treatment and disposal of the contaminated material.

2.5.7.6 Contaminated Materials

If contaminated soil is encountered during excavation activities, appropriate measures will be taken to properly dispose of the contaminated materials. Based on a review of the WDNR's Remediation and Redevelopment Sites Map, there are no remediation sites documented on or adjacent to any of the four potential substation sites. There are eight sites listed along existing double-circuit 345/138 kV transmission lines (Lines 111/HOLG21 and 111/971K51) that pertain to closed sites for lead-based paint abatement activities completed by ATC during past maintenance work on those lines. There are no open sites located within the transmission line route alternatives, although there are several sites listed as closed along each of the alternatives.

The existing steel lattice structures that will be removed as part of this project have been tested and shown to be coated with paint containing lead. ATC has previously found that soils below similar structures may be impacted by lead. ATC, in consultation with the WDNR's Remediation and Redevelopment program staff, has developed a lead remediation process including sampling protocols and materials handling procedures to ensure that lead contamination is identified and addressed in conformance with WDNR regulations. ATC intends to implement this process for existing steel lattice structures that will be removed as part of this project.

2.5.7.7 Excavation Methods

Materials will be excavated at structure sites located in upland and wetland locations. No excavation will be completed in stream channels. The equipment utilized may include a combination of track-mount auger diggers, hydro-excavating trucks, backhoes, trenchers, concrete trucks, and tire-mount cranes. Structure/foundation installation will involve using auger equipment to excavate a circular hole of appropriate diameter and depth into on-site soils. Upland excavation material will be temporarily stockpiled adjacent to the excavation until the structure or equipment is installed. Upon completing the installations, the excavated materials will either be reused on site for backfill or thin spreading if clean, or hauled to landfill if contaminated. Wetland excavated material will be temporarily contained until it can be backfilled in the transmission structure location, evenly spread in an upland location, or hauled off-site for disposal.

If necessary, the site will be stabilized by seeding and mulching. Erosion control measures will be applied as described in Section 2.5.6.1.

2.5.7.8 Method of Dewatering Excavated Materials

Excavated materials that contain free water will be stockpiled and contained on-site using silt fence or other materials capable of controlling runoff from the work area. Upon dewatering the soils, the materials will be disposed of as described in Section 2.5.7.7.

2.5.7.9 Estimated Volume of In-channel and Upland Excavated Materials

Alternative 1/1A proposes excavations for 278 to 280 reinforced concrete foundations, depending on which substation sites are ordered. The borings for the concrete foundations are estimated to result in approximately 14,500 cubic yards of excavated material. Alternative 1/1B proposes excavations for between 314 and 317 reinforced concrete foundations, which are estimated to generate approximately 15,200 cubic yards of excavated material. Alternative 2 proposes excavations for 362 to 364 reinforced concrete foundations, which are estimated to generate approximately 25,100 cubic yards of excavated material. The proposed work at the BHA-North Substation site would result in approximately 102,000 cubic yards of excavated material. The proposed work at the BHA-South Substation site is anticipated to generate approximately 130,000 cubic yards of material. The proposed work at the BRV-North Substation site is anticipated to generate approximately 58,000 cubic yards of material. The proposed work at the BRV-South Substation site is anticipated to generate approximately 147,000 cubic yards of excavated material. The excavation quantities may vary from the estimated quantities based on the final foundation and substation designs (including permanent stormwater management facilities) and the contractor excavation methods.

2.5.7.9.1 Volume of Dredged Materials (cubic yards)

2.5.7.9.1.1 Excavation from bed and bank of waterway

No excavation is anticipated to be required within any channels for any of the project alternatives.

2.5.7.9.1.2 Excavation from wetland

Alternative 1/1A proposes excavations for 27 to 29 reinforced concrete foundations in wetland areas, which are estimated to

generate approximately 2,000 to 2,400 cubic yards of material. Alternative 1/1B proposes excavations for 34 to 37 reinforced concrete foundations in wetland areas, which are estimated to generate approximately 2,400 to 2,900 cubic yards of material. Alternative 2 proposes excavations for 36 to 38 reinforced concrete foundations in wetland areas, and is estimated to generate approximately 3,600 to 3,900 cubic yards of material. Excavation at the BHA-North Substation site would result in the excavation of no wetlands soil. Excavation at the BHA-South Substation site would result in the excavation of approximately 7,000 cubic yards of wetlands soil. Excavation at the BRV-North Substation site would result in the excavation of approximately 3,000 cubic yards of wetlands soil. Excavation at the BRV-South Substation site would result in the excavation of approximately 12,000 cubic yards of wetlands soil.

2.5.7.9.2 Volume of Upland materials (cubic yards)

Alternative 1/1A proposes excavations for 259 reinforced concrete foundations in upland areas, which are estimated to generate approximately 12,600 cubic yards of material. Alternative 1/1B proposes excavations for 266 reinforced concrete foundations in upland areas, which are estimated to generate approximately 12,900 cubic yards of material. Alternative 2 proposes excavations for 333 reinforced concrete foundations in upland areas, and is estimated to generate approximately 21,900 cubic yards of material. The proposed work at the BHA-North Substation site is anticipated to result in the excavation of approximately 102,000 cubic yards of material from uplands. The proposed work at the BHA-South Substation site is anticipated to result in the excavation of approximately 123,000 cubic yards of material from uplands. The proposed work at the BRV-North Substation site is anticipated to result in the excavation of approximately 55,000 cubic yards of material from uplands. The proposed work at the BRV-South Substation site is anticipated to result in the excavation of approximately 135,000 cubic yards of material from uplands.

2.5.7.10 Estimated Volume and Location of Re-used In-channel and Upland Materials

Specific quantities of excavated material to be re-used cannot be provided at this time. Upland excavation material will be temporarily stockpiled adjacent to the excavation until the structure or equipment is installed. Upon completing the installations, and depending on the

results of soil tests, the excavated materials will either be reused on site for grading activities if clean, or hauled to landfill if contaminated. Wetland excavated material will be temporarily contained until it can be backfilled in the transmission structure location, evenly spread in an upland location, or hauled off-site for disposal. Disturbed soils will be re-seeded and/or mulched at the earliest suitable opportunity, and any temporary piles of excavated material will be surrounded with silt fence or other erosion control devices, if necessary.

The volume of material to be reused cannot be provided at this time. Excavated material from the four potential substation sites would either be used as fill material to level the site from which the material came or the other substation site to be constructed from the project or would be disposed of offsite.

2.5.7.10.1 Re-Use of Dredged Materials

No material will be dredged as a part of construction activities for this project.

2.5.7.10.2 Re-use of Upland Materials

2.5.7.10.2.1 Total Volume of Reused Upland Materials (cubic yards)

The total volume of re-used upland materials cannot be determined at this time. Reused materials will be used in compliance with permits obtained by ATC for this project.

2.5.7.10.2.2 Location

The location of reused material cannot be determined at this time.

2.5.7.10.2.3 Purpose of Upland Materials Usage

Exact use of excavation materials cannot be determine at this time, but material will be needed to fill several of the substation sites to level them for construction of the substations.

2.5.7.11 Off-site Disposal Plans for Contaminated & Non-contaminated Materials

As necessary, ATC will arrange for off-site disposal of contaminated or uncontaminated materials at an approved location. Upon determination of the presence of contaminated materials, a plan for the transportation and disposal of contaminated materials will be developed. No soils will be disposed of within wetland areas.

2.5.8 Dewatering Plan

At this time, the location and amount of dewatering activities are unknown. Geotechnical information gathered upon final route selection will allow ATC to make assumptions regarding the necessity to dewater at construction locations. If dewatering is necessary, it will be completed as described below and will comply with *Wis. Admin. Code* ch. NR 216. The following is a general summary of ATC's dewatering practices.

The presence of groundwater at or near the ground surface can impact the construction procedures used when boring holes for transmission structures. If groundwater flow into an excavation results in the excavation becoming unstable, it is often necessary to support the walls of the excavation and/or dewater the site. Depending on site conditions and permit requirements, the extracted groundwater is generally discharged to an upland area where it is allowed to re-infiltrate, or to the local storm or sanitary sewer system with approval. Extracted groundwater may also be discharged to a nearby water body if there is no indication of contamination and sediments, and it is free of fines. Water which may contain solids from the construction process is most often pumped out of the excavation and trucked either to a treatment facility or to an upland site where it can be allowed to settle and re-infiltrate. Another alternative would be the use of a settling or frac tank on site. The extracted groundwater would be pumped to the frac tank to allow settling of suspended solids. Then the water would be discharged to an upland area. The solids remaining in the frac tank are typically vacuumed out, and disposed of at an appropriate facility.

2.5.8.1 Dewatering / Diversion of Flow

At this time, it is not known if or where dewatering activities may be necessary. If dewatering is necessary, it will be conducted in accordance with *Wis. Stat*. § 283.33, *Wis. Admin. Code* ch. NR 216 and local storm and sewer discharge permit requirements.

No flow diversion activities are anticipated for this Project.

2.5.8.2 Downstream Impact Minimization (during high flow conditions)

This section is not applicable to this Joint Application as no downstream impacts are anticipated during high flow conditions.

2.5.8.3 Analysis of Possible System Overload Scenarios

There are no planned structures in proximity to streams and dewatering into a stream will not occur. Therefore, stream overload scenarios do not apply.

2.5.8.4 Impacts of System Overload on Construction Activities and Water Quality

It is not anticipated that run-off from an overloaded system will impact construction activities and therefore, impacts to water quality do not apply.

2.5.8.5 Water Discharge Locations (provide the following)

Exact dewatering locations are not known at this time. If dewatering is necessary, ATC will comply with the terms and conditions of the WPDES Storm Water Discharge Permit (*Wis. Admin. Code* ch. NR 283) as shown in Appendix E.

2.5.8.6 Back-up System

This section is not applicable to this project as there is no anticipated need for stormwater management back-up systems due to the limited amount of dewatering anticipated for this Project.

2.5.8.7 High Flow Plan

This section is not applicable to this project as there is no anticipated need for a high flow plan due to the limited amount of dewatering anticipated for this Project.

2.5.8.8 Contaminated Water

No contaminated water is anticipated to be present at excavation locations. If necessary, ATC or its contractor will develop a specific contaminated water management plan that will list and describe what contaminants are present and what measures will be taken including:

- Methods of isolating the contaminated water;
- Methods of analyzing the contaminated water;
- Where the water will be tested;
- Methods of removing the contaminated water from the site; and
- Treatment and disposal of the contaminated water.

2.6 SUBSTATION INFORMATION

2.6.1 Substation Location, Dimensions & Layout

Two new substations are proposed to be constructed. The Branch River Substation will be located on one of two parcels in the town of Franklin, Manitowoc County. The layout of the substation is dependent on the parcel and transmission line alternative chosen. Substation plan views for each parcel and alternative are provided in Appendix B, Figures 12 through 15.

The Barnhart Substation will be located at one of two locations in the town of Lima, Sheboygan County. The layout of the substation is dependent on the location and transmission line alternative chosen. Substation plan views for each location and alternative are provided in Appendix B, Figures 16 through 19.

Other substations requiring modification include Forest Junction, Howards Grove, Erdman and Point Beach substations. General arrangement drawings are provided showing the existing and new facilities in Appendix B, Figures 20 through 23, respectively.

The locations of the proposed Barnhart and Branch River substations, and the Forest Junction, Howards Grove, and Erdman substations are identified on the orthophotography provided in Appendix A, Figure 5.

Existing exterior facilities at Cedarsauk, Edgewater, Granville, Holland, Mullet River, Sheboygan Energy Center, South Fond du Lac and South Sheboygan Falls substations will not be modified. Therefore General arrangement drawings are not provided. The locations of these facilities and the Point Beach Substation are identified on the Orthophotography in Appendix A, Figure 1.

2.6.2 Size (acres) and Orientation

The proposed Barnhart and Branch River substations will each be sited on one of two parcels/locations designated “North” and “South.” The parcel locations are identified on the Appendix A, Figure 8, Tax Parcel maps.

<u>Branch River Substation</u>

ATC plans to purchase at least 30 acres of land on which to construct the proposed Branch River Substation. There are two separate proposed parcels of property designated as Branch River North and Branch River South substation options. The actual acreage purchased will depend on negotiations with the landowner. The orientation of the Branch River

Substation within the parcels is shown in Appendix A, Figures 16 and 17, for the North and South options, respectively. Barnhart Substation

ATC plans to purchase at least 35 acres of land on which to construct the proposed Barnhart Substation. There are two separate proposed parcels of property designated as Barnhart North and Barnhart South Substation Options. The actual acreage purchased will depend on negotiations with the landowner. The orientation for the Barnhart Substation within the parcels is shown Appendix A, Figures 19 and 20, for the North and South Options, respectively.

2.6.3 Landscaping

No special landscaping is anticipated at either the proposed Barnhart Substation or the Branch River Substation. No grading or landscaping is planned at the other substations.

2.6.4 Substation Plat and Topographic Maps

The Tax Parcel and Topographic Maps are provided for the proposed Branch River and Barnhart substations alternatives as follows:

Tax Parcel

Barnhart North	Appendix B, Figure 15
Barnhart South	Appendix B, Figure 16
Branch River North	Appendix B, Figure 19
Branch River South	Appendix B, Figure 20

Topographic

Barnhart North	Appendix B, Figure 17
Barnhart South	Appendix B, Figure 18
Branch River North	Appendix B, Figure 21
Branch River South	Appendix B, Figure 22

2.6.5 Transmission Lines and Structures

The project is proposed as either converting the 138 kV circuit of a double-circuited 138 kV and 345 kV transmission line to a new 345 kV circuit (Project Alternative 1) or constructing a primarily single-circuit new 345 kV transmission line (Project Alternative 2). See Section 2.1.1 for a discussion of the transmission line routing into the Barnhart and Branch River substations. See Section 2.1.2 for a description of the expected structure types to be used for various segments of the transmission line route, depending on the route chosen by the Commission.

Substation transmission dead-end structures are assumed to be typical. The 345 kV dead-end structures will be approximately 100 feet tall. The 138 kV dead-end structures will be approximately 70 feet tall.

345 kV Transmission Lines at Barnhart Substation

In both Project Alternative 1 and Alternative 2 the following existing 345 kV transmission lines will be split and terminated into the proposed Barnhart Substation:

- 345 kV Edgewater to South Fond du Lac circuit W-1;
- 345 kV Edgewater to Cedarsauk circuit 796L41; and
- 345 kV Sheboygan Energy Center to Granville circuit L-SEC31.

138 kV Transmission Lines at Barnhart Substation

In Alternative 1 only, the following existing 138 kV transmission lines will be split and terminated into the proposed Barnhart Substation:

- 138 kV Mullet River to South Sheboygan Falls circuit X-57; and
- 138 kV Howards Grove to Holland circuit HOLG21. Portions of HOLG21 will be rebuilt as a new transmission line to allow for the existing portions to be upgraded to 345 kV operation.

Additionally, one new 138 kV transmission line (circuit HOLG21N) will be routed into the substation in Alternative 1A or 1B.

345 kV Transmission Lines at Branch River Substation

In both Project Alternative 1 and Alternative 2 the following existing 345 kV transmission lines will be split and terminated into the proposed Branch River Substation:

- 345 kV Point Beach to Forest Junction circuit 121;
- 345 kV Point Beach to Sheboygan Energy Center circuit 111; and
- 345 kV Sheboygan Energy Center to Granville circuit L-SEC31.

In Alternative 1 an existing 138 kV circuit will be converted to a 345 kV circuit and connected to the Forest Junction, proposed Barnhart and proposed Branch River substations. In Alternative 2 a new 345 kV transmission line will be constructed and connected to the Barnhart and Branch River substations.

345 kV Transmission Lines at Forest Junction Substation

In Alternative 1, 138 kV circuit 971K51 will be converted to a 345 kV circuit and connected to the existing circuit 121 position on the 345 kV

ring bus position at the Forest Junction Substation. Circuit W-1 will be routed to a new line position on the bus. The new 345 kV line will be double-circuited with the existing circuit 121 and will connect to the proposed Branch River Substation.

138 kV Transmission Lines at Erdman Substation

In Alternatives 1A and 1B a new 138 kV transmission line between the Howards Grove and Erdman substations will be constructed. The line will be terminated at the Erdman Substation at the existing western dead-end. The two existing 138 kV transmission lines at the substation will be repositioned on the bus to allow for the addition of the new line. The transmission line, Erdman to 20th Street Substation, will be moved to the eastern dead-end. The transmission line from the Erdman Substation to the Lodestar Substation will be moved to a new southern line position.

138 kV Transmission Lines at Howards Grove

In Alternatives 1A and 1B the existing 138 kV transmission line 971K51 (Howards Grove-Forest Junction) will be de-energized. The existing Howards Grove 138 kV substation bus will be extended and a new line position will be built. A new transmission line to Erdman will be connected to the line position.

2.6.6 Access Roads

Existing access roads will be used for all substations except the proposed Barnhart and Branch River substations. The proposed 25 foot-wide access roads to the Barnhart and Branch River Substations are shown in Appendix B, Figures 15 through 22.

For the Barnhart South Substation Option, the access road will connect to State Highway 28 and extend south to the substation. For the Barnhart North Substation Option, the road will connect to State Highway 28 and extend north to the substation.

For the Branch River South Substation Option, the access road will connect to Polifka Road and extend north to the substation. For the Branch River North Substation Option, the road will connect to Menchalville Road and extend east to the substation.

2.6.7 Construction Procedures including erosion control techniques (see section 2.5.6)

Excavation work to accommodate equipment foundations, conduit and grounding will occur within the current fenced areas at the Erdman, Forest Junction, Howards Grove, and Point Beach substations. Upon

completion of sub-grade construction, the site will be re-covered with a crushed gravel surface. Minor excavation work to install conduit will occur at the Edgewater, Mullet River, Sheboygan Energy Center, South Fond du Lac and South Sheboygan Falls substations. Excavation work is not planned or anticipated at the Cedarsauk, Granville, and Holland substations.

Construction of the proposed Barnhart Substation and Branch River Substation will involve grubbing existing vegetation, removal of top soil, performing necessary grading to establish rough grades, and construction of required storm water management facilities. The drilled pier foundations will be installed by use of appropriate size drill rigs. Any soil will be distributed on the site or at another approved upland location. After foundations have been installed a crushed rock surface will be placed over the site. Construction procedures will be in accordance with all applicable permit requirements. Appropriate erosion control and storm water management measures as described in Section 2.5.6 will be implemented.

2.6.8 Environmental Information including:

2.6.8.1 Land Use and Zoning

2.6.8.1.1 Identify current land use at and surrounding the substation site

Branch River Substation North Option

The site is 33.78 acres in size and is bordered on the west by Menchalville Road. The double-circuited 345/138 kV transmission circuits 121 and 971K51 are located along the south site boundary. The site is currently used for agricultural purposes, supporting an alfalfa crop at the time of the site visit. There are two residences located adjacent to the site, one to the northeast and one to the northwest. The remainder of the surrounding areas is used for agricultural purposes. There is a small wetland located along the south site boundary.

Branch River Substation South Option

The site is 40 acres in size and is bordered on the west by Menchalville Road and on the south by Polifka Road. The double-circuited 345/138 kV transmission circuits 121 and 971K51 are located along the south site boundary. The 138 kV transmission circuit 971K51 is located along the east site boundary. The site is currently used for agricultural purposes, supporting a corn crop at

the time of the site visit. There are two residences located across Menchalville Road from the site. There is a farm located approximately 825 feet east of the site. The remainder of the surrounding area is used for agricultural purposes. The property slopes fairly severely to the south. A wetland delineation completed in 2010 determined that 7.02 acres of wetland are located in the northern and southern and southeastern portions of the site, of which 3.04 acres are considered to be farmed wetlands, which are located in the southern portion of the site.

Barnhart Substation North Option

The site is approximately 35 acres in size and is located approximately 850 feet north of STH 28. The double-circuited 345/138 kV transmission circuits L-SEC31 and HOLG21 are located along the west site boundary. The Mullet River is located approximately 330 feet north of the site. The site is currently used for agricultural purposes, supporting a corn crop at the time of the site visit. There is a farm located approximately 800 feet south of the site. An unnamed tributary to the Mullet River is located in the western portion of the site and flows in a south to north direction towards the Mullet River.

Barnhart Substation South Option

The site is 110 acres in size and is located south of STH 28. The double-circuited 345/138 kV transmission circuits L- SEC31 and HOLG21 are located along the east site boundary and L-SEC31 continues along the south side of the site boundary. The property is currently used for agricultural purposes, supporting a soybean and corn crop at the time of the site visit. There is a burned out, abandoned farm located on the northeast portion of the site. A private cemetery is located to the northwest of the site and a residence is located across STH 28 from the site. There is a forested area to the south of the site. The remaining surrounding area is used for agricultural purposes. There is an unnamed tributary to the Mullet River that meanders through the site flowing from west to east with 6.00 acres of wetlands present on the site. Of the total wetlands area, 1.03 acres are considered to be farmed wetlands that are scattered throughout the site.

All other substation construction would take place inside the boundary fences of existing substations.

2.6.8.1.2 Identify the existing zoning for the proposed expansion or new substation (include zoning within at least ½ mile radius of the project site

Zoning at and surrounding the proposed Barnhart and Branch River site alternatives is shown in Appendix A, Figure 7.

2.6.8.2 Agricultural Impacts

Branch River Substation North

Constructing the new Branch River Substation on the north option would result in the loss of approximately 24 acres of agricultural land for the footprint of the substation plus an additional 0.3 acres would be impacted for a permanent access road.

Branch River Substation South

Constructing the new Branch River Substation on the south option would result in the loss of approximately 26 acres of agricultural land for the footprint of the substation plus an additional 0.5 acres would be impacted for a permanent access road.

Barnhart Substation North

Constructing the new Barnhart Substation on the north option would result in the loss of approximately 33 acres of agricultural land for the footprint of the substation plus an additional 0.5 acres would be impacted for a permanent access road.

Barnhart Substation South

Constructing the new Barnhart Substation on the south option would result in the loss of approximately 20 acres of agricultural land for the footprint of the substation plus an additional 0.8 acres would be impacted for a permanent access road.

2.6.8.3 Forestry Impacts

There would be no impacts to forest lands as the result of construction at any of the four new substation options.

2.6.8.4 Endangered/Threatened/Special Concern Species

Review of the sites for the potential Branch River and Barnhart substations for endangered, threatened and special concern plants and animals, or valuable natural communities indicates that none of these features will be impacted by substation construction. For additional information describing the review techniques and results, see Section 2.4.8.

2.6.8.5 Archaeological and Historical Resources

There would be no impacts anticipated to archaeological or historical resources as the result of construction at any of the four new substation options. See the Archaeological survey report in Appendix I, Exhibit 3.

2.6.8.6 Affected Waterways (identify which waterways are WDNR classified as Outstanding and Exceptional Resource Waters)

Branch River Substation North

There is an unnamed tributary to the Branch River located approximately 530 feet southeast of the north option. Constructing the new Branch River Substation on this property would not result in impacts to the waterway, as long as stormwater and erosion control BMPs are used during and after construction activities. The waterway is not classified as an Outstanding or Exceptional Resource Water.

Branch River Substation South

There is an unnamed tributary to Branch River located adjacent to the east boundary of the south option. Constructing the new Branch River Substation on this property would not result in impacts to the waterway, as long as stormwater and erosion control BMPs are used during and after construction activities. The waterway is not classified as an Outstanding or Exceptional Resource Water.

Barnhart Substation North

There is an unnamed tributary to the Mullet River located adjacent to the west side of the north option property. Constructing the new Barnhart Substation on this property would not result in impacts to the waterway, as long as stormwater and erosion control BMPs are used during and after construction activities. The waterway is not classified as an Outstanding or Exceptional Resource Water.

Barnhart Substation South

There is an unnamed tributary to Mullet River that crosses the central portion of the south option. Constructing the new Branch River Substation on this property would not result in impacts to the waterway, as long as stormwater and erosion control BMPs are used during and after construction activities, although a new crossing of the waterway would be required for a permanent access road. The

waterway is not classified as an Outstanding or Exceptional Resource Water.

2.6.8.7 Wetlands Affected by Substation Construction (if applicable then provide)

Branch River Substation North

There would be approximately 0.45 acres of wetland filled as a result of constructing the new Branch River Substation on the north option.

Branch River Substation South

There would be approximately 1.5 acres of wetland filled as a result of constructing the new Branch River Substation on the south option.

Barnhart Substation North

There would be no wetlands filled as a result of constructing the new Barnhart Substation on the north option.

Barnhart Substation South

There would be approximately 0.92 acres of farmed wetland filled as a result of constructing the new Barnhart Substation on the south option.

2.6.8.7.1 Facility Wetland Delineation Boundary Map

The delineated wetland boundaries are identified on the Environmental Access Plans in Appendix A, Figure 13, and Figures 23 through 26.

2.6.8.7.2 Wetland Type (by WWI classifications and plant community type)

Branch River Substation North

The wetlands that would be impacted by the Branch River Substation North Option are classified as E2K (emergent/wet meadow, narrow-leaved persistent vegetation, with wet, Palustrine soils).

Branch River Substation South

The wetlands that would be impacted by the Branch River Substation South Option are classified as E2Kf (farmed emergent/wet meadow, narrow-leaved persistent vegetation, with wet, Palustrine soils).

Barnhart Substation North

There would be no wetlands impacted by the Barnhart Substation North Option.

Barnhart Substation South

The wetlands that would be impacted by the Barnhart Substation South Option are classified as E2K (emergent/wet meadow, narrow-leaved persistent vegetation, with wet, Palustrine soils) and E2Kf (farmed emergent/wet meadow, narrow-leaved persistent vegetation, with wet, Palustrine soils).

2.6.8.7.3 Invasive Species Presence

Branch River Substation North

The wetlands that would be impacted by the Branch River Substation North Option are dominated by adventitious reed canary grass (*Phalaris arundinacea*), which is not listed as an invasive species in *Wis. Admin. Code* ch.NR 40.

Branch River Substation South

The wetlands that would be impacted by the Branch River Substation South Option are dominated by adventitious reed canary grass (*Phalaris arundinacea*), which is not listed as an invasive species in *Wis. Admin. Code* ch. NR 40.

Barnhart Substation North

The wetlands that would be impacted by the Barnhart Substation North Option are dominated by adventitious reed canary grass (*Phalaris arundinacea*), which is not listed as an invasive species in *Wis. Admin. Code* ch. NR 40.

Barnhart Substation South

The wetlands that would be impacted by the Barnhart Substation South Option are dominated by advantitious reed canary grass (*Phalaris arundinacea*), which is not listed as an invasive species in *Admin. Code* ch.NR 40.

2.6.8.7.4 Identify Wetlands Located in Special Natural Resource Interest Area (per Wisc. Adm. Code § NR 19.09) Affected by Substation Construction

None of the wetlands impacted by any of the substation options are located in Special Natural Resources Interest Areas.

2.7 EMF INFORMATION

ATC recognizes concerns expressed by stakeholders regarding exposure to transmission line EMF. Along with the energy industry, ATC continues to monitor developments on this issue. While studies of magnetic fields have produced little conclusive data regarding health effects, scientists generally agree that the studies taken as a whole show no consistent association between exposure and health risks.

A six-year federally mandated study that concluded in 1999 reported:

"The scientific evidence suggesting that [EMF] exposure poses any health risk is weak … the probability that EMF exposure is truly a health hazard is currently small. The weak epidemiological association and lack of any laboratory support for these associations provide only marginal scientific support that exposure to this agent is causing any degree of harm." (*National Institute of Environmental Health Sciences*, June 15, 1999)

As demonstrated by the information provided in this section, EMF levels decrease rapidly as distance from the proposed transmission line increases. Recognizing that distance is the principal means of mitigating EMF exposure from transmission lines, ATC proposes transmission line routes and line designs that to the extent practical, increase the distance of the proposed lines from permanently occupied dwellings and other potentially sensitive receptors.

A report has been prepared documenting magnetic field calculations performed for the proposed line route and design configurations following the guidance in the PSCW's "Information Requirements for Applications to Construct Electric Transmission Lines and Substations," (Part 2.00), Version 18B, using the AC/DC Line program, Version 3.0, developed by the Electric Power Research Institute. The report, as summarized below is contained in Appendix F. All exhibits, figures and tables referenced in the Sections 2.7.1 and 2.7.2 below are contained in the report.

2.7.1 Transmission Line EMF

The configuration of the transmission line within any route segment may vary depending on the transmission line alternative chosen, the Barnhart and Branch River substation options selected, the presence or absence of existing facilities, and other constraints. Appendix F, Tables 1 through 10, provide a cross reference associating the Appendix F tables and figures referenced below with each alternative and configuration.

2.7.1.1 Identify existing electric distribution facilities

Distribution facilities along the Project routes are identified in Appendix A, Figure 12, and Appendix F, Figures 1 through 85. There are no overhead electric distribution facilities along the transmission lines routes identified in this Joint Application that will be underbuilt with a new overhead transmission line. The location of distribution facilities in close proximity to the proposed transmission lines that will be modified or relocated as a result of the proposed project are identified in the line segment descriptions in Section 2.1.1.

2.7.1.2-2.1.7.4 Transmission line EMF profiles

Detailed calculated EMF profiles for each transmission line route and design configuration within each route segment in this Joint Application are provided in Appendix F, Tables 11 through 77.

Magnetic field levels for the transmission line facilities (1) at system peak and (2) under normal (defined as 80% of system peak), intact system conditions, are provided in the report contained in Appendix F for the planned in-service year 2018 and 10 years following, year 2028. Additionally, calculated magnetic field levels are provided for the existing transmission lines where applicable. Calculations were performed for each line segment on the route, using the height of the lowest conductor above ground at mid-span for overhead transmission lines. The results of magnetic field calculations for proposed transmission line route and design configurations that could be constructed by the proposed Project are provided in Appendix F, Tables 1 through 77.

The magnetic field levels listed in the tables contained in the report are the root mean square (RMS) resultant level at one meter above ground. The conductor phase arrangement and phase angles, and distribution facility arrangement are provided in the cross-section figures, Appendix F, Figures 1 through 85, included with the report. The transmission line phase arrangements were chosen to minimize magnetic field levels.

2.7.1.5 EMF Modeling Assumptions

EMF modeling assumptions for each route and design configuration on each route segment are provided in Appendix F, Figures 1 through 85. The following information is provided on each figure:

2.7.1.5.1 Phase angles

2.7.1.5.2 Pole design diagram including dimensions of pole arms and conductor locations, showing conductor horizontal distance from pole and conductor distance from ground at structure.

2.7.1.5.3 Height of lowest conductor(s) at mid-span

2.7.2 Existing Substations EMF levels (affected by new generation and/or transmission lines) on drawing including:

Existing substations affected by new transmission lines are the Forest Junction, Howards Grove and Erdman substations. The following readings measurements were taken with a Sypris model 4090 EMF meter:

2.7.2.1 EMF readings at each corner and mid-way point along each substation fence and also outward from the fence at 25 feet intervals out to 100 feet from the fence.

2.7.2.2 EMF readings at the substation fence where the transmission line enters and leaves the substation.

The readings for the Forest Junction, Howards Grove and Erdman substations are documented in Figures 86, 87 and 88, respectively.

2.7.2.3 Substations Associated with New Generation project

The proposed project is not associated with a new generation project.

2.7.3 New Power Plants (requiring no line additions

This section is not applicable. The proposed project does not interconnect a new power plant.

2.8 WDNR PERMITS AND APPROVALS

A WDNR Utility Permit is anticipated to be required for this project. Throughout the process of route evaluation and selection, ATC engaged with both WDNR and PSCW staff in the project pre-application/consultation process as described in *Wis. Stat*. § 30.025(1m). By participating in the consultation process, ATC was able to share information regarding the proposed project with both agencies, receive and incorporate feedback on both the initial route segments and the later defined routes from the PSCW and WDNR, and ensure that ATC's Utility Permit Application would contain all of the data identified as being required by the PSCW and WDNR to review and permit the proposed project.

ATC submitted Part 1 of an application, as provided for in *Wis. Stat*. § 30.025(1b), (1e) and (1s), for all WDNR permits required for construction of the facilities proposed in this Joint Application. These permits include:

- Chapter 30 Permit to place temporary clear span bridges in or adjacent to navigable waters, pursuant to *Wis. Stat*. § 30.123 and *Wis. Admin. Code* ch. 320, to grade near the OHWM of existing navigable waterways, pursuant to *Wis. Stat*. § 30.19 and *Wis. Admin. Code* ch. 341, and to construct an artificial water body (including a stormwater management pond) within 500 feet of the OHWM of existing navigable waterways, pursuant to *Wis. Stat*. § 30.19 (1g) and *Wis. Admin. Code* ch. 343;
- Wetland Water Quality Certification to discharge fill in wetlands, pursuant to *Wis. Stat*. § 281.36 and *Wis. Admin. Code* chs. NR 103 and 299;
- WPDES Storm Water Discharge Permit pursuant to *Wis. Stat*. ch. 283 and *Wis. Admin. Code* ch. NR 216;
- Incidental Take Authorization pursuant to *Wis. Stat*. § 29.604 *if the need for that permit is identified by WDNR*; and
- Any other applicable permit which is required, if the need for that permit is identified by WDNR.

A copy of the WDNR Utility Permit Application-Part 1, and the corresponding cover letter are included in Appendix E. Detailed technical information supporting the application for permits is contained in this Technical Support Document and is being provided to the WDNR as Part 2 of ATC's Utility Permit Application by copy of this Joint Application to the Commission.

2.8.1 Waterways and Wetlands

Temporary clear span bridge crossings will be required at navigable waterways as described in Section 2.4.12. The proposed locations are

specified and enumerated in Appendix E, Utility Permit Application-Part 1, Attachments F and G, and are shown on Appendix A, Figure 13, and Figures 23 through 26. These crossings require approval by the WDNR under *Wis. Stat.* ch. 30. All waterways are less than 35 feet wide. With the exception of the minimum clearance standard, all the bridges are designed to meet the standards and conditions for temporary clear span bridge crossings as authorized by *Wis. Admin. Code* § NR 320.04. Accordingly, ATC is requesting that WDNR waive the clearance standard for all bridge crossings as authorized by *Wis. Admin. Code* § NR 320.04(3). Approximate waterway dimensions are detailed for each proposed bridge crossing location (where access was allowed) in Appendix E, Utility Permit Application-Part 1, Attachment G. A typical detail drawing for a temporary clear span bridge crossing is provided in Appendix E, Utility Permit Application-Part 1, Attachment B.

Structures are proposed to be placed in wetland areas as described in Section 2.4.13. Temporary fill for construction access is also proposed to be placed in wetland areas as described in Section 2.5.4.1. Additionally, wetlands will be affected by substation construction as described in Section 2.6.8.7. The proposed locations are specified and enumerated in Appendix E, Utility Permit Application-Part 1, Attachments F and G, and the wetlands are shown on Appendix A, Figure 13 and Figures 23 through 26. Placement of fill in wetlands will require approval under Section 404 of the Clean Water Act (CWA) from the USACE and Water Quality Certification from the WDNR under Section 401 of the CWA.

2.8.2 Wetlands Practicable Alternatives Analysis including:

2.8.2.1 Method of Factoring Wetlands into Transmission Line Corridor and Route Selection Process and also Substation Siting Process

During initial project planning, environmental and social impacts, along with engineering feasibility and cost, were evaluated along numerous different routes that could potentially be used to route a transmission line between the new Branch River and Barnhart substations. The segments that were eliminated following this initial evaluation included those:

- in or near highly developed residential areas;
- in areas with concentrated farm yards; and
- in areas with high quality natural habitat or habitat with known protected species.

Following initial evaluation, two alternative 345 kV routes and two alternative 138 kV routes were identified for further evaluation. Segments comprising these routes are detailed in Section 2.4. These alignments were chosen based on a number of factors including minimizing impacts to residences, farm yards, wetlands, forested areas, and the location of existing transportation and utility corridors.

A number of potential substation sites were evaluated for each of the two new substations proposed for this project. The two final potential sites chosen for each substation location were selected based on the location in relation to the existing transmission lines that will be looped into the new substations, the locations in relation to nearby residences, cost of construction at each site, and the minimization of environmental impacts from the construction of the substation.

2.8.2.2 Provide analysis for avoiding and minimizing transmission line wetland impacts through structure location and construction access. For substation siting provide analysis for avoiding and minimizing wetland impacts considering cost, technological constraints and logistical reasons why other sites are not practicable.

Alternative 1A, Alternative 1B, and Alternative 2 will avoid and minimize wetland impacts to the extent practicable. However, given the extent of wetlands in the project area and structure spanning requirements, wetland impacts cannot be completely avoided along either route. Based on standard design elements, transmission structures along the 345 kV alternatives will typically span 700 to 800 feet and along 138 kV alternatives will span 500 to 600 feet. This distance is dependent upon several factors, including topography and ROW constraints.

The number of structures preliminarily determined to be placed in wetlands represents a worst-case estimate. Upon alternative approval, the final design will further attempt to minimize wetland impacts. For example, an effort will be made to move structures near a wetland edge to outside of the wetland. However, based on the number and extent of wetlands along each alternative, complete avoidance of wetlands is not likely.

Access through wetlands will also be minimized to the extent practicable. For example, if construction occurs during periods when the ground is not frozen or dry, wetlands occurring along roads will be accessed from the adjacent roads near the structure location, which

will eliminate the need for heavy equipment to access through the entire length of the wetland. Construction crews will also attempt to gain off-ROW access to avoid crossing wetlands.

As many as ten different potential sites were evaluated for both the Barnhart Substation and Branch River Substation locations. Each site was evaluated based on the cost for site preparation, cost and impact of routing the transmission lines in and out of each site, the ability of engineers to design the substation at each site with consideration of the locations of the existing transmission lines, and whether or not all required design features, such as access roads and stormwater management facilities would fit on each site.

The final two options for each substation were selected because the sites were large enough for the substations and all the ancillary features and were located closest to the existing transmission lines that will be routed into the new substations, both reducing the cost of building new transmission lines along new ROW and reducing and avoiding impacts to wetlands. The sites which were not selected would have resulted in longer segments of new transmission lines to route the existing lines in and out of the substations, which would result in more wetland impacts and a higher cost to build the project.

Impacts to wetlands at each potential substation location will be minimized during final design by locating the footprint of the substation in such a way that the direct impacts to wetlands and waterways will be minimized to the greatest extent possible. In addition, storm water management facilities and access roads will be located in locations that will reduce direct impact to wetlands or waterways.

2.8.2.3 If wetland impacts cannot be avoided, describe the construction and restoration methods that are planned to minimize wetland impacts

The use of heavy equipment in wetlands will be avoided whenever possible. No permanent fill placement is proposed for wetland access routes. When wetland access is required, disturbance to wetlands will be limited as much as possible. Examples of some disturbance limiting techniques include: timing wetland construction during dry or frozen conditions, construction of ice roads, and the use of low ground pressure equipment, and/or construction matting materials to help minimize soil and vegetation disturbances.

Upon completion of the transmission line and substations, ATC will complete site restoration and re-vegetation consistent with the activities described in Section 2.5.5.

2.8.3 Storm Water Management Permit

Based on the planned work, land disturbing activities associated with the Project will exceed one acre requiring authorization under *Wis. Admin. Code* ch. NR 216. The required application forms have been submitted in the WDNR Utility Permit Application-Part 1, and are located in Appendix E of this Joint Application. Appropriate erosion control measures and BMPs as described in the Department's technical standards will be followed and maintained until final restoration and re-vegetation are complete.

2.8.4 Endangered/Threatened Species Analysis and Incidental Take Request for Authorization

An evaluation of potential impacts to rare species is included in Appendix I, and is being submitted as a redacted document. The WNHI database review identified records of several endangered or threatened species near the project area. Protected species protocols and other protective measures will be implemented when possible to avoid impacts to endangered or threatened species and their habitats; thus, incidental take permits may not be necessary. The protective measures include identification and avoidance. However, if protective measures cannot be achieved, ATC will consult with WDNR to determine whether an Incidental Take Authorization is necessary.

2.9 OTHER AGENCY CORRESPONDENCE

2.9.1-2.9.2 Copies of ATC Correspondence with Other State, Federal and Local Government Agencies

Copies of correspondence with other State, Federal, and Local Government Agencies are contained in Appendix G.

2.9.3 Agency Permits

2.9.3.1 CPCN Applications

2.9.3.1.1 Exempted Local Permits and Ordinances

The following local permits and ordinances may apply[2] to the proposed project absent the provisions of *Wis. Stat.* § 196.491(3)(i):

Town of Franklin

Conditional Use Permit for new control house.

Town of Lima

Conditional Use Permit for new substation and transmission lines.

Town of Mosel

Conditional Use Permit for transmission line construction.

Town of Sheboygan

Conditional Use Permit for transmission line construction and Erdman Substation improvements.

Town of Centerville

Rezoning permit for new transmission lines.

Sheboygan County

Erosion Control Permit

Manitowoc County

Erosion Control Permit

[2] ATC accepted evaluations of local zoning representatives and did not seek to reconcile any differences between those evaluations and the local zoning ordinance.

2.9.3.1.2 Communications with Permitting Authorities

Documentation of communications with local jurisdictions concerning potentially applicable local permits is contained in Appendix G, Exhibit 7.

2.9.3.2 Certificate of Authority Applications

This Joint Application is for a Certificate of Public Convenience and Necessity. Therefore, this section is not applicable.

2.9.3.3 List of Federal permits

The placement of fill in wetlands will require approval under Section 404 of the Clean Water Act (CWA) from the USACE and Water Quality Certification from the WDNR under Section 401 of the CWA.

2.9.3.4 List of Other permits

The typical state permits and other organization permissions that might be obtained after the issuance of the Certificate of Public Convenience and Necessity and the Utility Permit include:

State Agencies and Others		
Department of Transportation	Road Crossing	Design Approval
	Construction adjacent to, with-in, or co-location with the ROW of State Highways & Roads	Utility Permit DT 1553
	Oversize Loads or Excessive Weights on Highways	*Wis. Stat*. ch. 348 Vehicles – Size, Weight and Load; *Wis. Stat*. § 348.25-Vehicle Weight and or Load Permit
Wisconsin State Historical Society	Site Preparation and Grading	Approval of Archeological Surveys (*Wis. Stat*. § 44.40 and Section 106 of National Historic Preservation Act)

2.10 PROPERTY OWNER INFORMATION

Alphabetized lists for each of the following groups is provided in Appendix H:

2.10.1 Property Owners

The mailing list of potentially-affected property owners is provided as List 1. This list also includes property owners and others in the project area that requested ATC include them in the mailing list provided in this Joint Application.

2.10.2 Public Property

The mailing list of public property owners is provided as List 2.

2.10.3 Clerks of Cities, Villages, Townships, Counties, and Regional Planning Commissions

The mailing list of clerks and Regional Planning Commissions is provided in List 3.

2.10.4 State and Federal Agencies/Local Media

The mailing list of state and federal agencies and local media outlets is included in List 3. Additionally, libraries in the project area are also listed to facilitate the distribution of the application as required by *Wis. Stat.* § 196.491(3)(a)1.

A list of local elected officials is included as List 4.

APPENDIX A	**PROJECT MAPS & ENVIRONMENTAL TABLES**
Figure 1	Proposed Project (shows proposed & alternate routes)
Figure 2 Alt 1	Alternative 1 Page Index – 1"=400' Scale Maps
Figure 2 Alt 1A	Alternative 1A Page Index – 1"=400' Scale Maps
Figure 2 Alt 1B	Alternative 1B Page Index – 1"=400' Scale Maps
Figure 2 Alt 2	Alternative 2 Page Index – 1"=400' Scale Maps
Figure 2 OPGW	OPGW Page Index – 1"=400’ Scale Maps
Figure 3 Alt 1	Alternative 1 Page Index – 1"=2000' Scale Maps
Figure 3 Alt 1A	Alternative 1A Page Index – 1"=2000' Scale Maps
Figure 3 Alt 1B	Alternative 1B Page Index – 1"=2000' Scale Maps
Figure 3 Alt 2	Alternative 2 Page Index – 1"=2000' Scale Maps
Figure 4 Alt 1	Existing Land Use Alternative 1
Figure 4 Alt 1A	Existing Land Use Alternative 1A
Figure 4 Alt 1B	Existing Land Use Alternative 1B
Figure 4 Alt 2	Existing Land Use Alternative 2
Figure 5 Alt 1	Orthophotography Alternative 1
Figure 5 Alt 1A	Orthophotography Alternative 1A
Figure 5 Alt 1B	Orthophotography Alternative 1B
Figure 5 Alt 2	Orthophotography Alternative 2
Figure 6 Alt 1	Topography Alternative 1
Figure 6 Alt 1A	Topography Alternative 1A
Figure 6 Alt 1B	Topography Alternative 1B
Figure 6 Alt 2	Topography Alternative 2
Figure 7 Alt 1	Zoning Alternative 1

APPENDIX A	**PROJECT MAPS & ENVIRONMENTAL TABLES**
Figure 7 Alt 1A	Zoning Alternative 1A
Figure 7 Alt 1B	Zoning Alternative 1B
Figure 7 Alt 2	Zoning Alternative 2
Figure 8 Alt 1	Tax Parcels Alternative 1
Figure 8 Alt 1A	Tax Parcels Alternative 1A
Figure 8 Alt 1B	Tax Parcels Alternative 1B
Figure 8 Alt 2	Tax Parcels Alternative 2
Figure 9 Alt 1	Floodplain Alternative 1
Figure 9 Alt 1A	Floodplain Alternative 1A
Figure 9 Alt 1B	Floodplain Alternative 1B
Figure 9 Alt 2	Floodplain Alternative 2
Figure 10	Adopted Land Use Plans
Figure 11A	Airport Height Limitation Manitowoc County
Figure 11B	Airport Height Limitation Sheboygan County
Figure 12 Alt 1	Confined Animal Operations & Distribution Facilities Alternative 1
Figure 12 Alt 1A	Confined Animal Operations & Distribution Facilities Alternative 1A
Figure 12 Alt 1B	Confined Animal Operations & Distribution Facilities Alternative 1B
Figure 12 Alt 2	Confined Animal Operations & Distribution Facilities Alternative 2
Figure 13 Alt 1	Environmental Features & Access Plan Alternative 1
Figure 13 Alt 1A	Environmental Features & Access Plan Alternative 1A
Figure 13 Alt 1B	Environmental Features & Access Plan Alternative 1B
Figure 13 Alt 2	Environmental Features & Access Plan Alternative 2
Figure 13 OPGW	Environmental Access Plan OPGW
Figure 14	Laydown Yards

APPENDIX A **PROJECT MAPS & ENVIRONMENTAL TABLES**

Figure 15 Branch River North Tax Parcels

Figure 16 Branch River South Tax Parcels

Figure 17 Branch River North Topography

Figure 18 Branch River South Topography

Figure 19 Barnhart North Tax Parcels

Figure 20 Barnhart South Tax Parcels

Figure 21 Barnhart North Topography

Figure 22 Barnhart South Topography

Figure 23 Branch River North Environmental Access Plan

Figure 24 Branch River South Environmental Access Plan

Figure 25 Barnhart North Environmental Access Plan

Figure 26 Barnhart South Environmental Access Plan

Table 1A General Route Impacts
- 345 kV Alternative 1, 138 kV Alternative 1A
- 345 kV Alternative 1, 138 kV Alternative 1A
- 345 kV Alternative 2

Table 1B Distance to Potentially Sensitive Buildings
- 345 kV Alternative 1, 138 kV Alternative 1A
- 345 kV Alternative 1, 138 kV Alternative 1A
- 345 kV Alternative 2

Table 2 Impacts by Segment and Route
- 345 kV Alternative 1, 138 kV Alternative 1A
- 345 kV Alternative 1, 138 kV Alternative 1A
- 345 kV Alternative 2

Table 3 Impacts – Public and Tribal Lands
- 345 kV Alternative 1, 138 kV Alternative 1A
- 345 kV Alternative 1, 138 kV Alternative 1A
- 345 kV Alternative 2

APPENDIX A PROJECT MAPS & ENVIRONMENTAL TABLES

Table 4 Route Impact Summary

- 345 kV Alternative 1, 138 kV Alternative 1A
- 345 kV Alternative 1, 138 kV Alternative 1A
- 345 kV Alternative 2

APPENDIX B	TRANSMISSION FACILITIES	PAGES
Figure 1	Existing 345 kV Double-Circuit I-String Lattice Tower	1
Figure 2	345 kV Double-Circuit I-String Steel Pole	1
Figure 3	Existing 138 kV Double-Circuit I-String Steel Pole	1
Figure 4	138 kV Single-Circuit Delta Steel Pole with Braced-Post Insulators	1
Figure 5	138 kV Single-Circuit Vertical Steel Pole	1
Figure 6	138 kV Single-Circuit Vertical Steel Pole with Horizontal Post Insulators	1
Figure 7	138 kV Single-Circuit Delta I-String Pole	1
Figure 8	138 kV Double-Circuit Steel Pole	1
Figure 9	345 kV Double-Circuit V-String Pole	1
Figure 10	345 kV Single-Circuit Delta V-String Pole	1
Figure 11	345 kV Single-Circuit Vertical V-String Pole	1
Figure 12	Barnhart Substation – North, Alternative 1	1
Figure 13	Barnhart Substation – South, Alternative 1	1
Figure 14	Barnhart Substation – North, Alternative 2	1
Figure 15	Barnhart Substation – South, Alternative 2	1
Figure 16	Branch River Substation – North, Alternative 1	1
Figure 17	Branch River Substation – South, Alternative 1	1
Figure 18	Branch River Substation – North, Alternative 2	1
Figure 19	Branch River Substation – South, Alternative 2	1
Figure 20	Forest Junction Substation, Alternative 1	1
Figure 21	Howards Grove Substation, Alternatives 1A and 1B	1
Figure 22	Erdman Substation, Alternatives 1A and	1

APPENDIX B	TRANSMISSION FACILITIES	PAGES
	1B	
Figure 23	Point Beach Substation, Alternatives 1 and 2	1
Figure 24	345 kV Substation, Typical Elevation Drawing	1

APPENDIX C **TRANSMISSION STUDIES**

Exhibit 1 Project Scoping Document

Exhibit 2 Interconnection System Impact Study

Exhibit 3 Interim Operation Study

APPENDIX D **PUBLIC OUTREACH**

Exhibit 1 Open House One

Exhibit 2 Open House Two

Exhibit 3 Open House Three

APPENDIX E WDNR PERMIT APPLICATION

APPENDIX F EMF STUDIES

APPENDIX G **AGENCY CORRESPONDENCE**

Exhibit 1	Detailed Project Plan
Exhibit 2	WDNR Response to Detailed Project Plan
Exhibit 3	WisDOT Constructability Report 3/5/2012
Exhibit 4	WisDOT Constructability Report 7/27/2012
Exhibit 5	Wetland Delineation Report Transmittal
Exhibit 6	WisDOT Constructability Report Response
Exhibit 7	Communications – Local Permitting Authorities

APPENDIX H	**MAILING LISTS**
List 1	Property Owners
List 2	Public Property Owners
List 3	Clerks, Libraries, Regional Planning Commissions, Media, Agencies
List 4	Local Officials

APPENDIX I **ENVIRONMENTAL SUPPORT**

Exhibit 1 Endangered Resource Review Request

Exhibit 2 Endangered Resources Review

Exhibit 3 Cultural Resources Review

Exhibit 4 Endangered Resource Review Response