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PUBLIC SERVICE COMMISSION OF WISCONSIN
WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Badger-Coulee Transmission Line Volume 1

Draft Environmental Impact Statement

PSC Docket 5-CE-142

Date Issued: August 2014

PUBLIC SERVICE COMMISSION OF WISCONSIN

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Badger-Coulee Transmission Line Project

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This draft Environmental Impact Statement for the proposed Badger-Coulee 345 kV transmission line project is progress towards compliance with the Public Service Commission's requirement under Wis. Stat. § 1.11 and Wis. Admin. Code § PSC 4.30. It also is progress toward compliance with the Department of Natural Resources requirements under Wis. Admin. Code § NR 150.22.

By: Kathleen J Zuelsdorff Date: August 19, 2014

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To the Reader

This draft environmental impact statement (EIS) fulfills part of the requirements of the Wisconsin Environmental Policy Act (WEPA), Wis. Stat. § 1.11. WEPA requires state agencies to consider environmental factors when making major decisions. The purpose of this draft EIS is to provide the decision makers, the public, and other stakeholders with an analysis of the economic, social, cultural, and environmental impacts that could result from the construction of the proposed 345 kV transmission line and its associated facilities. This document has been prepared jointly by the Public Service Commission of Wisconsin (Commission or PSC) and the Wisconsin Department of Natural Resources (DNR).

You are encouraged to comment on this draft EIS. The comment period on this draft EIS ends on October 3, 2014. Please use the PSC docket number 5-CE-142 on all correspondence. Written comments should be addressed to:

Docket 5-CE-142 comments
Public Service Commission
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Comments may also be submitted electronically at the Commission's web site at http://psc.wi.gov. Once at the site, click on the "Public Comments" button on the side menu bar. On the next page select the "File a comment" link that appears for docket number 5-CE-142. Specific questions on the draft EIS should be addressed to:

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Comments received during the comment period will be used to prepare the final EIS, which will become part of the record used by the Commission to make its final decisions on this project. At this time, the Commission decision on the proposed project is expected in April 2015.

The Commission decision on the merits of this project will be based on the record of a public hearing that will be held about 30 days after the final EIS is issued. When the final EIS is prepared, the Commission will issue a Notice of Hearing. The hearing will satisfy the WEPA requirements of the Commission and DNR. The final EIS and testimony from the public hearing will be included in the hearing record.

If necessary, DNR will hold separate hearings on its water permits or other DNR regulatory actions discussed in this draft EIS.

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Executive Summary

On October 15, 2013, American Transmission LLC (ATC) and Northern States Power Company-Wisconsin (NSPW) filed an application for a Certificate of Public Convenience and Necessity (CPCN) with the Public Service Commission of Wisconsin (PSC or Commission) under Wis. Stat. § 196.491 and Wis. Admin. Code § PSC 111.53 for authority to construct a new 345 kilovolt (kV) electric transmission line from the Briggs Road Substation in La Crosse County to the existing North Madison Substation in Dane County, and on to the existing Cardinal Substation, also in Dane County. Depending on the route segments used, the new Badger-Coulee 345 kV transmission line would be between 154 and 187 miles long. No new substations are proposed, although modifications would be needed at the Briggs Road, North Madison and Cardinal Substations to accommodate the new 345 kV line.

PROPOSED BADGER-COULEE PROJECT

In their application ATC and NSPW proposed two routes, a “Northern” Route and a “Southern” Route, each composed of a number of segments. However, these routes intersect one another at several locations and have three segments that are common to both routes. These intersection points allow the Commission to select a final overall route that may contain segments or portions of both of the applicants’ proposed routes.

Thus, to facilitate the discussion and comparison of the proposed segment alternatives, Commission staff conducted its cost and environmental analyses based on the six distinct geographic areas of the project that are defined by the intersection points. Starting in La Crosse Country and moving eastward along the project to Dane County, each geographic area is covered in a separate chapter in this EIS document as described below:

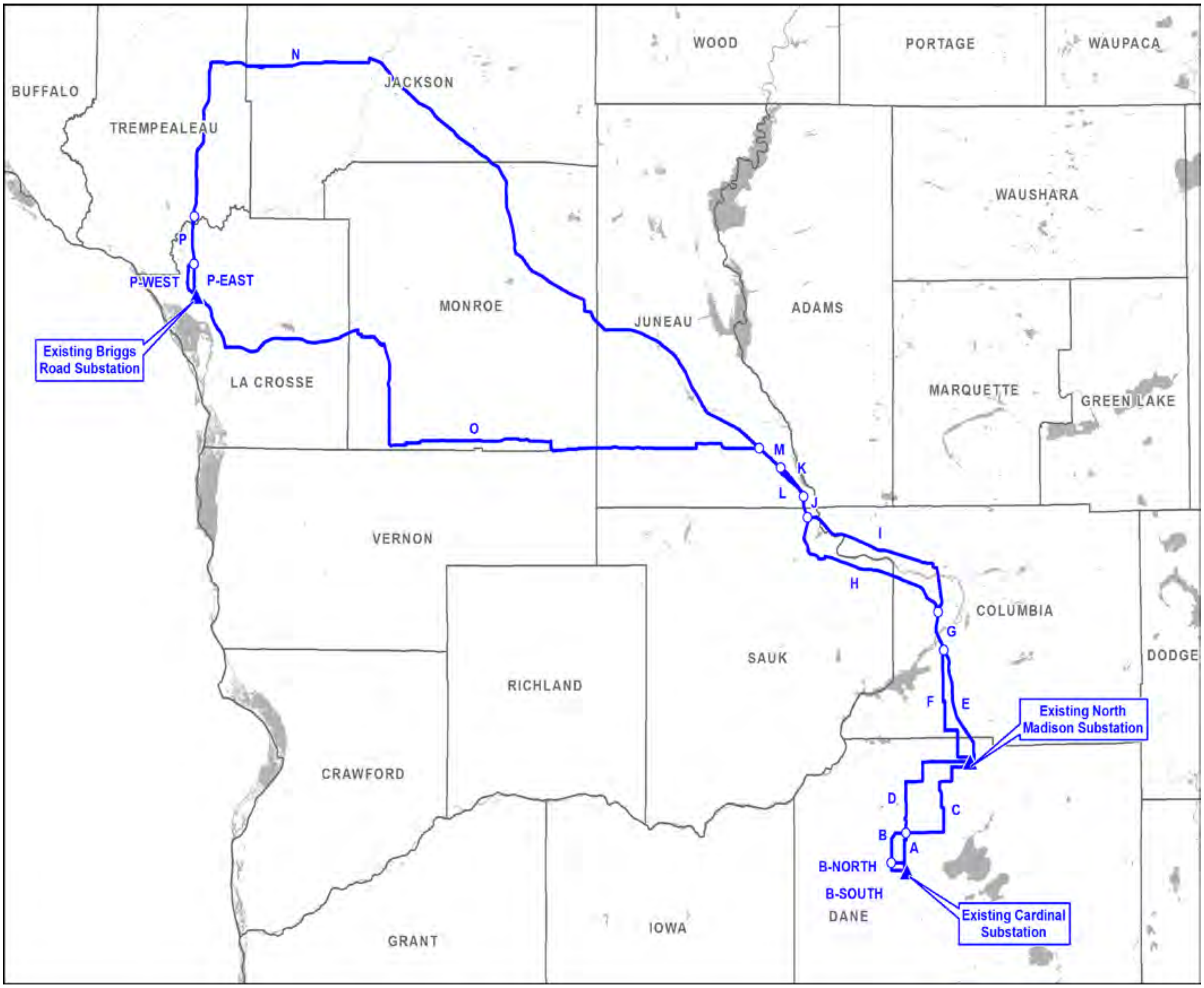
- Briggs Road Substation to Lyndon Station – Segments P, N, and O (Chapter 6)
- Lyndon Station to Wisconsin Dells – Segments M, L, and K (Chapter 7)
- Wisconsin Dells to the town of town of Caledonia – Segments J, H and I (Chapter 8)
- Town of Caledonia to the North Madison Substation – Segment G, E and F (Chapter 9)
- North Madison Substation to the town of Springfield – Segments C and D (Chapter 10)
- Town of Springfield to the Cardinal Substation – Segments A and B (Chapter 11)

The possible routes for the new 345 kV transmission line cross the counties of Columbia, Dane, Jackson, Juneau, La Crosse, Monroe, Sauk, Trempealeau, and Vernon and potentially involve some 77 municipalities and townships. Many of the proposed route segments share right-of-way (ROW) with existing transmission lines, interstate highway and railroad corridors, although large portions of some route segments run cross-country and require all new ROW. For most of the route segments, there are two segment alternatives. Three of the segments, Segments M, J, and G have no alternative and are referred to as common segments.

The proposed transmission line would be constructed on steel, single-pole structures in a single- or double-circuit delta-configuration over most of the route. However, due to some wide river crossings and the extremely hilly topography in some portions of the project area, steel H-frame structures are proposed for use on some segments.

The overall cost of the Badger-Coulee Project is expected to range between $540 and $580 million, depending on the final route/segments selected. Costs are discussed in detail in this EIS in Chapter 2, Section 2.4. This project would be jointly owned and operated by ATC and NSPW. The project costs were estimated in 2018 dollar costs, the projected in-service year. The cost estimates include substation costs, distribution line relocation costs, and allowance for funds used during construction (AFUDC).

Figure ES-1 Badger-Coulee route segments



There are numerous intervenors in the Badger-Coulee docket, including environmental advocacy groups, individual landowners, utilities, and a number of municipal government offices. The primary issues of contention, based on comments received during the scoping process, include: 1) the need for the proposed project; 2) the cumulative impacts of the CapX and Badger-Coulee 345 kV transmission lines on some communities; 3) the compatibility of the proposed routes with local land use plans; 4) individual hardships and property impacts; and 5) reliable transfer of renewable generation resources.

NEED FOR THE PROPOSED PROJECT

Commission staff's analysis of project need is on-going and will be covered in greater detail in the final EIS. The need for the proposed Badger-Coulee project is and will continue to be a subject of scrutiny throughout the Commission's review process including during the public and technical hearings.

The applicants' stated purposes for the Badger-Coulee transmission line project are to: 1) improve electric system reliability locally and regionally; 2) deliver economic savings for Wisconsin utilities and electric consumers; and 3) expand infrastructure to support the public policy of greater use of renewables. The analysis of need provided in the project application relied heavily on the planning process of the Midcontinent Independent System Operator (MISO). More information about this process is included in Chapter 3.

Existing transmission resources

The La Crosse area is served by a network of 161 kV and 69 kV lines. When construction of the Alma-La Crosse (CapX) 345 kV project is complete, the main 161 kV links will be Alma-Marshland-Briggs Road, Alma-Tremval-Briggs Road, Genoa-Coulee-La Crosse, and Genoa-La Crosse tap. The CapX 345 kV project will extend a new 345 kV line into the new Briggs Road Substation from Rochester, Minnesota. The remainder of western Wisconsin is currently served by a network of 161 kV and 69 kV lines.

The Madison area is served by 345 kV lines from Columbia Generating Station to North Madison and from Rockdale Substation to the Cardinal Substation. The area is also served by various 138 kV and 69 kV lines, including an existing 138 kV line from the North Madison Substation to the Cardinal Substation.

The applicants state that growing demand for electricity in the study area would exceed the ability of the current electrical system to reliably deliver power at peak load and under contingency conditions, when one or more transmission elements are out of service. In addition, the applicants state that there is a need to improve west to east power flow capability in order to relieve transmission system congestion. Finally, the applicants also state that there is wind electric generation in Minnesota that needs to be moved during times of higher wind speeds and low loads.

System alternatives

The non-transmission alternatives to this project discussed in the Badger-Coulee application and being analyzed by staff include: energy efficiency and load reduction; generation; distributed resources; and a no-build alternative.

In addition to the non-transmission alternatives, a number of transmission alternatives were also described in the application. These include:

- Spring Green 345 kV alternative – This 345 kV transmission line would originate at the Briggs Road Substation, extend to the existing Spring Green Substation near Spring Green, Wisconsin, and continue to the existing Cardinal Substation. The overall length of this alternative is approximately 130 miles and its estimated cost is $459 million.

- 345 kV to Iowa alternative – This 345 kV transmission line alternative would originate at the existing Cardinal Substation, extend west to the existing Spring Green Substation, and continue to the Dubuque, Iowa area. The overall length of this alternative is approximately 110 miles and its estimated cost is $370 million, which includes a new 345 kV substation in the Dubuque area to accommodate a new tap into the proposed Hazleton - Salem 345 kV transmission project.

- Combination 345 kV alternative – This 345 kV transmission line alternative includes all aspects of the proposed Badger-Coulee project and the 345 kV to Iowa alternative. The overall length of this alternative is approximately 240 miles and the applicants estimate the cost of the Combination 345 kV alternative at $920 million.

- 765 kV alternative – This is a combination of 345 kV and 765 kV transmission lines that would connect multiple points in Western Wisconsin and Minnesota to points in South Central Wisconsin. New 345 kV lines would extend from the Adams Substation near Adams, Minnesota to the Genoa Substation near Genoa, Wisconsin and from the Briggs Road Substation to the Genoa Substation. A new 765 kV line would begin at the Genoa Substation and extend to the existing North Monroe Substation, near Monroe, Wisconsin. A new double-circuit 345 kV line would originate at the North Monroe Substation and extend to the existing Paddock Substation, near Beloit, Wisconsin. The overall length of the alternative would be 275 miles, including 130 miles of 765 kV transmission line and 145 miles of 345 kV lines. The applicants estimate the cost of this alternative at $1,071 million.

- Low-Voltage alternative – This alternative is a large combination of new, rebuild, and uprate construction of 161 kV, 138 kV, 115 kV, and 69 kV transmission facilities to eliminate violations of NERC Category B reliability requirements, and reactive compensation to eliminate NERC Category C reliability requirements. The only new line included in this alternative is an 18-mile 161 kV line from the existing Liberty Substation near Dubuque, Iowa to the Nelson Dewey Substation in Cassville, Wisconsin. All other projects would be either rebuilds or uprates of existing transmission lines. Several transformers at existing substations would be replaced. ATC estimates the cost of this alternative to be $429 million in year-of-occurrence dollars. Also, ATC estimates the present value (discounted to 2012) of the change in net transmission charges to ATC network customers over the 40-year life of the projects to be an increase of $467 million.

ATC's analysis of these alternatives is based on a number of criteria that are described in Chapter 3, along with a table showing the monetized benefits of each alternative according to ATC's analysis. ATC thinks the Badger-Coulee alternative has excellent quantitative benefits and scores well in all of the important qualitative measures. In addition, when the Badger-Coulee project and the 345 kV to Iowa alternative are combined to create the Combination 345 kV alternative, ATC's analysis shows that the quantitative results have the highest level of benefits of all transmission system alternatives. Thus, ATC concluded that the proposed Badger-Coulee project is the applicants' preferred transmission system alternative.

PROPOSED PROJECT AND ROUTE SEGMENTS

Between the Briggs Road Substation and a point just north of Lyndon Station there are two alternative routes. One includes Segment P (with a P-west or P-east option) and Segment N (combined length of 113 miles), which extends north through urbanized areas in the village of Holmen and town of Holland and continues north and east across the Black River through a rural landscape before hitting the Interstate 94 corridor at Black River Falls. From there, Segment N continues southeast down the interstate corridor to Lyndon Station. Segment O, the alternative, extends south from the Briggs Road Substation through the city of Onalaska and then east along I-90 corridor toward Sparta. It leaves the I-90 corridor before reaching Sparta and turns south toward Cashton and then east over very hilly topography past Ontario and Elroy before entering more level terrain and ending at Lyndon Station after traversing a distance of 85 miles.

Between Lyndon Station and Wisconsin Dells, the alternatives includes common Segment M and Segment K, which continue to follow the I-90/94 corridor south for a distance of 7.5 miles, or a combination of Segments M and L. The latter combination (M-L) is approximately the same length as combined Segment M-K, but Segment L leaves the interstate corridor and follows a railroad corridor near USH 12 until the railroad tracks intersect the I-90/94 corridor north of the city of Wisconsin Dells.

Between Wisconsin Dells and the town of Caledonia the alternative routes are longer and more varied. Segment J is a common segment that continues to follow the interstate corridor before joining either Segment I or Segment J. Segment I passes through the city of Wisconsin Dells and crosses the Wisconsin River at the Kilbourn Dam and again near its termination along I-39. Between Wisconsin Dells and I-39, Segment I follows a rail corridor and existing transmission line north of the Wisconsin River for much of its length. Segments J and H continue to follow the I-90/94 corridor, crossing through the edge of Mirror Lake State Park and a developed area near the Dells before extending along an expanse of high-quality natural landscapes that include many publicly-owned properties. Both of the combined routes, Segment J-I and J-H are approximately 24 miles in length.

From the town of Caledonia to the North Madison Substation the alternative routes, which both include common Segment G, differ substantially. Segment G-E parallels the east side of I-39/90/94, sharing WisDOT ROW and crossing the Wisconsin River before continuing south for approximately 15.0 miles and turning west to parallel an existing double-circuit 345 kV line across agricultural fields into the substation. The alternative combination, Segment G-F, crosses the Wisconsin River and turns west into the rolling wooded terrain east of Lodi, where it runs southward on new cross-country ROW and eventually slightly east to enter the North Madison Substation. Combined Segment G-F is slightly longer at 19.2 miles, compared to 17.3 miles for Segment G-E.

Between the North Madison Substation and the town of Springfield, alternative Segments C and D run approximately 15.5 miles across an agricultural landscape to intersect in the town of Springfield. Segment D follows an existing transmission line corridor along most of its length; whereas, Segment C mostly follows a combination of existing electric lines and local road corridors.

From the town of Springfield to the Cardinal Substation alternative Segments A and B differ substantially in length and the type of landscapes they affect. Segment A is 4.6 miles long and is mostly double-circuited with existing transmission lines across a fairly level agricultural landscape. Segment B lies farther to the west, and cuts through rolling terrain that is a mixture of forest and agriculture, as it covers the 7.4 mile distance to the Cardinal Substation, mostly on new cross-country ROW. The southern-most portion of Segment B follows an existing electric line through some county-owned land and across Black Earth Creek.

POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

Between its origin at the Briggs Road Substation in La Crosse County and its terminus at the Cardinal Substation in Dane County, the Badger-Coulee project area differs substantially ecologically, topographically and culturally going from west to east. The forested slopes and narrow valleys of the

Western Coulee and Ridge Ecological Landscape along Segment O and the western third of Segment N contrast sharply with the flat agricultural lands common in the Southeast Glacial Plains Ecological Landscape along Segment A, C and D.

The western terminus of the project at the Briggs Road Substation lies within an urban/suburban setting. Within 15 to 20 miles after leaving the substation, the route segments transition to the rural landscapes that encompass much of the central part of the project area. Near the eastern project terminus, the route segments again enter an area of developing urban fringe that includes clusters of residential properties surrounded by farms and woodland.

The visual, aesthetic and cultural impacts associated with the miles of Segment N that parallel the busy I-90/94 corridor between Black River Falls and Lyndon Station differ greatly from the visual, aesthetic and cultural impacts along the miles of Segment O that cross the coulee country on new ROW between Cashton and Lyndon Station.

Farther south along Segments H and I, there are many significant natural resources, including the Wisconsin and Baraboo Rivers and their associated floodplains and large expanses of marsh. A large number of publicly and privately-owned properties that are managed for recreational and natural resource purposes are also present in this area. Determining which route segments would have the least or fewest long-term impacts on these natural resources involves many considerations.

The discussion below highlights some of the differences and similarities between the segment alternatives and the impacts that would be expected to occur as a result of building and maintaining the proposed 345 kV transmission line.

Briggs Road to Lyndon Station

Both routes (Segment P, using P-east or P-west, and Segment N versus Segment O) initially pass through a relatively urbanized area and impact a large number of single- and multi-family residential properties and subdivisions, in addition to schools, daycares and municipal facilities. Residences become more scattered once the route segments leave the Holmen/Onalaska area.

The greatest differences between the segment alternatives in this part of the project area relate to the topography, the amount of public versus private lands crossed and the amount of corridor sharing. Combined Segment P-N corridor shares with existing transmission lines or roads for 72 percent of its 112-mile length – most of this with 161 kV transmission lines and interstate corridors. Less than half the distance of Segment O corridor is shared with existing ROWs; new cross-country ROW is needed on 65 percent of its length.

In addition, Segment O passes through the unglaciated Driftless Area of Wisconsin that is typified by steep-sided slopes and narrowly dissected valleys with numerous small streams. Construction would be challenging and require cleared ROW greater than the typical 120 feet and as wide as 330 feet in some locations. Segment N follows an existing transmission line ROW for 36 miles and interstate ROW for most of the remainder of its length, resulting in incremental ROW clearing as opposed to new impacts.

Finally, both Segment N and O pass through Amish communities; the community near Cashton along Segment O is the largest and one of the most conservative Amish settlements in Wisconsin. Burdening this community with the impacts and long-term presence of the proposed transmission line would be a consideration in the routing decisions if the project is approved.

Lyndon Station to Wisconsin Dells

There are no significant differences between the segment alternatives Segments M-K and M-L. Segment M-L crosses fewer waterways and affects less wetland acreage, but Segment M-K would result in fewer acres of forest cleared and has no residences within 300 feet of the proposed centerline. Agricultural impacts are not an issue on either route.

Wisconsin Dells to the town of Caledonia

Segment J, which is a common segment following the interstate corridor, leads into Segment I or Segment H. Segment I passes through the city of Wisconsin Dells affecting several developed properties, but then follows an existing transmission line and rail corridor eastward toward I-39 where it crosses the Wisconsin River adjacent to the Pine Island State Wildlife Area. Segment H remains along the interstate corridor, passing through the edge of Mirror Lake State Park and portions of the Pine Island State Wildlife Area. Both segments could have substantial impacts on birds using the Leopold-Pine Island Important Bird Area (see Chapter 8, Section 8.1.2 for more information) and the Baraboo River Waterfowl Production Area. Views from the Aldo Leopold Shack, a National Historic Landmark, could also be adversely affected by one or both of these alternatives, depending on the design of the transmission line at certain locations.

Town of Caledonia to the North Madison Substation

Combined Segment G-E impacts less forest and wetland acreage than the Segment G-F alternative. It also affects fewer residential properties, most likely because nearly 46 percent of Segment G-E shares corridors with existing ROWs compared to 15 percent for combined Segment G-F. Lastly, Segment G-E affects less agricultural land than Segment G-F.

North Madison Substation to town of Springfield

Segments C and D are the route alternatives in this part of the project area. Although both cross a predominantly agricultural landscape, there are some major differences in the potential impacts that would result from constructing the new transmission line on Segment C versus Segment D. Segment D shares over 71 percent of its ROW with existing transmission lines, whereas Segment C corridor shares approximately 27.5 percent of its ROW. Because of this extensive use of existing ROWs, Segment D affects fewer acres of wetlands and woodland and has nearly half the number of residences within 300 feet of the proposed transmission centerline as Segment D.

Town of Springfield to the Cardinal Substation

Segment A is much shorter in length than the Segment B alternatives and it also shares its ROW with existing roads and transmission lines to a much greater extent than Segment B. Although Segment B affects fewer acres of agricultural land, construction of the proposed Badger-Coulee transmission line on one of the Segment B alternatives would result in greater forest, wetland and waterway impacts. In addition, more residences are within 300 feet of the proposed centerline on Segment B.

In summary, although some route segments may be more compatible with a new high-voltage transmission line than others, construction and operation of the proposed Badger-Coulee 345 kV transmission line would have substantial impacts on many natural, community and cultural resources in the project area, regardless of which route alternatives are chosen.

CHAPTER

1

1. Project Overview and Regulatory Responsibility

1.1. THE BADGER-COULEE PROJECT

1.1.1. Certificate of Public Convenience and Necessity application

On October 15, 2013, American Transmission LLC (ATC) and Northern States Power Company-Wisconsin (NSPW) filed an application with the Public Service Commission of Wisconsin (PSC or Commission) under Wis. Stat. § 196.491 and Wis. Admin. Code § PSC 111.53 for authority to construct new transmission facilities. The applicants are seeking the Commission's approval of the project and the issuance of a Certificate of Public Convenience and Necessity (CPCN). The primary focus of the proposed Badger-Coulee Transmission Line Project (Badger-Coulee) is to install a new 345 kilovolt (kV) electric transmission line from the under-construction Briggs Road Substation in La Crosse County to the existing North Madison Substation in Dane County, then on to the existing Cardinal Substation, also in Dane County. No new substations are proposed as part of this application. Depending on the route segments selected by the Commission, the new Badger-Coulee 345 kV transmission line would be between 154 and 187 miles long.

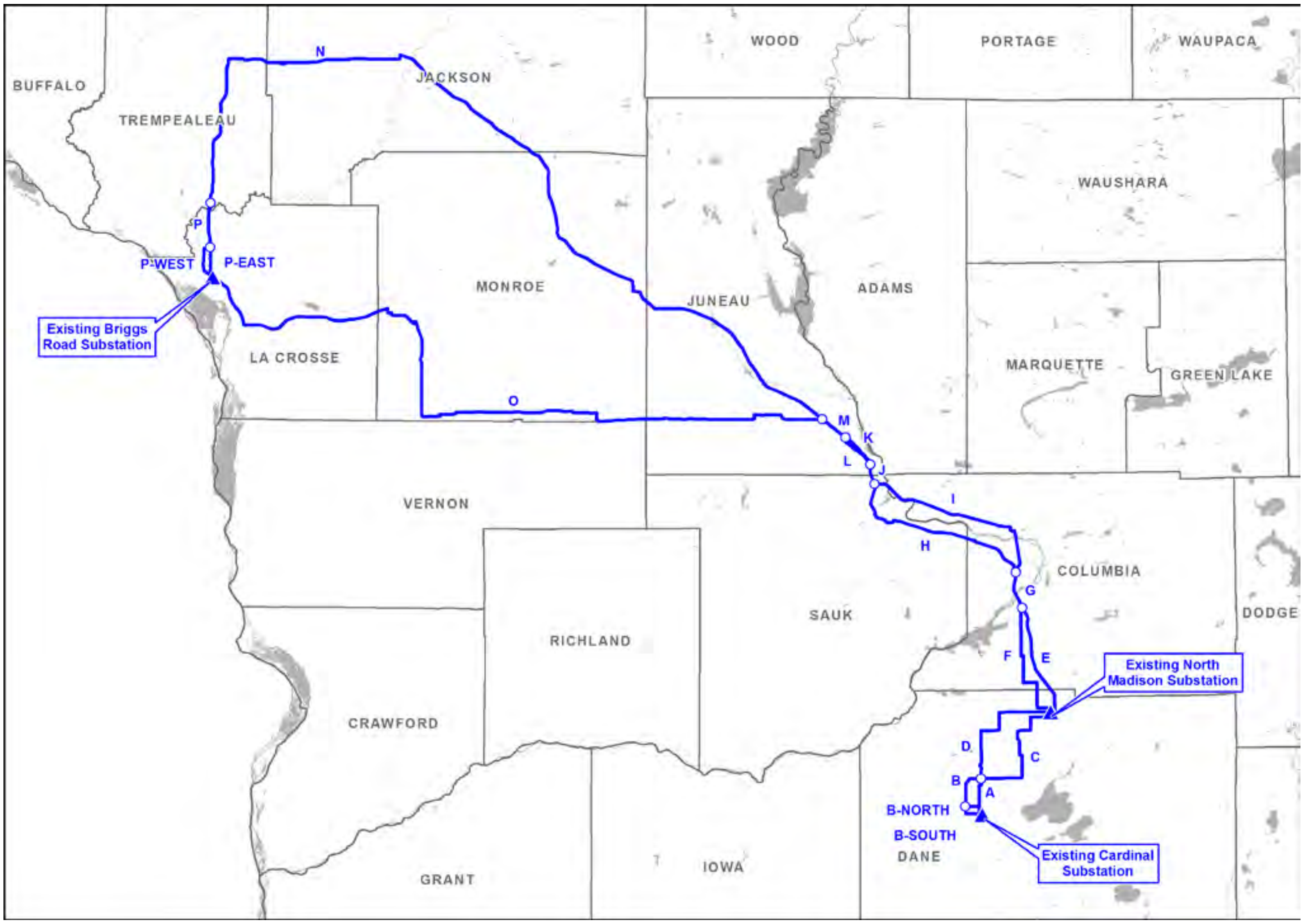
The applicants' stated purposes of the Badger-Coulee transmission line project are to: 1) improve electric system reliability locally and regionally; 2) deliver economic savings for Wisconsin utilities and electric consumers; and 3) expand infrastructure to support the public policy of greater use of renewables. A more detailed discussion of these needs is included in Chapter 3.

1.1.2. Project description

For the Badger-Coulee project, the applicants propose to construct and place into operation new 345 kV terminals at three existing substations: Briggs (town of Onalaska, La Crosse County), North Madison (town of Vienna, Dane County), and Cardinal (town of Middleton, Dane County). No new land acquisition is proposed for the substations. Routes identified in the application for the new 345 kV transmission line cross the counties of Columbia, Dane, Jackson, Juneau, La Crosse, Monroe, Sauk, Trempealeau, and Vernon and potentially involve some 77 municipalities and townships.

The route segments under consideration occupy every type of land use and resource including rural, urban, woodlands, wetlands, and rivers. Many of the proposed route segments share ROW with existing transmission lines, highway, and railroad corridors. Large portions of some route segments run cross-country and would require all new ROW.

Figure 1.1-1 Badger-Coulee route segments



Route alternatives for the proposed 345 kV transmission line are identified as Segments A through P and then further divided into subsegments. The routes are depicted in Volume 2 of this environmental impact statement (EIS). For most of the route segments, there are two segment alternatives. Three of the segments, Segments M, J, and G have no alternative and are referred to as common segments. There are seven chapters in this EIS, Chapters 6 through 11, that discuss in detail the different impacts associated with a set of route segment alternatives. The chapters and route segment alternatives are:

- **Chapter 6 - Segments P-N or Segment O**
  (Briggs Road Substation to just north of Lyndon Station)
  Segments P and N together are approximately 113 miles long and start at the Briggs Road Substation, currently under construction as part of the approved NSPW CapX2020 Alma-La Crosse 345 kV Transmission Project, commonly referred to as CapX (docket 5-CE-136).[1] The segments head north through the town of Holland and the village of Holmen, crossing a diverse area of existing and new residential developments, natural areas, schools, parks, and agricultural fields. The two segment options, P-east (Subsegments O0a and P11-P14) and P-west (Subsegments P0-P8) parallel each other, less than a mile apart. P-east travels north along USH 53 for much of its length. It also parallels but does not overlap the approved CapX transmission line ROW. P-west heads north through residential neighborhoods before turning east along STH 35

[1] PSC docket 5-CE-136 Final Decision dated May 30, 2012, PSC REF#: 165332.

to connect to the common part of Segment P. From STH 35, Segment P continues north primarily along the west side of USH 53.

Crossing the Black River into Trempealeau County, Segment N would be double-circuited with an existing transmission line through a rural landscape consisting of wooded hillsides and farmed hilltops and valleys. Routed around the village of Ettrick and the city of Blair, the segment turns eastward into Jackson County. Still double-circuited with an existing lower-voltage transmission line, the segment intersects with I-94, just north of Black River Falls. From there, it becomes single-circuited, sharing the WisDOT ROW along I-94 for the remainder of the segment. Segment N passes near to or through the outskirts of the municipalities of Warrens, Tomah, Oakdale, Camp Douglas, New Lisbon, and Mauston before ending just north of Lyndon Station.

The alternative to Segments P and N is the 85-mile-long Segment O. It travels south out of Briggs Road Substation, through the city of Onalaska, sharing ROW with USH 53. This first portion of the segment crosses a congested urban area crowded with many residential and commercial properties, highways, roads, and other utility corridors. Segment O then turns east along I-90 crossing the villages of West Salem, Bangor, and Rockland. Soon after entering Monroe County, the segment turns south along mostly new ROW, skirting the southern boundary of the village of Cashton, and then east headed towards I-90/94. East of Cashton, the segment requires all new ROW through an area with few opportunities for corridor sharing. The landscape is typified by steep-sided hills and narrow valleys supporting numerous creeks and springs. Small, irregularly-shaped agricultural fields dot the hilltops and narrow valleys. The segment continues east crossing the southern portion of the city of Elroy, Juneau County, where the landscape becomes more open and agricultural. The segment ends at the interstate, I-90/94.

- **Chapter 7 - Common Segment M and Segment K or L (just north of Lyndon Station to the Wisconsin Dells)**
  Segments N and O connect to common Segment M which at its southern end connects to either Segment K or L. The total length of either Segments M-L or Segments M-K is a approximately 7.5 miles long through Juneau County. These segments are located mostly in or overlapping interstate or railroad ROWs. Segment K is located east of Segment L along the interstate. Despite sharing ROW with these major transportation corridors, the proposed segments cross through largely wooded and undeveloped areas. The segments end near the Wisconsin Dells and connect to Segment J.

- **Chapter 8 - Common Segment J and Segment H or I (Wisconsin Dells to the town of Caledonia)**
  Segment J is a short segment that continues along the west side of I-90/94 and connects at its southern end to either Segment H or I. The combined lengths of Segments J-H or J-I are both approximately 24 miles. They start in Juneau County and cross into Sauk County, near the northern edge of the Wisconsin Dells. From there the segments run parallel, one north of the Wisconsin River and the other south of the River. The segments end at the intersection of I-90/94 and I-39.

  Segment H would be primarily new transmission ROW, partially overlapping parts of the WisDOT ROW. It crosses a mix of agricultural fields and restored natural landscapes including large contiguous blocks of diverse habitats owned/managed by the Department of Natural Resources (DNR), U.S. Fish and Wildlife Service (USFWS), and private entities. Segment I crosses through the business district of the Wisconsin Dells and then veers southeast, crossing the

Wisconsin River directly downstream of the Kilbourn Dam. In Columbia County, Segment I would be double-circuited with an existing electric transmission line adjacent to and southwest of a railroad through a mix of agricultural fields and natural landscapes. It then crosses to the east side of I-90/94 and crosses the Wisconsin River for a second time.

- **Chapter 9 - Common Segment G and Segment E or F**
  (town of Caledonia, Columbia County to the North Madison Substation, Dane County)
  Segment G is approximately 4.2 miles long and connects at its southern end to either Segment F or E. Segment G is located along the east side of I-39/90/94 and crosses the Wisconsin River. It traverses a level, mostly rural agricultural landscape, except near the Wisconsin River where wooded hills surround the river. Segment E is approximately 13 miles long and continues primarily along the east side of I-39/90/94. The segment shares ROW with the interstate and crosses agricultural fields. For its final two miles, the segment turns south, paralleling another major transmission line cross-country, to end at the North Madison Substation. Segment F is 15 miles long and is almost entirely new ROW that jogs cross-country south and east through a complicated mixed-use landscape of agricultural fields, wooded areas, and residential properties. The segment ends at the North Madison Substation.

- **Chapter 10 - Segment C or Segment D**
  (North Madison Substation to the town of Springfield)
  From the North Madison Substation in Dane County the route continues on either Segment C or D for a distance of approximately 15 miles through agricultural fields. Segment C is located east of Segment D. It jogs repeatedly east, west and south, mostly on new cross-country ROW. For a little over one-third of the segment, the new line would share ROW with existing lower-voltage lines. Segment D also travels west and south cross-country, but for the most part is double-circuited with an existing transmission line.

- **Chapter 11 - Segment A or B**
  (town of Springfield to the Cardinal Substation)
  Segments D and C connect to either Segments A or B. Segment A is east of Segment B. The segments start by crossing agricultural fields, but south of CTH K, the land use quickly changes into residential developments that are an outgrowth from the city of Middleton. Segment A is 4.6 miles long and is mostly double-circuited with an existing transmission line. Segment B is approximately 7.4 miles long and would require mostly new ROW. After the first 5.0 miles, Segment B can be routed along Option B-north (Subsegments B4a, A6b, A7, and A8) or Option B-south (Subsegments B3b, B4, and B5). Option B-north turns east from Segment B about three-quarters of a mile north of USH 14, across a wooded hillside, then follows the same route as Segment A into the Cardinal Substation. Option B-south continues south until reaching USH 14, where it would be double-circuited with an existing transmission line through the Black Earth Creek Wildlife Area. The segment then continues east along USH 14, before crossing the highway and ending at the Cardinal Substation.

1.1.3. Project cost and ownership

The overall cost of the project is expected to range between $540 and $580 million, depending on the final route/segments selected. Costs are discussed in detail in this EIS in Section 2.4 of Chapter 2.

This project would be jointly owned and operated by ATC and NSPW. ATC owns and operates transmission facilities in the eastern two-thirds of Wisconsin and much of the upper peninsula of

Michigan. NSPW is a subsidiary of Xcel Energy which owns and operates transmission facilities in Wisconsin, Minnesota, the Dakotas, Colorado, Kansas, Oklahoma, Texas, New Mexico and a small portion of the upper peninsula of Michigan.

In addition, the applicants anticipate three passive investors for that portion of the proposed transmission line between Briggs Road and the North Madison Substations. The passive investors would most likely be Dairyland Power Cooperatives (DPC), WPPI Energy (WPPI), and Southern Minnesota Municipal Power Agency (SMMPA). DPC is a not-for-profit transmission-generation cooperative based in La Crosse and serves 25 separate distribution cooperatives and 16 municipal utilities located in southern Minnesota, western Wisconsin, northern Iowa and northern Illinois. WPPI is a not-for-profit regional municipal power company based in Sun Prairie, Wisconsin and serving 51 customer-owned electric utilities in Wisconsin, Iowa, and the upper peninsula of Michigan and helping them share generation and other resources. SMMPA is a nonprofit political subdivision of the State of Minnesota and a joint action agency comprised of 18 member municipalities in Minnesota that own and operate municipal electric systems. SMMPA is based in Rochester, Minnesota. Passive investors would not be involved in project management responsibilities or have any day-to-day operational control of facilities.

The applicants state that precise investment arrangements are still being determined. The anticipated percentage ownership of each owner and investor is provided in the Table 1.1-1, below.

Table 1.1-1 Potential project ownership interests

Participating Entity	Ownership Percentages			
	Briggs Road Substation Improvements	Cardinal Substation Improvements	Transmission Line Between Briggs Rd. and North Madison Substations	Transmission Line Between North Madison and Cardinal Substations
ATC		100	50	100
NSPW	100		37	
DPC			5.0	
SMMPA			6.5	
WPPI			1.5	

1.1.4. Proposed construction schedule

Provided the project is granted a CPCN by the Commission and all state and federal approvals and permits are granted, the applicants anticipate construction to start on the transmission line in July 2016 and on the substations in April 2017. Their expected in-service date for the project is December 2018.

The Commission has the final authority to certify whether and how the project may be built (see Section 1.2).

1.2. ROLE OF THE PUBLIC SERVICE COMMISSION OF WISCONSIN

1.2.1. Approval, denial, or modification of this proposed project

The Commission has the authority to approve, deny, or modify any and all facilities proposed in the Badger–Coulee Project application. If the project is approved, the Commission will select the route and design for the proposed transmission line.

1.2.2. Commission considerations

Compared to other state agencies, the regulatory interests of the Commission in reviewing this proposed transmission project are quite broad. These interests cover the need for the project, the project cost and electrical performance, and the project's short- and long-term environmental and social impacts (other than those specifically under DNR permit).

1.2.2.1. Certificate of Public Convenience and Necessity law

Wisconsin Statute (Wis. Stat.) § 196.491(3) requires the Commission to make all of the following determinations before approving construction of a major transmission line:

- Under Wis. Stat. § 196.491(3)(d)2, the proposed facilities must satisfy the reasonable needs of the public for an adequate supply of electric energy.
- Under Wis. Stat. § 196.491(3)(d)3, the facilities must be in the public interest, considering: alternative sources of supply, alternative locations or routes, individual hardships, engineering factors, economic factors, safety, reliability, and environmental factors.
- Under Wis. Stat. § 196.491(3)(d)3r, if the high-voltage transmission line is proposed to increase the transmission import capability into this state, existing ROW must be used to the extent practicable, and the routing and design must minimize environmental impact in a manner that is consistent with achieving reasonable electric rates.
- Under Wis. Stat. § 196.491(3)(d)3t, the 345 kV line must provide usage, service, or increased regional reliability benefits to the wholesale and retail customers or members in this state, and the benefits of the line must be reasonable in relation to the cost of the line.
- Under Wis. Stat. § 196.491(3)(d)4, the facilities must not have undue adverse impact on environmental values such as, but not limited to: ecological balance, public health and welfare, historic sites, geological formations, aesthetics of land and water, and recreational use.
- Under Wis. Stat. §§ 196.491(3)(d)5 and196.49(3)(b), the facilities must not substantially impair the efficiency of the applicants' service or reasonably exceed the applicants' probable future requirements, and the value or available quantity of service the facilities provide must be proportionate to their cost.
- Under Wis. Stat. § 196.491(3)(d)6, the facilities must not unreasonably interfere with the orderly land use and development plans for the area involved.
- Under Wis. Stat. § 196.491(3)(d)7, the facilities must not have a material adverse impact on competition in the relevant wholesale electric service market.

1.2.2.2. Required priorities for meeting energy demands

In addition to the above statutory determinations, the Commission must address the priorities in Wis. Stat. §§ 1.12 and 196.025. These laws require the Commission to give priority to specific methods of meeting energy demands to the extent these methods are "cost-effective and technically feasible." The Commission must consider options based on the following priorities, in the order listed, for all energy-related decisions:

- Energy conservation and efficiency
- Noncombustible renewable energy resources
- Combustible renewable energy resources
- Nonrenewable combustible energy resources, again in the order listed:
    - Natural gas

- Oil or coal with a sulfur content of less than one percent
- All other carbon-based fuels

If the Commission finds that any of these statutorily preferred options, or a combination of these options, constitutes a cost-effective and technically feasible alternative to the project, the Commission must reject all or a portion of the project as proposed.

1.2.2.3. Required priorities for electric transmission corridors

Wisconsin Stat. § 1.12(6) also directs the Commission to consider corridor sharing opportunities when reviewing transmission facility projects. The statute states that, when siting new electric transmission facilities, it is the policy of the state to attempt to share existing corridors to the greatest extent feasible. However, when selecting existing corridors to share, the Commission must determine that corridor sharing is consistent with economic and engineering considerations, reliability of the electric system, and protection of the environment. When feasible, corridors should be utilized in the following order of priority:

a. Existing utility corridors
b. Highway and railroad corridors
c. Recreational trails, to the extent that the facilities may be constructed below ground and that the facilities do not significantly impact environmentally sensitive areas
d. New corridors

1.2.3. Interagency relationships in the PSC process

Commission staff routinely consult with various government regulatory agencies to better understand the potential impacts of a project. However, certain Wisconsin departments are more integrated into the preparation of this EIS. These include the Department of Natural Resources (DNR) which is by law a co-author of the EIS, the Department of Transportation (WisDOT), the Department of Agriculture, Trade and Consumer Protection (DATCP), and the Wisconsin Historical Society (WHS). The related responsibilities of these agencies are described briefly in Section 1.4 and integrated into the impact discussions later in the document, where appropriate.

1.2.4. Intervenors in the PSC process

A number of organizations, local government offices, utilities, and community groups have requested to "intervene", to become parties to the docket before the Commission. The intervenors in this docket are:

- Clean Wisconsin
- Midwest Independent Transmission System Operator, Inc. (MISO)
- Save Our Unique Lands of Wisconsin (SOUL)
- Concerned Citizens of Highway 33
- Jane and Stephen Powers
- Wind on the Wires (WOW), Fresh Energy, and the Izaak Walton League of America-Midwest Office (IWLA)
- Dane County
- Environmental Law and Policy Center (ELPC)
- Town of Holland
- Citizens' Energy Task Force (CETF)

- Citizens' Utility Board (CUB)
- Patricia A. Conway
- Town of Middleton
- Anthony J. Kampling
- Holland Neighborhood Preservation Association (HNPA)
- City of Onalaska
- Dairyland Power Cooperative (DPC)
- WPPI Energy (WPPI)
- Southern Minnesota Municipal Power Agency (SMMPA)
- Wisconsin Business and Labor Intervener Group (WBLIG)
- Nick Hansen
- Jeffrey Hansen and Rita Hansen
- Laura Kunze

Under Wis. Stat. § 196.31 and Wis. Admin. Code ch. PSC 3, the Commission may compensate any organization or individual for the cost of participating in its proceedings if all of the following conditions are met:

- The intervening organization or individual is a customer of the utility that is the subject of the proceeding or is someone who may be materially affected by the proceeding's outcome.
- The intervening organization or individual must have been granted full party status and will participate as such in the proceeding.
- Without compensation, the intervenor would experience "significant financial hardship."
- Without compensation for the intervenor, an interest that is material to the proceeding would not be adequately represented.
- The intervenor's interest and position must be represented to result in a fair determination in the proceeding.

1.3. PUBLIC INVOLVEMENT

Public involvement and comments throughout the review process also contribute to the Commission's analysis of the impacts of a proposed project. Public input is received through:

- Written and spoken comments from public information meetings sponsored by the applicants
- Written or public comments solicited by the Commission at environmental scoping meetings
- Phone calls and written comments received prior to completion of the final EIS
- Written and oral comments on the draft EIS
- Testimony at public hearings

1.3.1. Applicant-sponsored meetings

Prior to submitting its CPCN application to the Commission, the applicants sponsored a series of public information meetings throughout the project area beginning in September 2010 and continuing periodically until October 2012. These meetings were held to solicit input on possible routes studied and considered by the applicants. The applicants informed the Commission staff about these meetings and about their results. Comments from these meetings were provided to the PSC as part of their application. Those meetings were not attended by Commission staff.

1.3.2. Commission-sponsored meetings

After the application was submitted and declared complete on April 30, 2014, the PSC, DATCP, and DNR held a series of public open-house meetings as part of the scoping process for preparation of the draft EIS. During the meetings, Commission staff worked to clarify the state review process of the application and requested comments from the public about the project. The Commission also solicited comments in a letter sent on May 12, 2014, to interested and affected persons, towns, counties, and municipalities. Throughout the time Commission staff was preparing the draft EIS, comments and questions have been received at the Commission by first-class mail, e-mail, telephone, and through the PSC website.

Following the release of this draft EIS, a 45-day comment period will begin. Written or verbal comments may be made to staff until the comment period closes. After the 45-day comment period, Commission staff will prepare a final EIS considering comments received on the draft EIS.

The Commission's review process focuses on gathering, organizing, and analyzing information for technical and public hearings. A period of at least 30 days will occur between the issuance of the final EIS and the opening of the public hearing for this case. This period will allow the public and government agencies the opportunity to review the final EIS prior to the hearings so that they can prepare appropriate, informed, and useful written or oral testimony.

Testimony received during the public hearings will become part of the case record. The Commission will approve, reject, or modify the applicants' proposal based on its reading and discussion of the case record. At the hearing sessions, a court reporter will record the oral and written testimony presented by Commission staff, utility staff, staff of other agencies, representatives of intervening organizations, and the public. The final EIS will be entered into the hearing record as a portion of Commission staff's testimony. At this time, the public and technical hearings for this project proposal are expected to occur in December 2014 and January 2015, respectively. An official notice that includes specific times for these hearings will be mailed to members of the entire project mailing list when the final EIS is issued.

1.4. ROLE OF OTHER STATE AGENCIES

Commission staff consults with other state agencies to gain information about resources in the project areas and to assess the potential impact on these resources. As stated above, four state agencies have important responsibilities as part of the overall review of the proposed project.

1.4.1. Department of Natural Resources

DNR enforces provisions of Wis. Stat. ch. 30 on navigable waters, harbors, and navigation, and is reviewing an application from the utilities for impacts to waterways and wetlands in addition to construction site erosion control. Stormwater permits must be obtained under Wis. Admin. Code ch. NR 216 and NR 151. Connected with this permitting, DNR will also process Incidental Take Authorization for Endangered or Threatened Species as needed under Wis. Stat. § 29.604, depending on the route approved.

As part of its review, DNR consulted with the applicants regarding the range and methods to be used for bird-related studies. Based on these discussions, the applicants conducted three bird surveys, including a bald eagle nest inventory and monitoring survey, a red-shouldered hawk broadcast call survey in areas of suitable habitat, and a breeding songbird point count along some portions of the proposed routes. The bald eagle study was conducted in the spring of 2013 and studied nest sites identified in the DNR database as well as those identified by the public. The red-shouldered hawk survey was conducted in DNR-approved locations of potential hawk habitat (Segments N, H, and I) during the first part of May 2013. The breeding bird survey was conducted in May through mid-July of 2013 at survey stations along Segments N and O.

DNR works with the U.S. Army Corps of Engineers (USACE) and USFWS as well as with the Commission.

The PSC and DNR are required under Wis. Stat. § 196.025(2m)(b)1. and 3. to prepare this final EIS cooperatively and include all of the information needed by both agencies to carry out their respective duties under Wis. Stat. § 1.11 (Wisconsin Environmental Policy Act – Governmental consideration of environmental impact). These two agencies are co-authors of this EIS, with the Commission as the lead agency.

1.4.2. Department of Agriculture, Trade and Consumer Protection

The Department of Agriculture, Trade and Consumer Protection (DATCP) has responsibilities to farm landowners that begin after a CPCN is issued and easement negotiations have commenced. Under Wis. Stat. § 32.035(4), DATCP must prepare an agricultural impact statement (AIS) if the project involves the potential exercise of the power of eminent domain and if more than five acres of any farm operation could be taken. When an AIS is prepared, it is made available to farm land owners to aid them in easement negotiations. DATCP and PSC staffs have consulted and cooperated during the review of this project.

Both permanent and temporary impacts of the Badger-Coulee project will be described in the AIS. DATCP staff have identified the types of soils within the potential transmission line corridors that could be affected by construction of the project. Questionnaires have been sent to farmland owners who could have four or more acres of ROW on their agricultural land. In total, 130 farmland owners were surveyed. The information gathered from these questionnaires will help identify potential impacts on individual farms. Those individual impacts will, in turn, allow DATCP staff to describe the broader picture of the project's overall impacts on agriculture.

The Badger-Coulee AIS will include descriptions of the project, the agricultural setting of the counties within the project limits, a list of the acreage and description of all land lost to agricultural production and all other land with reduced productive capacity, the construction process, segments and associated landowner comments, impacts on agriculture, and recommendations. In addition, the AIS must include DATCP's analyses, conclusions, and recommendations concerning the agricultural impacts of the project.

When the AIS for this project is completed, its executive summary will be included in the Final EIS and the full document will be available on DATCP's website[2].

Currently, the AIS for this project is still being drafted; however, its table of contents is included in Appendix D of this EIS.

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[2] DATCP website that will have the AIS:
http://datcp.wi.gov/Environment/Agricultural_Impact_Statements/Current_Projects/index.aspx

1.4.3. Wisconsin Department of Transportation

1.4.3.1. WisDOT authority

Under Wis. Stat. § 86.07(2), WisDOT controls whether and how utility facilities and access driveways may be constructed/located on highway ROW. Under Wis. Stat. § 86.16, utilities may locate their facilities along and across highway ROW with the written consent of the maintaining jurisdiction. The maintaining jurisdiction would be WisDOT and its regional offices for the state trunk highway system. The state trunk highway system includes state highways, federal highways, and the Interstate System, and WisDOT is the maintaining authority for the entire system. WisDOT also has federal obligations under 23 USC 111 and 23 CFR 645. This includes maintaining a Utility Accommodation Policy, which is approved by the U.S. Federal Highway Administration (FHWA), and the protection of scenic easements from above-ground construction of any type under federal law.

WisDOT and PSC have a Cooperative Agreement and liaison procedures to ensure that, whenever practical, existing transportation or transmission corridors are used for new electric transmission facilities instead of new corridors.

1.4.3.2. Project constructability report

The construction of transmission lines along highway corridors presents issues that need to be addressed and coordinated with WisDOT. This project proposes to construct transmission structures and transmission ROWs on many WisDOT-controlled ROWs. In agreement with WisDOT, the applicants have prepared a preliminary constructability report to document issues associated specifically with the Badger-Coulee project and to help WisDOT prepare a letter of understanding that addresses this project. The preliminary constructability report can also help expedite the WisDOT permitting process if the Commission authorizes the project and selects a route.

In addition to reviewing constructability issues associated with existing highway facilities, the applicants also have factored WisDOT's future highway expansion plans into their route selection and alignments. This process has helped to make the applicants aware of WisDOT highway expansion projects near the proposed segments and has been used by the applicants to help develop alternative alignments in WisDOT corridors.

The preliminary constructability report has been submitted to WisDOT for review and comment, but WisDOT's final response has not yet been received by the applicants. However, the applicants' state that, based on their consultations with the WisDOT, they anticipate that WisDOT will provide overall acceptance of the shared corridors because the project routes already incorporate adjustments made to respond to WisDOT's future expansion plans and routes through selected interchanges. The applicants have indicated that, if the project is approved by the Commission, they will meet with WisDOT, discuss any remaining concerns, and incorporate the resolutions to these concerns in the Project's detailed engineering. Once detailed engineering is completed, the applicants will submit a final constructability report to WisDOT.

The Badger-Coulee transmission line project shares or crosses WisDOT ROW on almost all segments.

1.4.3.3. WisDOT scenic easements

WisDOT holds several scenic easements along I-94 in Jackson County that would be crossed by Segment N of this project. These scenic easements exist because WisDOT sold the adjoining remnant parcels but retained scenic easement rights to prevent the occurrence of structures, billboards, junkyards and other potentially unsightly items. Three of these easements restrict the applicants' ability to use the land for this project within different distances from the highway corridor. The applicants have worked directly with WisDOT to determine how to route the transmission line through these areas. For more information about the location of these easements and the alternative centerline approaches, see Section 6.1.5.2.

1.4.4. Wisconsin Historical Society

Under Wis. Stat. § 44.40, the Commission must determine if a requested action is going to affect historic properties listed with the Wisconsin Historical Society (WHS). Historic properties include archeological, architectural, and other historical cultural resources. The Commission, like all Wisconsin state agencies, must report to WHS on potential impacts of the proposed project to listed historic properties. WHS determines if those impacts would be adverse and provides direction to the Commission for avoiding or reducing the impacts. If sites must be protected or their impacts mitigated as part of a proposed project, the Commission must enforce those mitigation measures in any certification of the project.

WHS also has federal obligations. WHS is the home of the Wisconsin State Historic Preservation Officer (WSHPO), who provides direction to federal agencies complying with Section 106 of the National Historic Preservation Act (NHPA) in Wisconsin. There is federal agency interest in this project, as described in the next section of this EIS. The requirements of Section 106 for the federal agencies supersede but do not eliminate the requirements of Wis. Stat. § 44.40 for the Commission. They often are more stringent than state law requirements and are enforced directly by the federal agency that has the interest. WHS may require a field survey of any federal area of potential effect. If something is found, it may require a more detailed survey to determine the significance of the find and its eligibility for entry into the National Register of Historic Places. After significance is determined, the federal agency and the applicant must negotiate with WHS to avoid or reduce adverse effects of the project on that historic resource. Other persons or entities with an interest in the historic resource must be identified so that they can join the Section 106 process as consulting parties. Resolution of all Section 106 requirements might not be completed at the time of the Commission hearing on this project.

In the case of Badger-Coulee, the applicants retained a "qualified archaeologist" as defined by the U.S. Secretary of the Interior,[3] to conduct an assessment of previously inventoried above-ground architectural and historic resources and burial sites in the areas potentially affected by the proposed project. This consultant has provided information and recommendations[4] that have, in turn, been made into recommendations to the Commission by WHS under Wis. Stat. § 44.40. The potential impacts to the resources and the WHS recommendations are discussed in the appropriate chapters for the different segments in this EIS.

1.5. ROLE OF FEDERAL AGENCIES

USFWS, USACE, NRCS, NPS, and FAA each have responsibilities related to construction of the proposed project. Table 1.5-1 summarizes the different federal interests.

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[3] Archaeological Consultants that are qualified archaeologists under the U. S. Secretary of Interior's professional qualification standards. http://www.wisconsinhistory.org/Content.aspx?dsNav=N:4294963828-4294963805&dsNavOnly=N:1215&dsRecordDetails=R:CS2835

[4] Commonwealth Cultural Resources Group, Inc. *A Cultural Resources Assessment of the Proposed Routes of the Badger Coulee Transmission Line Project*. August 2013.

Table 1.5-1 Federal Interests in this Project

Agency	Responsibility	Status
U.S. Fish and Wildlife Service (USFWS)	Protection of federally listed endangered and threatened resources. Protection of Bald Eagles under the Bald and Golden Eagle Protection Act. Approval for crossing USFWS-owned property. Crossing of properties with USFWS easements	Coordination of species issues. Review ongoing. 2/26/14 USFWS rejected applicants' ROW request. To be negotiated after Commission decision.
U.S. Army Corps of Engineers (USACE)	Section 404 permits to construct in wetlands. Archeological review under Section 106 National Historic Preservation Act. Approval of constructing in navigable waterways under Section 10 of Rivers and Harbors Act.	Permit to be applied for after Commission decision. Cultural resource review to be submitted after Commission decision Permit to be applied for after Commission decision.
Natural Resource Conservation Service (NRCS)	Review of new impacts on properties with NRCS easements	To be negotiated after Commission decision.
National Park Service (NPS)	Review of new impacts to properties that were purchased to some degree with federal grants under the Land and Water Conservation Act (LAWCON)	Preliminary applications for the LAWCON properties submitted to DNR 6/27/14.
Federal Aviation Administration (FAA)	A determination for permissible heights of towers and lines near airports.	Preliminary FAA determinations completed. After Commission decision, any required notices will be refiled.

One of the federal agencies will take the lead role in meeting the federal environmental review requirements under the National Environmental Policy Act (NEPA) for the proposed project. The lead agency will solicit comments on the project from other federal agencies and may prepare an environmental assessment or an environmental impact statement. This process will likely not be initiated until after the Commission makes its final decision. If draft permits are issued at the federal level, the lead agency would likely hold public hearings.

1.6. COUNTY AND LOCAL GOVERNMENTS

County and local governments have numerous concerns that can be addressed during the PSC project review. Local governments have written seeking to minimize adverse impacts on the local communities that they are charged to manage and protect. They attempt to ensure that the routes and design of the proposed transmission facilities meet local agency standards and permitting requirements and conform to local ordinances and zoning regulations. They also provide information including land use plans, county forest plans, watershed management plans, recreational plans, and agricultural extension programs.

Before the CPCN can be issued, the Commission, under Wis. Stat. § 196.491(3)(d)6, must determine that, "The proposed facility will not unreasonably interfere with the orderly land use and development plans for the area involved." However, after a project is approved, under Wis. Stat. § 196.491(3)(i):

> "If installation or utilization of a facility for which a certificate of convenience and necessity has been granted is precluded or inhibited by a local ordinance, the installation and utilization of the facility may nevertheless proceed."

This statute restricts the ability of local governments to block a project through a local ordinance if the project has received a CPCN. The first statutory reference indicates that the Commission must be aware of potential conflicts with existing local ordinances, zoning, or land use plans when making its final decisions about the project.

While not applicable under Wis. Stat. § 196.491(3)(i), all counties crossed by this proposed project regulate ground disturbing activities under shoreland ordinances. Dane County and Trempealeau Counties have erosion control and stormwater management ordinances that would have applied to certain ground disturbing activities. In addition, Trempealeau County also has a comprehensive zoning ordinances that might have addressed a number of other resources of environmental significance.

The applicants state that they took steps to reach out to all local units of government located in the study area through mailings, phone calls/conversations, one-on-one meetings, and presentations to local officials and staff, as well as with other potentially affected interests. Further, the applicants state that they would apply for those permits and other authorizations governed by local ordinances (county, town, village or city) that involve matter of public welfare and safety. These permits generally include road crossing permits, road weight limits, noise abatement ordinances, and other similar public safety concerns.

Many local governmental offices have commented during the pre-application process and during the preparation of this EIS. Resolutions adopted by a majority of local governments were forwarded to Commission staff, as have letters requesting PSC studies and describing their cultural and natural resources. Issues expressed by local governments include concerns over the need for the project and the potential impacts on their communities' electric rates, health, economic growth, and natural resources.

During the pre-application process, the PSC has received approximately 182 letters, comments, and resolutions from approximately 100 different units of government; some submitting more than one resolution and comment. The following table, Table 1.6-1 contains a list of all local units of government and government entities that submitted pre-application comments, the date and type of communication received, and the PSC REF (Electronic Regulatory Filing system (ERF)) number (if appropriate). Additional comments and resolutions have been received during the EIS Scoping Period.

Table 1.6-1 Pre-application Badger-Coulee comments from units of government (June 2010 through April 2014)

Political Entity	Date	PSC REF Number* (ERF)	Type of Comment
Amberg, town	9/11/12	173001	Resolution
Arlington, town	6/11/12	167110	Resolution
Baraboo, city	6/11/12		Resolution
Baraboo, town	6/17/11, 2/17/12, 8/13/12, 11/12/12, 4/16/14	159292, 170544	Resolutions and Letters
Bergen, town	12/28/11, 4/23/12	157641, 163593	Resolutions
Big Falls, town	9/26/12	173033	Resolution
Buena Vista, town	4/19/12	163446	Resolution
Burns, town	8/23/12	170733	Resolution
Camp Douglas, village	8/17/12	170384	Resolution
Cashton, village	1/2/13		Resolution
Catawba, town	6/24/12	167111	Resolution
Cazenovia, village	9/3/12	171345	Resolution
Christiana, town	10/28/11, 6/6/12	167121	Resolution and Letter
Clinton, town	1/30/12, 9/25/12, 3/24/14	158788, 173019, 201264	Resolutions and Letter
Coon, town	11/14/11		Resolution

Political Entity	Date	PSC REF Number* (ERF)	Type of Comment
Crawford Stewardship Project	2/27/12	160265	Resolution
Crawford, county	11/7/12	176094	Resolution
Dane, town	9/26/12, 4/14/14	173030	Resolution and Letter
Dane, village	6/19/12	166849	Resolution
Dayton, town	4/20/12	163565	Resolution
Dekorra, town	10/9/12	174280	Resolution
Dellona, town	11/29/11, 3/28/12	156319, 162181	Resolutions
Delton, town	9/25/12, 3/27/14	172977	Resolution and Letter
Eagle, town	4/20/12	163566	Resolution
Ellenboro, town	9/3/12	171349	Resolution
Excelsior, town	2/28/12		Letter
Farmington, town	10/13/11	173057	Resolution
Ford, town	9/3/12	171340	Resolution
Forest, town	6/6/12, 6/24/12, 7/11/12	167121, 167112, 168243	Resolutions and Letters
Fountain, town	9/25/12	172963	Resolution
Garden Valley, town	7/25/12	168929	Resolution
Georgetown, town	9/3/12, 11/13/12	171347, 176795	Resolution and Letter
Glendale, town	5/24/12		Letter
Goodman, town	11/7/12	176076	Resolution
Greenwood, town	12/28/11, 9/26/12, 3/31/14	157640, 173028, 201264	Resolutions and Letter
Harmony, town	9/3/12	171346	Resolution
Hawkins, town	5/3/12	164168	Resolution
Hillsboro, town	3/8/12, 9/3/12	171348	Resolution
Holland, town	9/30/13, 1/3/14, 3/31/14, 4/7/14	195055, 201264, 201656	Letters and Petitions
Irving, town	6/24/10	167113	Resolution
Ithaca, town	6/24/12	167114	Resolution
Jackson, county	5/24/12, 9/4/12	171352	Resolutions
Jefferson, town	4/16/12, 6/6/12, 6/24/12, 4/21/14	163319, 167121, 167115	Resolutions and Letters
Juneau, county	9/3/12, 10/2/12, 4/3/14	171335, 173664	Resolutions and Letters
Kickapoo, town	5/3/12, 4/25/14	164155	Resolution and Letter
Kildare, town	9/25/12, 4/3/13	172974	Resolution and Letter
Knox, town	9/5/12	171575	Resolution
La Crosse, county	12/21/11, 11/15/12, 12/19/13	176497	Resolutions and Letter
La Valle, town	6/15/11, 3/15/12, 12/24/12	157891, 161323, 178136	Resolutions and Letter
Lena, town	9/3/12	171341	Resolution
Lemonweir, town	6/24/12, 4/21/14	167116	Resolution and Letter
Leon, town	7/12/12	168271	Resolution
Liberty, town	12/28/11, 4/23/12	157619, 163587	Resolutions
Lindina, town	10/9/12, 3/17/14	174279, 201264	Resolution and Letter
Lisbon, town	8/18/12, 11/16/12, 3/26/14	170463, 176630, 201264	Resolution and Letters
Little Falls, town	9/29/11		Letter
Lyndon Station, village	11/15/11, 5/7/12, 9/10/12, 11/28/12, 3/9/14	166561, 171764, 177037, 201264	Letters and Resolutions
Lyndon, town	9/3/12	171342	Resolution
Manchester, town	7/5/12, 9/3/12	171336	Resolutions and Petitions

Political Entity	Date	PSC REF Number* (ERF)	Type of Comment
Mauston, city	10/15/12, 11/7/12	176075	Resolutions
Melrose, town	9/3/12	171339	Resolution
Meteor, town	5/3/12	164164	Resolution
Middleton, town	12/15/11, 7/18/12	157083, 168537	Letters
Millston, town	8/16/12	170229	Resolution
Mineral Point, town	3/17/14	200524	Resolution
Monroe, county	4/12/12	163892	Resolution
Murry, town	5/3/12	164165	Resolution
North Bend, town	9/3/12	171338	Resolution
Onalaska, town	6/18/12, 9/5/12, 11/26/12	168799, 171560, 176980	Resolutions and Letter
Onalaska, city	6/18/12	168799	Resolution
Orange, town	9/25/12	172966	Resolution
Pembine, town	10/26/12	173016	Resolution
Portland, town	6/24/12	167117	Resolution
Poynette, village	4/6/12, 11/21/12	162918, 176892	Resolution and Letter
Prentice, town	5/3/12	164154	Resolution
Reedsburg, city	1/25/12	158610	Resolution
Reedsburg, town	5/29/12		Resolution
Richland, county	1/31/12		Resolution
Ridgeville Plannning Commission	11/21/11		Letters
Ridgeville, town	12/15/11, 8/23/12, 12/26/12, 4/25/14	157100, 170731, 178153	Resolutions and Letters
Roosevelt, town	5/3/12	164174	Resolution
Sauk, county	1/27/12	158769	Resolution
Seven Mile Creek, town	9/26/12	173042	Resolution
Sheldon, town	9/3/12	171350	Resolution
South Lancaster, town	9/26/12	172978, 173000	Resolutions
Sparta, city	4/16/12	163310	Resolution
Sparta, town	7/24/12	168827	Resolution
Spring Green, town	10/25/12	172976	Resolution
Springfield, town of Dane County	6/24/12, 11/15/12, 3/24/14	167118, 176768, 201264	Resolution and Letters
Stark, town	3/21/11, 4/21/11, 10/6/11, 10/31/11, 11/17/11, 4/23/12, 6/6/12, 3/31/14	155806, 156038, 163594, 167121, 201264	Petitions, Resolutions, and Letters
Sterling, town	4/23/12	163578	Resolution
Summit, town	11/7/12	176088	Resolution
Troy, town	3/15/12	161324	Resolution
Union, town	1/12/12, 2/17/12	158150, 159855	Resolution and Letter
Vernon, county	8/25/11	171353	Resolution
Viroqua, town	7/8/11, 4/23/12, 6/6/12, 11/19/12	163583, 167121, 176769	Resolutions and Letters
Webster, town	12/28/11, 4/23/12, 6/6/12, 3/24/14	157620, 163584, 167121, 201264	Resolutions and Letters
Wellington, town	5/3/12	164156	Resolution
Wells, town	6/24/12, 3/20/14	167119, 201264	Resolution and Letter
Wheatland, town	9/4/12	171351	Resolution
Whitestown, town	1/30/12, 4/23/12, 6/6/12, 4/11/14	158789, 163586, 167121	Resolutions and Letters
Wilton, town	2/27/12		Resolution
Winfield, town	10/5/11		Letter
Wingville, town	5/3/12	164153	Resolution

Political Entity	Date	PSC REF Number* (ERF)	Type of Comment
Wonewoc, town	6/24/12, 3/14/14	167120, 201264	Resolution and Letter
Woodland, town	9/27/11	158637	Letter
Wyoming, town	9/25/12	172973	Resolution

*Note: The Commission does not typically post to the PSC website (Electronic Regulatory Filing system (ERF)) comments that are submitted outside of a comment period. Comments with ERF REF numbers were uploaded onto the PSC web site by the commenter, themselves. Comments that have no identified PSC ERF number were submitted by e-mail or U.S. mail.

CHAPTER

2

2. Proposed Project

2.1. PROJECT DESIGN

2.1.1. Transmission structures and configurations

The applicants propose to use a number of structure types and configurations to accommodate the wide range of environments encountered by this project. Most of the transmission poles would be self-supporting, monopole structures, though H-frames are proposed for some locations. The poles would have either a weathering steel finish (weathers to a deep dark brown color) or a galvanized coating (gray color). In general, structure heights for this project would range from 80 to 180 feet tall with a distance of 500 to 2,300 feet between structures. Appendix A, Figures 1 through 7 are diagrams of typical structure configurations identified in the project application.

Conductors strung on single-circuit structures that are designed to accommodate the straight portions of the route (referred to as tangent structures) and structures designed to handle small angles to the alignment (0° to 12°) typically would be in a delta configuration as shown in Appendix A, Figure 1. Where the available ROW width is limited, the conductors could be constructed in a vertical configuration as shown in Appendix A, Figure 2. Single-circuit medium-angle, large-angle, and dead-end structures would also typically use the vertical configuration similar to the diagram shown in Appendix A, Figure 3. Where the proposed 345 kV line would be double-circuited with a lower-voltage transmission line, a vertical configuration (Appendix A, Figures 4 and 5) would be constructed. In some cases and in some locations, the lower-voltage line is proposed to be underbuilt on the new 345 kV line (Appendix A, Figure 6). H-frames (Appendix A, Figure 7) are proposed in some locations which allow for longer span lengths without creating taller structures. The horizontal configuration of the conductors on H-frame structures minimizes impacts to birds during flight and may have aesthetic benefits (see Section 2.3.4 for discussion of impacts to bird flight).

For portions of the route that would be single-circuited, the conductors would be supported by porcelain or glass insulators in a V-string or I-string configuration. Where the proposed line would be double-circuited with an existing lower-voltage electric line, a mixture of porcelain or glass string assemblies or polymer braced post assemblies would be used for the lower-voltage circuit.

The proposed transmission line would be energized at 345 kV. The applicants propose to use vertically bundled pair of TP-477 kilo circular mils ACSR (Aluminum Conductor Steel Reinforced) (Hawk) conductors for each phase of the 345 kV circuit. The mid-span conductor height would be highly variable because of topography. However, in general, the minimum height of the bottom conductor at mid-span would be about 27 feet above the ground surface.

All segments would use two shield wires to help protect the phase conductors from lightning strikes. Depending on the line configuration, the two shield wires may consist of one standard steel stranded wire and one steel and aluminum stranded wire containing a 48-fiber optic bundle core (generally known as optical ground wire or OPGW) or two OPGWs. OPGW allows both lightning protection and a communication path between substations.

2.1.2. Foundations

2.1.2.1. Traditional foundations

Two types of structure foundations would be primarily used for this project, direct embedded and reinforced concrete caissons. Direct embedded structures tend to be more economical than concrete foundations and are typically used for tangent and small angle structures. Soil conditions would determine the appropriate foundation type and the required dimensions of the drilled hole. Where poor soils conditions are encountered, deeper and wider excavations would be necessary.

For direct embedded structures, the excavated holes would range from 3 to 6 feet in diameter and 20 to 30 feet in depth. The integrity of the hole may be protected with the installation of a permanent culvert. After the hole is excavated to the required depth and the embedded portion of the steel structure is inserted into the hole, the structure is plumbed and the hole is backfilled with a granular engineered material which is compacted in lifts until reaching the ground surface. Direct-embedded poles do not use concrete foundations.

For reinforced concrete caissons, the excavated holes would range from 5 to 12 feet in diameter and 20 to 60 feet in depth. The volume of the holes is anticipated to average between 30 and 60 cubic yards but may be in excess of 150 cubic yards at several of the largest foundations. After the hole is drilled to the required depth, concrete caissons are formed using a rebar and anchor bolt cage that is placed into the excavation, and the hole is filled with concrete. After the caisson is allowed to cure, the structure is bolted onto the exposed anchor bolts. General steps for the installation of this type of foundation are described in Sections 4.4.3 and 4.4.4 of Chapter 4. Photos of typical foundation construction activities can be found in the following figures in Volume 2 of this EIS: Figure Vol. 2-14, 2-16, and 2-19 for drilling and augering the hole; Figure Vol. 2-20 through 2-22 for installing the foundation; and Figure Vol. 2-27 and 2-28 for installing the structure on the foundation.

All construction materials, equipment, and labor would be brought to remote foundation sites over temporary access roads, using special matting where required to protect underlying soils and vegetation. Typical equipment for this phase of construction includes dump trucks, drill rigs, cranes, vacuum trucks, and tanker trucks.

2.1.2.2. Alternate foundations

In some places access is limited and/or protection of a natural resource is paramount, making alternative construction methods prudent for consideration. Helicopters can provide a low impact alternative for almost all phases of construction. In some difficult locations, their use may reduce required construction time, eliminate the need for extensive road building, and reduce the construction footprint considerably. Light helicopters may be used along the entire length of this project in stringing operations and the installation of conductors, shield wires, and bird diverters (see Figure Vol. 2-31). Heavy helicopters may be used to transport equipment and materials including the tower components (see Figure Vol. 2-29) to remote locations. A potential use for heavy helicopters would be along Segment O where line construction may be from ridge top to ridge top, spanning the valley below. They are also used in the construction of alternative types of foundations, including micro-piles and vibratory caissons (see Figure Vol. 2-25), both of which are described below.

Micro-pile Foundations

Micro-piles are an alternative to conventionally drilled foundations. They are a set of components for a type of deep foundation that is used to support the bottom of transmission structures. Each element is usually high-strength and relatively small-diameter casing and/or rod. The size and number used depends first on the transmission structure requirement for weight and lateral forces such as wind and turning angles. The other major design issue is the subsurface soil conditions and profile of materials at various depths. A typical pile is approximately five inches in diameter in the upper section and as small as one inch in diameter at the bottom. The number of piles per transmission tower leg typically ranges from three to 12. The length of each pier may be from 25 to over 50 feet. The casing is advanced to the design depth using a drilling technique. Reinforcing steel in the form of an all-thread bar is typically inserted into the micro-pile casing and high-strength cement grout is then pumped into the casing. The micro-piles are then commonly capped with concrete collars to which the transmission tower is affixed.

This type of foundation is suitable for remote rocky locations commonly found along Segments N and O. While vehicle access to transmission structure sites are still necessary for micro-pile foundation construction, the vehicles would be small excavators and pick-up trucks, as opposed to larger and heavier cranes and concrete trucks. In this way impacts to the environment would be reduced.

Helical Pier Foundations

A second alternative foundation is helical pier foundations which are suitable for areas with high water tables or unstable conditions where a deep foundation would be typically required. Helical piers are also known as screwpiles. They are composed of a steel shaft with screw or helix tip that upon rotation pulls the shaft into the ground. A large hydraulic auger system twists the piles down and measures the torque for the correct resistance for the design loadings. The piers, which can be pipe shafts or a solid bar are driven through unsuitable soils to the more dense materials below. The helical screws can be from six to over 20 inches in diameter. Depending on the soil profile at the site, these peers are installed to depths typically from 10 to over 80 feet deep. Typically three to six piers are used per transmission foundation or pole. After the piers are installed, they are capped with concrete or a welded steel collar to which transmission towers are affixed. This installation method requires no soil excavation or removal as is common with other drilling techniques. Furthermore, in mucky and wetland environments, no fill is added.

This type of foundation is suitable for areas of deep wet and mucky environments. In other transmission construction projects, marsh buggies were used during frozen conditions to access the constructions sites. The hydraulic augers were also installed on the marsh buggies and further minimized the impact to the natural resource (see Figure Vol. 2-26). The applicants have identified potential use of this type of construction in the vicinity of Segment N, through the wet and marshy Lemonweir River area.

Vibratory caissons

In sandy soil and wetlands, one method of a direct embedded foundation is vibratory-driven steel cans which can be used to vibrate the steel cylindrical foundation into the ground. A single steel foundation, which can be many feet in diameter, is driven into the ground with a vibratory hydraulic hammering system. The multi-sided steel caisson is fitted with a temporary special cap for strength while the vibrating machine forces the hollow pole into the ground. This is used when the soil is saturated or very loose. The inside can be backfilled to various depths with material to prevent buckling and stress. The equipment necessary for this type of foundation construction consists of either a crane which would be driven to the location or a helicopter-based vibratory caisson and hammer unit (see Figure Vol. 2-25). The use of helicopters for vibratory caisson construction can only be used for lightly loaded structures such as tangent structures.

Vibratory Piles

Vibratory piles or hammer-driven piles are the most common driven pile system with the pile being either an H-beam or pipe. Hammers can be diesel or hydraulic driven. Each pile is typically from six to 18 inches in width and are often sectionalized and linked together to be driven to deeper depths. The piles can reach to depths of 50 feet. The number of piles per foundation depends on the loading requirement of the transmission structure and the soil conditions at various depths. They are typically capped with steel. This method is used when the soil is too hard for screw type.

Construction traffic associated with this construction method is considerably heavier than that for micro-piles. Vibratory Piles require a large track mounted crane for installation of the piles. The benefit of using vibratory or hammer driven piles is that low ground pressure track equipment can be used to minimize environmental impacts and the potential footprint of the impact. It avoids the need for extensive matting required for concrete trucks to access the foundation sites.

The applicants state that once geotechnical studies are completed and design details are finalized, foundation specifics would be determined and alternative foundation systems would be evaluated, as appropriate to mitigate specific impacts in specific locations.

2.1.3. ROW requirements

An electric transmission line ROW is a strip of land that an electric utility uses to construct, maintain, or repair a power line. Transmission lines are often centered in the ROW, but may be offset, if all the conductors are located on one side of the structure. The structures (usually poles and cross arms) keep the wires away from the ground, other objects, and each other. Structure height, type, and configuration, along with span length and ROW width are very interrelated. For example, to increase the distance between transmission structures, such as when avoiding a field or crossing a river, structure heights and ROW widths may also need to increase. Additionally, factors such as topography and the acuteness of turn angles affect ROW widths and structure heights.

The proposed transmission ROW must be wide enough to keep conductors a safe distance from buildings, trees, the ground, and other features as they hang between the transmission poles or other structures. It also requires a ROW wide enough for the equipment to access the ROW and construct the line. Additional temporary construction ROW may be required in addition to the permanent ROW described in the application. Also, easements might be needed for access roads during construction and/or later on for maintenance of the line. An easement agreement is the method by which the utility ensures that the electric line is kept clear of vegetation, buildings, and other structures that could interfere with its operation. It also allows the landowner certain land use controls and conditions. For more information about ROW easement negotiations and rights of landowners see Section 4.3 of this EIS.

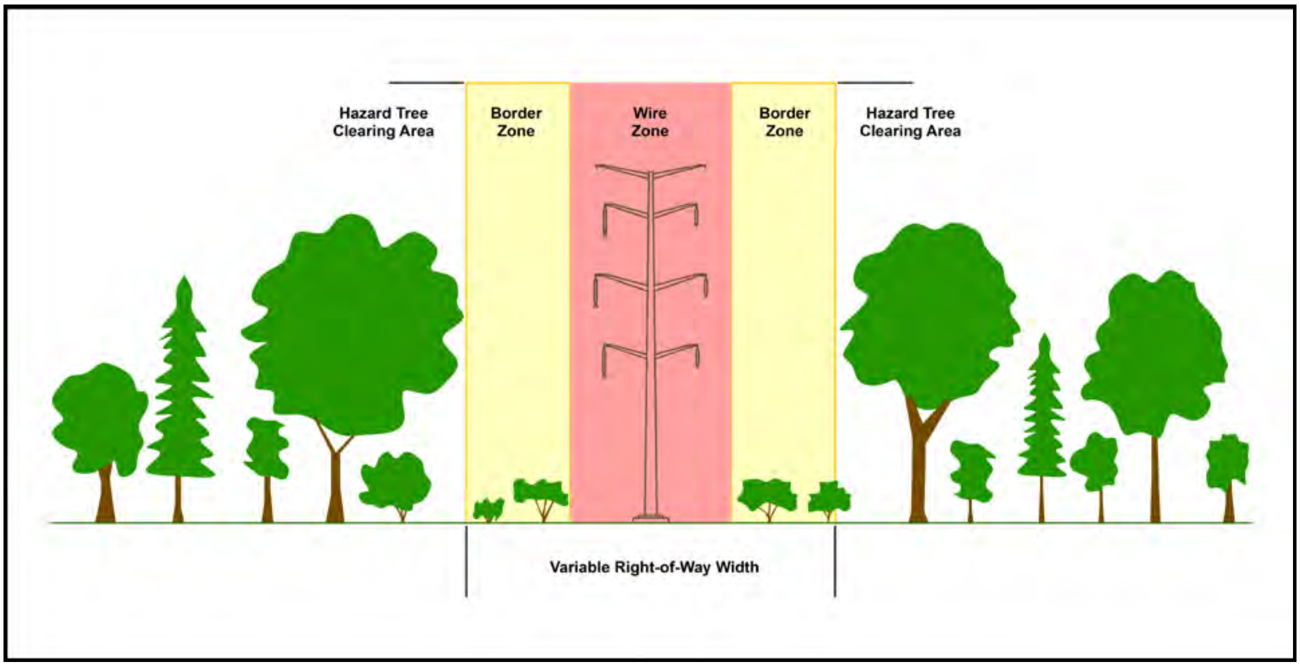
Typically, for this project, the ROW would be 120 feet wide but in a few select locations, the proposed ROW would be as much as 275 feet wide. Details about ROW requirements for various segments proposed for this project can be found in the individual segment descriptions in Chapters 6 through 11 of this EIS. For much of the proposed ROW, it would share or overlap existing ROWs of other electric lines, roads, and railroads. The applicants state that all new high-voltage easements would be acquired where the project ROW overlaps existing transmission line ROW. The disposition of the existing transmission easement would be determined on a case-by-case basis by the applicants.

In a number of locations, existing lower-voltage electric lines located along the proposed routes would be removed and double-circuited with the new 345 kV line using the existing ROW. In other cases, the applicants propose to relocate the line elsewhere. In a few locations, lower-voltage transmission lines are poorly sited and use multiple angle structures. In these instances, the applicants propose to double-circuit the existing and new 345 kV transmission lines on new ROW that may have fewer impacts and/or a more reasonable alignment.

Prior to the construction of this line, the full width of the ROW would be cleared. After the transmission line is installed, the utility is required to maintain the ROW so that vegetation is kept a safe distances from the conductors. The Commission requires Wisconsin utilities to maintain their ROW and clearances in accordance with the National Electric Safety Code (NESC). The NESC requirements are incorporated into Wis. Admin. Code ch. PSC 114. NESC generally requires the pruning or removal of interfering trees to minimize the risk of vegetation-related outages. Otherwise, there are increased chances of fires or electrical or mechanical damage to the electrical equipment.

Both ATC and NSPW have published ROW vegetation management information on their websites that includes lists and diagrams illustrating the types of clearances or removals that would be maintained. They also employ an approach using a "wire zone" and a "border zone" concept as illustrated in Figure 2.1-1.

Figure 2.1-1 Typical ROW vegetative management zones



The wire zone is directly under the transmission conductors and is kept in low-growing non-woody plants and grasses to make it easier for line maintenance and repair. Other plants would be removed. The border zone is from the wire zone to the edge of the ROW, as defined by the easement contract. The utility in charge of maintenance may allow some low-growing woody plants in the border zone, but it is important to note that anything located in the border zone can be at risk for removal if not specified in the easement contract or if there is a change to the operation or maintenance requirement of the electrical facilities.

However, there may be differences between ATC's and NSPW's practices regarding the height and type of plants that are allowed to regrow in the border zone. It is not yet known which vegetative management program would govern the maintenance for the ROWs that would be co-owned by both utilities.

Outside of the ROW, the transmission owner may conduct additional tree trimming or removal. Under state law, Wis. Admin. Code PSC § 113.0512, transmission owners are required to trim or remove trees that could pose a threat to the transmission line even if those trees are located outside the border zone and ROW. These "hazard" trees are trees that pose an unacceptable risk of failing and contacting the line before the next ROW maintenance cycle. If identified, these hazard trees must be topped, pruned, or felled so that they no longer pose a hazard.

2.1.4. Off-ROW access roads

Off-ROW access roads become necessary where there are natural constraints such as steep hills, large high-quality wetlands, or other limitations where direct access from public roads are not possible. Information about the off-ROW access roads proposed for the Badger-Coulee project is included in most segment chapters of this EIS (see Sections 6.2.1, 7.2.1, 8.2.1, 9.2.1, and 11.2.1). The constraints the applicants cite as requiring off-ROW access roads include slopes greater than 20 percent, river crossings wider than 12 feet, and access limitations along roads and railroads.

If the project is approved, the applicants would re-evaluate the proposed access plan based on the route chosen by the Commission, field reviews, and subsequent negotiations with private landowners. Prior to construction, existing off-ROW access paths may need modifications and improvements to allow for safe equipment movement to and from the ROW. These modifications may include vegetation removal, grading and/or gravel placement; however permanent wetland fill is not proposed. The applicants list a range of methods to avoid placing fill in wetlands, such as ice roads, construction during dry or frozen conditions, low ground pressure equipment, or construction mats. Any methods used in wetlands would be subject to DNR permitting review and approval.

Once construction is completed, off-ROW access roads may be restored to pre-construction conditions. Depending on negotiations with the property owner, the access road may be left in place.

2.2. SEGMENT AND SUBSTATION SITE ALTERNATIVES

2.2.1. Alternative substation sites

At the pre-application meetings held prior to 2013, the applicants referred to the potential for five substation sites near La Crosse for the endpoint of this project. The sites included the Briggs Road Substation which is currently under-construction (the only proposed endpoint for this project), and sites near Ettrick, near Arcadia, in the town of Trempealeau, and in the town of Gale. During the Commission's review of the CapX project in 2012, ATC submitted testimony indicating that its preference would be to interconnect the proposed Badger-Coulee project with the CapX project at a location farther north than the proposed Briggs Road Substation (PSC REF#: 158036, pp. 2-4; PSC REF#: 158037.) ATC proposed these alternative substation sites because of routing difficulties anticipated for the Badger-Coulee project in the congested area between the Mississippi River to the west and the bluffs to the east. In its decision on the CapX project, the Commission, on May 30, 2012 authorized the proposed Briggs Road Substation as the western terminus of the CapX project (PSC REF#: 165332), because that location best served the local area need for the La Crosse area. As such, the western terminus of the proposed Badger-Coulee project became the Briggs Road Substation, and the applicants' proposed alternative substation locations for the CapX project were removed from further consideration. Additionally, the Commission's review of the CapX project indicated that there could be reliability concerns associated with a permanent single 345 kV source of supply to the Briggs Road Substation under certain load conditions. These concerns eliminate the possibility of connecting the proposed Badger-Coulee project to the CapX project at a point north of Holmen and supplying the Briggs Road Substation solely with the CapX 345 kV line.

2.2.2. Segment alternatives

Wisconsin Stat. § 1.12(6) specifies siting priorities for new electric transmission facilities. These statutory siting priorities include, in order of priority: existing utility corridors; highway and railroad corridors; recreational trails to the extent the facilities may be constructed below ground and do not significantly impact environmentally sensitive areas; and, new corridors. The applicants identified and reviewed over 2,500 miles of possible route segments which were then narrowed down to the segments proposed in the application.

The applicants initially identified potential route corridors between the end points of the proposed project. These potential route segments were then screened against a long list of criteria to arrive at the potential route alternatives presented in the Badger-Coulee application. Some of the criteria considered by the applicants when identifying possible places to site routes, as well as places not to site routes, included existing utility and highway ROWs, the potential for corridor sharing, the location of sensitive resources, the potential for highway expansion, the minimization of natural resource impacts, avoidance of tribal and historic resources, the location of airports and airstrips, the location of military installations, potential construction obstacles, and local agricultural practices. These and other considerations were used to refine the initial routes.

The two military installations, Fort McCoy and Volk Field present very specific routing limitations for the Badger-Coulee project. The larger of the two installations is Fort McCoy which straddles I-90 and occupies a total of almost 100 square miles of land in Monroe County. Volk Field is located north of I-94 in Juneau County, in the town of Orange (see Figure Vol. 2-1.17). Discussions between the applicants and the military bases indicated that a route through either Fort McCoy or Volk Field would not be approved.[5] Additionally, there are Department of Defense-established Accident Potential Zones (APZs) that extend beyond the physical boundaries of the installations. Compatible land uses within these APZs prohibit aboveground transmission facilities unless they serve the military installation. Finally, there are FAA structure height limitations associated with the military runways at these bases that are designed to protect flight paths into and out of the airports. They would, for the most part, require transmission structures inside these areas to be less than 65 feet tall. Due to the bluff terrain located southeast of Fort McCoy and southwest of Volk Field, transmission structures would not be buildable within these height-restricted areas. Figures 2.2-1 and 2.2-2 show the FAA structure height limitation areas and the DOD APZs for the bases.

While the applicants originally considered route segments that paralleled I-90, the issues associated with Fort McCoy and Volk Field prevented this interstate corridor from becoming part of a proposed route through most of Monroe County and resulted in Segment O being located six miles south of I-90. Furthermore, along Segment N, avoidance of Volk Field issues contributed to the deviation from I-94 that became Subsegments N10 through N14.

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[5] Data Request Response 5.17 PSC ERF #210424.

Figure 2.2-1 FAA areas of height restrictions for Fort McCoy and Volk Field

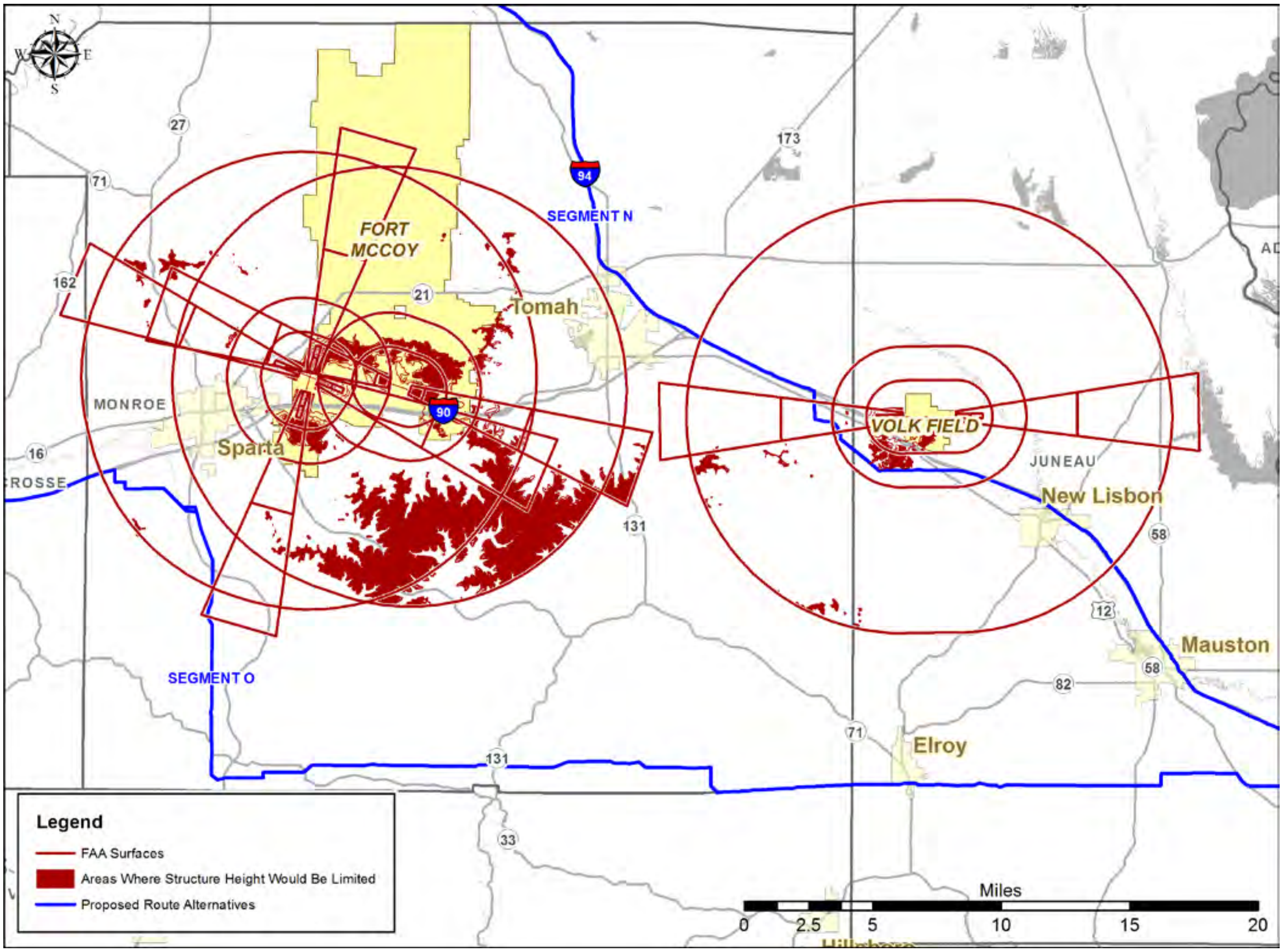
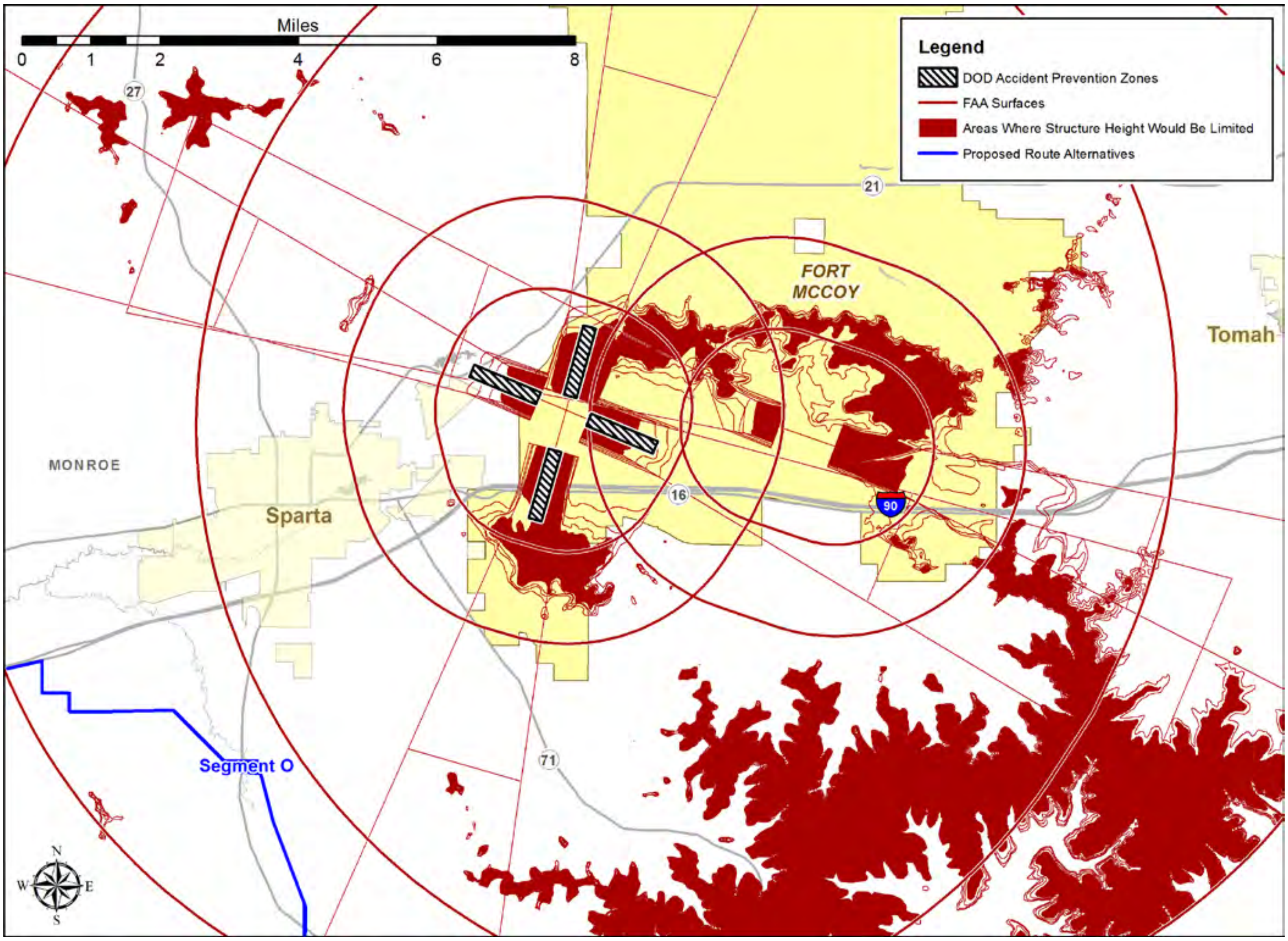


Figure 2.2-2 DOD Accident Prevention Zones for Fort McCoy



2.3. REGIONAL ENVIRONMENTAL ISSUES

2.3.1. Southwest and South Central Wisconsin Environment

The project area for the proposed Badger-Coulee transmission line stretches across four of the 16 different ecological landscape regions identified in Wisconsin. DNR, in combination with the U.S. Forest Service, has defined these regions based on a combination of physical and biological factors, such as climate, geology, topography, soils, water, and vegetation. These factors are known to control or influence biotic composition and ecological processes.[6]

As shown in Figure Vol. 2-3, the four ecological landscapes crossed by the Badger-Coulee project route segments are: 1) the Western Coulees and Ridges; 2) the Central Sand Plains; 3) the Central Sand Hills; and 4) the Southeast Glacial Plains. Consideration of these ecological landscapes and their physical, biological and socio-economic components may be useful in identifying potential construction issues and assessing short- and long-term environmental and socio-economic impacts. These potential

[6] Wisconsin Department of Natural Resources (DNR). 2014. The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management.

construction considerations and possible impacts are discussed in Chapters 6 through 11, which cover the route segments proposed by the applicants for the Badger-Coulee 345 kV transmission line.

2.3.1.1. Western Coulees and Ridges

The Western Coulees and Ridges Ecological Landscape[7] is a large area extending along much of western Wisconsin south of St. Croix and Barron Counties. Virtually all of Segment O, from the Briggs Road Substation in La Crosse County to a point approximately 5.0 miles west of Lyndon Station, crosses the Western Coulees and Ridges Ecological Landscape. In addition, Segment P (east and west) and the western portion of Segment N, from the town of Gale northward past Ettrick and Blair and east toward the town of Springfield, also traverses this ecological landscape. Several other subsegments, N10 through N13, near Camp Douglas also cross this area as they veer south of the interstate corridor to avoid potential conflicts with Volk Field.

The Western Coulees and Ridges Ecological Landscape, which comprises a portion of the Driftless Area, is characterized by its highly eroded, unglaciated topography with ridges and deeply incised, steep-sided valleys. It contains high-gradient headwater streams with extensive stream networks and dendritic drainage patterns. In this ecological landscape, porous sedimentary bedrock (especially sandstone) discharges cold groundwater into the streams that occupy the numerous valleys of this highly dissected landscape. Numerous named and unnamed creeks are crossed by Segment O, in addition to the Baraboo, Little La Crosse, and La Crosse Rivers. Segment P crosses the Black River approximately 12 miles from its confluence with the Mississippi River. Segment N crosses the Trempealeau River at least four times, as well as many small creeks and streams.

The steep-sided slopes along these segments are mostly forested, with an abundance of oaks and other hardwoods. In general, the predominant forest cover type group in the Western Coulees and Ridges landscape is oak (51 percent of the forested land area), followed by northern or central hardwoods, mostly maple and basswood (26 percent), lowland hardwoods (10 percent), and aspen (6 percent). All other forest types each occupy five percent or less of the land area. The Western Coulees and Ridges Landscape also supports the state's best examples of dry prairie and sand prairie; however, good quality sand prairies are very rare, with most of the historical acreage converted to irrigated agricultural fields, red pine plantations, or subdivisions.

The floodplain forests associated with some of the major waterways (Black, Chippewa, Trempealeau, and La Crosse Rivers) are some of the largest in the upper Midwest. Large stands of floodplain forest are highly significant to forest-interior birds and other species, especially when they contain riverine lakes and ponds and adjoin extensive areas of upland forest. Marshes are also common within the large river floodplains. Spring seeps are plentiful, though they are small and highly localized features on the toe slopes along many rivers and streams.

The ridge tops and valley bottoms have been mostly cleared and the lands have been converted to agricultural uses because of their rich, productive soils.

A mantle of loess (wind-deposited silty material) covers most of the landscape, with the thickest deposits on the ridges and closer to the Mississippi River. Soils on hilltops and side slopes are formed of loess,

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[7] Wisconsin Department of Natural Resources (DNR). 2014. The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management. Chapter 22, Western Coulees and Ridges Ecological Landscape. 123 pp. Wisconsin Department of Natural Resources, PUB-SS-1131X 2014, Madison.

loamy to clayey residuum, and loamy colluvium over limestone or sandstone. Particularly on south- and west-facing slopes, the soils tend to be dry and erodible, and their shallow depth to bedrock can limit management options. Some of the ridge top loess was moved downslope by erosion and has been incorporated into floodplain deposits. Soils of the narrower valleys are predominantly silty and loamy residuum and alluvium. These soils range from well-drained to very poorly-drained and have areas subjected to periodic flooding. Organic soils are uncommon within the Western Coulees and Ridges.

In the portion of this ecological landscape in which the project is proposed, the bedrock is composed of mostly Paleozoic sandstones and dolomites and exposed as cliffs and, more locally, as talus slopes.

2.3.1.2. Central Sand Plains

The Central Sand Plains Ecological Landscape[8] lies directly east of the western edge of the Western Coulees and Ridges and covers the eastern half of Jackson County, most of Juneau and Adams Counties and portions of Columbia and Sauk Counties. The portion of Segment N that stretches east from the town of Springfield to Black River Falls and then east and south along the interstate corridor toward Lyndon Station lies within the far western portion of the Central Sand Plains, with the exception of Subsegments N11 through N13 near Camp Douglas, which divert south and west of the I-94 corridor and briefly cross the steep ridge and valley topography of the Western Coulees and Ridges. Subsegment N14 then reconnects the remainder of Segment N (Subsegments N15-N23) to the interstate corridor and the flatter Central Sand Plains Landscape.

Segments M, L, K, J, and Subsegments I1 through I4, which continue southeast from Lyndon Station to Wisconsin Dells, lie within the extreme western portion of the Central Sand Plains. Subsegment I5 is divided between the Central Sand Plains and the Central Sand Hills Landscapes. Subsegments H1 through H4, which pass through the Lake Delton area, traverse the edge of the Central Sand Plains Landscape.

The Central Sand Plains is characterized by its flat, nearly level or gently sloping topography, sandy soils, and sandstone buttes, products of its glacial history. This ecological landscape consists of a large, flat expanse of lacustrine and outwash sand that was deposited in Glacial Lake Wisconsin[9] from glaciers to the north. These sands are underlain by Late Cambrian sandstone containing strata of dolomite and shale. Outcrops of this sandstone are scattered throughout this landscape, protruding from the level sand plains as bluffs or buttes, many of them sculpted by wind and water. Most of these exposures are around 100 feet higher than the surrounding plain, but some rise up to 300 feet.

In the portion of the project area within the Central Sand Plains, bedrock is buried beneath sandy drift material that can be up to 50 feet thick (Wisconsin Geological Natural History Survey 1983). These

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[8] Wisconsin Department of Natural Resources (DNR). 2014. The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management. Chapter 10, Central Sand Plains Ecological Landscape. 108 pp. Wisconsin Department of Natural Resources, PUB-SS-1131X 2014, Madison.

[9] Glacial Lake Wisconsin came into existence about 19,000 years ago when the Green Bay lobe of the Wisconsin glaciation advanced onto the east end of the Baraboo Hills and blocked the ancient river that ran through the valley now occupied by the Wisconsin River. Glacial ice lay along the eastern edge of the Central Sand Plains, blocking outflow in that direction, while higher elevations to the north and south forced the rising water to inundate land to the west. A number of tunnel channels emptied out of the glacial lake from beneath the ice sheet. Many of the sand and gravel quarries in the Johnstown Moraine east of I-39 are located where tunnel channels emerged from beneath the glacier. Meltwater from glaciers to the north also moved sand into the lake; braided stream sediments from this period are found on terraces along the Wisconsin River in Juneau County (Clayton 1989). Glacial meltwater is also rich in silt, and Glacial Lake Wisconsin was sufficiently deep and still for silty lacustrine materials to accumulate extensively in the lakebed. The silt layer was subsequently covered with sand but is near the surface in west-central Adams County.

deep, sandy soils are typically excessively drained, with very rapid permeability, very low available water capacity, and low nutrient status.

The vegetative cover in this ecological landscape is more varied than in some others. Forests, comprise 57 percent of the landcover and include stands of extensive oak-hickory, mixed pine-oak, aspen-birch, northern or central hardwoods, and jack pine.

The Central Sand Plains also supports a significant concentration of wetlands, covering 26 percent of the surface area of this ecological landscape. Slightly more than half of this wetland acreage is non-forested, consisting of shrub/scrub, bogs, fens, and sedge meadows. Extensive acid peatlands are present and a number have been converted into cranberry production or are subject to commercial harvest of the sphagnum peat moss, supporting a local industry.

Barrens vegetation was historically widespread on the droughty sands, but due to fire suppression and forestry practices, barrens communities are limited and most are in degraded condition. Restoring and managing these communities and their species composition is a priority for many public land managers in this area of the state.

Major river systems within the Central Sand Plains along the proposed route segments include the Black River, the Little Lemonweir and Lemonweir Rivers, and portions of the Wisconsin River. Many smaller streams and tributaries are also crossed by the route segments and are discussed in greater detail in the Wetlands and Lakes, Rivers and Streams sections of Chapters 6 through 11.

Recreation and forestry are important land uses in the Central Sand Plains as this region has a high percentage of forest cover and public lands. Agriculture is also important within the area covered by former Glacial Lake Wisconsin, although the sandy soils make center pivot irrigation a requisite in many locations. In some areas of this landscape (and the Central Sand Hills) stream flows and lake levels appear to be depressed in a way not entirely attributable to recent climatic conditions. These areas have a large concentration of high capacity wells, and counties within these landscapes are routinely ranked among the highest in the state with regard to the annual quantity of groundwater pumping. The Little Plover River and other headwaters streams are exhibiting reduced flows, and a number of seepage lakes have experienced severely depressed lake levels over the past several years (G. Kraft, University of Wisconsin-Stevens Point, personal communication).

Timber production is a prominent industry, although the volume per acre is relatively low due to low soil fertility. Frac-sand mining and processing is increasing throughout this area due to the abundance of suitable sand and the transportation opportunities available here.

2.3.1.3. Central Sand Hills

The Central Sand Hills Ecological Landscape is contiguous with the eastern border of the Central Sand Plains and includes the areas east and south of former Glacial Lake Wisconsin. A narrower finger of the Central Sand Hills also extends to the south forming a transition between the steep topography of the Western Coulees and Ridges and the mostly level Southeast Glacial Plains landscapes that cover much of southwestern and southeastern Wisconsin, respectively. Segments B and G, and portions of Segment E (north half of E1), H (H5-7), F (F1-F2) and I (I5-I13) cross through this narrow southern extension of the Central Sand Hills Landscape. Subsegment F3 borders the edge of the Central Sand Hills and the Southeast Glacial Plains, while Subsegments H8 through H9 traverse the edge of the Central Sand Hills and the Western Coulees and Ridges.

The rounded, hilly topography is the result of numerous glacial moraines, including a portion of the Johnson Moraine, that were later partially covered by glacial outwash. Other glacial features include numerous small kettle lakes associated with pitted outwash, although these are most common north and east of the project area. The sandstone bedrock is typically buried at depths greater than 50 feet; bedrock exposures are limited, but include Precambrian rhyolite bluffs.

In some areas sandy, nutrient-poor soils support a mixture of farm land, woodlots and a variety of wetlands. Agriculture is successful here with the use of center pivot irrigation, but there is a considerable amount of less productive and idle agricultural land. In other areas of this landscape, silty and clayey soils were deposited by Glacial Lake Oshkosh. Organic soils underlie the sandy soils in a few areas and muck farming still occurs in some locations.

The dominant species are white and red pine, white, red, and black oaks, and on more mesic sites, red maple. The understory is typically not very diverse and consists primarily of huckleberry, blueberry, bracken fern, and Pennsylvania sedge. Although a significant amount of this community type, referred to as the Central Sands pine-oak forest, is protected in the Central Sand Plains, very little is in public ownership in this Landscape. Small barrens and savanna remnants are also present in some upland areas, while fens, wet prairies, and rare coastal plain marshes occur less commonly in some lowlands.

High concentrations of coldwater streams and rivers occur in the Central Sand Hills and a few other landscapes because of the glacial moraines that discharge cold ground water into streams. As mentioned previously in the discussion on the Central Sand Plains, excessive groundwater withdrawal due by the large number of high capacity wells appears to be reducing stream flows and lake levels in some portions of this area.

Within the portion of the project area present in the Central Sand Hills, the Wisconsin River and a short, but ecologically important stretch of the lower Baraboo River are crossed by the proposed route segments. Other important rivers in this landscape that are located farther north and east of the transmission line routes include, among others, the Fox, Grand, and Mecan Rivers. A number of extensive riparian wetlands are found along these waterways. A large area of publicly-owned and managed marsh land lies between the Wisconsin and Baraboo Rivers along Subsegments H5 through H7. Overall, the current land cover is more than one-third agricultural crops, one third forest, and almost 20 percent grasslands with smaller amounts of open wetland, open water, shrubs, and urban areas.

2.3.1.4. Southeast Glacial Plains

The Southeast Glacial Plains Ecological Landscape[10] was once dominated by prairie, wetlands, oak savanna, oak forest, and maple-basswood forest but has been greatly changed by Euro-American settlement and related human disturbances. Agriculture, which now occurs on approximately 58 percent of this ecological landscape, and urban development have extensively altered the vegetation types, cover, and patterns. There have also been major changes to the hydrology.

Segments A, C, and D lie within the Southeast Glacial Plains ecological landscape, as well as Subsegment E2 and the south half of Subsegment E1 and Subsegments F4 through F5. This landscape can be characterized by its rolling to flat topography, and rich, productive, agricultural soils. These glacially

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[10] Wisconsin Department of Natural Resources (DNR). 2014. The ecological landscapes of Wisconsin: An assessment of ecological resources and a guide to planning sustainable management. Chapter 18, Southeast Glacial Plains Ecological Landscape. 122 pp. Wisconsin Department of Natural Resources, PUB-SS-1131X 2014, Madison.

deposited soils that originated from the Green Bay lobe during the late Wisconsin ice advance, may reach a depth of up to 50 feet in the western portion of this landscape and greater than 200 feet closer to Lake Michigan and along some of the major river systems.

Within the area surrounding Segments A, C and D, and portions of E and F there is a mantle of silty loess ranging in depth from 6 to 48 inches which resulted from wind deposition during and after glaciation[11] (Hole 1976). Upland soils range from well-drained to poorly-drained with very slow to rapid permeability, while lowland soils are poorly-drained. These soils are underlain by limestone and dolomite with some sandstone and shale. Bedrock outcrops are scarce throughout the entire landscape.

Land surface elevation within this portion of the project area ranges from approximately 950 to 1,150 feet. Although glacial features such as kames, eskers and drumlins are common in some areas of this ecological landscape, these landforms are uncommon along Segments A, C, D, and the portions of E and F located here.

Agriculture is the predominant land use in this ecological landscape and that is especially true in the areas bounding these route segments. Forested blocks tend to be small, fragmented, irregular in shape, and scattered throughout the area. While some globally rare communities, such as tall grass prairie, oak savanna and calcareous fens occur within this landscape, they are not present along the proposed routes. Only about four percent of this ecological landscape is publicly-owned.

Most riparian zones have been degraded due to sediment and nutrient-laden runoff from cropland and residential areas and many of the wetlands have been affected by hydrologic modifications such as ditching, tiling, and infestations of invasive plants. Still, numerous wetlands, including some large fertile marshes are present within this ecological landscape and several occur within the project area. Six Mile Creek and its tributaries are associated with several large wetlands northeast and northwest of Waunakee, narrow riparian wetlands within the city and a large wetland complex directly west of Waunakee. Subsegment C5 crosses Six Mile Creek approximately 1.2 miles west of STH 113.

Segment C3 traverses an area of historically farmed wetlands along CTH V that have been allowed to revert to shallow marsh within the past decade. These marshes are part of a scattered group of wetlands, located primarily within the town of Vienna, that have been designated as an Important Bird Area (IBA) (see Figure Vol. 2-6).

2.3.2. Rivers

The segments cross a large number of rivers and creeks. Some of these rivers are quite large and dominate the landscape. These include the Trempealeau River, the Wisconsin River, the Black River, and the Lemonweir River. The proposed transmission line routes would span smaller rivers but may require the construction of transmission poles below the high water mark in areas with large floodplains or wide rivers. Some rivers are designated by the DNR as Outstanding and Exceptional Water Resources and others are designated as Trout Streams (see Figure Vol. 2-4).

2.3.3. Depth to bedrock

Depth to bedrock can be a determining factor in designing a transmission line using appropriate structures and foundations. Some members of the public have expressed concerns about constructing the proposed

[11] Hole, F.D. 1976. *Soils of Wisconsin*. University of Wisconsin Press, Madison. 223 pp. and maps.

transmission line in areas of shallow bedrock because of potential adverse effects on local springs and seeps. A map of the depth to bedrock can be found in Figure Vol. 2-5.

2.3.4. Bird habitats and potential project impacts

2.3.4.1. Important Bird Areas

The Important Bird Area (IBA) program is a part of an international effort to identify and conserve areas that are critical to birds and biodiversity in general. Administered by the National Audubon Society and implemented by the Wisconsin Bird Conservation Initiative, these areas provide essential habitat to one or more species of breeding or non-breeding birds, particularly species of conservation concern. These sites are collectively owned and managed by many public and private entities, and are important on global, continental, regional, national, and state levels. The designation of a site as an IBA does not confer any legal status or carry any regulatory requirements, and the inclusion of land within an IBA boundary is entirely voluntary.

The proposed routes for this Project come into direct contact with five different IBAs:

- Segments P and N: the Van Loon Bottoms IBA
- Segment O: the Kickapoo-Wildcat IBA
- Segments I and H: Leopold-Pine Island IBA and the Baraboo Hills IBA
- Segments C, D, E, and F: Northern Empire Prairie IBA

Additionally, two other IBAS are within one-half mile of Badger Coulee segments (the Upper Mississippi River IBA and the Fort McCoy-Robinson Creek IBA. Figure Vol. 2-6 illustrates the location of these IBAs as they relate to the proposed routes. IBAs are further described in the appropriate chapters of this EIS.

2.3.4.2. Bird flight impacts

Bird collisions with electric lines can have significant ecological impacts because of bird injuries and death, particularly to protected species. The IBAs are recognized as important refuges for protected bird species, including migratory species. All migratory birds in North America are federally protected under the Migratory Bird Treaty Act of 1918 as amended because of their important role in global-scale ecology.

In a recent study, it is estimated that between eight million and 57 million birds are killed annually in the U.S. by collisions with power lines, and an additional 0.9 million to 11.6 million birds are killed by electrocution from power lines.[12] These annual mortality rate estimates are second only to those of collisions with buildings (estimated at 365 to 988 million)[13] and exceed those for collisions with communication towers (estimated at 6.6 million)[14] and wind turbines (estimated at 573,000).[15]

Many biological, environmental, and engineering factors influence the likelihood of bird collisions with electric transmission lines. A few of these factors include bird species' characteristics and behavior,

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[12] Loss, S.R., Will, T., Marra, P.P. 2014. Refining estimates of bird collision and electrocution mortality at power lines in the United States. PLoS ONE. 9(7): 1 – 10.
[13] Loss, S.r., Will, T., Marra, P.P. 2014. Bird-building collisions in the United States: estimates of annual mortality and species vulnerability. The Condor 116(1):8-23.
[14] Longcore, T., Rich, C., Mineau, P., MacDonald, B., Bert, D.G. et al. 2012. An estimate of mortality at communication towers in the United States and Canada. PLoS ONE. 7(4):1-17.
[15] Smallwood, K.S. 2013. Comparing bird and bat fatality-rate estimates among North American wind-energy projects. Wildlife Society Bulletin. 37:19-33.

surrounding land use, environmental conditions, and the design and placement of power lines and structures.[16] An important factor to reducing bird flight impacts is minimizing the vertical wire exposure zone of transmission configurations. H-frame transmission structures typically have only two wire planes, the conductors and the shield wire; whereas, delta-configured structures can have four wire planes. The vertical distance of these wire planes is also significantly greater for delta-configures structures than H-frames.

A critical factor in determining the level of transmission line collision risk is the frequency in which birds in flight typically cross a transmission line during commutes between their daily use areas. The following components related to bird species and environment contribute to the level of risk associated with a power line.[17]

- species size and maneuverability
- flight height
- time of day and related light/visibility
- presence of distracting lighting at night
- adverse weather conditions
- flocking behavior (i.e. migration method)

2.4. PROJECT COSTS

The estimated cost of the proposed Badger-Coulee project as estimated as the sum of year-of-occurrence dollars ranges from about $540 million to about $580 million, depending on the transmission line route used. These costs are estimated in 2018 dollar costs, which is the projected in-service year for the project. The cost estimates include substation costs, distribution line relocation costs, and allowance for funds used during construction (AFUDC).

2.4.1. Estimated project costs

Transmission line and substation costs by route alternative for the various sections of the line are included in Tables 2.4-1 through 2.4-6. Total project costs for four possible project route alternatives are included in Table 2.4-7. Table 2.4-7 does not include all possible segment combinations. If the Commission were to choose a route not presented in this table, additional cost information would be required from the applicants.

Table 2.4-1 Segments P and N versus Segment O (Briggs Road Substation to just north of Lyndon Station)

Alternative	Briggs Road Substation Costs	Line Construction Cost Estimate	Total
Segment P with P-west and Segment N	$7,300,000	$311,160,000	$318,460,000
Segment P with P-east and Segment N	$6,470,000	$308,640,000	$315,110,000
Segment O	$6,470,000	$254,340,000	$260,810,000

[16] Avian Power Line Interaction Committee (APLIC). 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC. Washington, D.C.
[17] Ibid

Table 2.4-2 Common Segment M and Segment L versus Segment K (just north of Lyndon Station to the Wisconsin Dells)

Alternative	Line Construction Cost Estimate
Segment M and Segment L	$19,690,000
Segment M and Segment K	$19,200,000

Table 2.4-3 Common Segment J and Segment H versus Segment I (Wisconsin Dells to the town of Caledonia)

Alternative	Line Construction Cost Estimate
Segment J and Segment H	$61,230,000
Segment J and Segment I	$72,580,000

Table 2.4-4 Common Segment G and Segment F versus Segment E (town of Caledonia to the North Madison Substation)

Alternative	North Madison Substation Costs	Line Construction Cost Estimate	Total
Segment G and Segment F	$7,990,000	$47,910,000	$55,900,000
Segment G and Segment E	$7,990,000	$39,330,000	$47,320,000

Table 2.4-5 Segment D versus Segment C (North Madison Substation to the town of Springfield)

Alternative	Line Construction Cost Estimate
Segment D	$47,070,000
Segment C	$43,460,000

Table 2.4-6 Segment B versus Segment A (town of Springfield to the Cardinal Substation)

Alternative	Cardinal Substation Costs	Line Construction Cost Estimate	
Segment B with B-south	$3,990,000	$22,090,000	$26,080,000
Segment B with B-north	$3,990,000	$21,900,000	$25,890,000
Segment A	$3,990,000	$17,340,000	$21,330,000

Table 2.4-7 Total project costs for four possible project route alternatives

	Project Route Alternative (not all possible combinations are shown)			
	Segments P with P-west, N, J, H, G, E, D, A	Segments P with P-east, M, K, J, H, G, E, D, A	Segments O, M, L, J, I, G, F, C, B with B-north	Segments O, M, L, J, I, G, F, C, B with B-south
Transmission Line Costs				
Briggs Road Substation to just north of Lyndon Station	$311,160,000	$308,640,000	$254,340,000	$254,340,000
Just north of Lyndon Station to the Wisconsin Dells	$19,200,000	$19,200,000	$19,690,000	$19,690,000
Wisconsin Dells to the town of Caledonia, Columbia County	$61,230,000	$61,230,000	$72,580,000	$72,580,000
Town of Caledonia to the North Madison Substation	$39,330,000	$39,330,000	$47,910,000	$47,910,000
North Madison Substation to the town of Springfield	$47,070,000	$47,070,000	$43,460,000	$43,460,000
Town of Springfield to the Cardinal Substation	$17,340,000	$17,340,000	$21,900,000	$22,090,000
Subtotal Transmission Line Costs	$495,330,000	$492,810,000	$459,880,000	$460,070,000
Substation Costs				
Briggs Road Substation	$7,300,000	$6,470,000	$6,470,000	$6,470,000
North Madison Substation	$7,990,000	$7,990,000	$7,990,000	$7,990,000
Cardinal Substation	$3,990,000	$3,990,000	$3,990,000	$3,990,000
Subtotal Substation Costs	$19,280,000	$18,450,000	$18,450,000	$18,450,000
Subtotal Transmission Line and Substation Costs	$514,610,000	$511,260,000	$478,330,000	$478,520,000
Calculation of Amounts Subject to Impact Fees				
Subtotal Transmission Line and Substation Costs	$514,610,000	$511,260,000	$478,330,000	$478,520,000
Less costs not subject to impact fees[18]	$107,050,000	$105,420,000	$96,210,000	$96,120,000
Subtotal Costs Subject to Impact Fees	$407,560,000	$405,840,000	$382,120,000	$382,400,000
Other Project Costs				
One-time 5.0% Environmental Impact Fee	$20,378,000	$20,292,000	$19,106,000	$19,120,000
Annual 0.3% Impact Fee (Calculated During 2-Year Construction Period Only)	$2,445,400	$2,435,000	$2,292,700	$2,294,400
Allowance for Funds Used During Construction	$27,256,000	$27,098,000	$24,688,000	$24,688,000
Precertification Costs	$15,100,000	$15,100,000	$15,100,000	$15,100,000
Subtotal Other Project Costs	$65,179,400	$64,925,000	$61,186,700	$61,202,400
Total Project Cost	$579,789,400	$576,185,000	$539,516,700	$539,722,400

2.4.2. Environmental impact assessment fees

Wisconsin communities in which high-voltage transmission lines at 345 kV or greater are constructed receive both a one-time payment and annual payments from fees paid by the utility. Under Wis. Stat. §§ 16.969 and 196.491(3g), and Wis. Admin Code ch. ADM 46, construction applicants that receive a

[18] Described in response to data request item 01.97, PSC REF#: 197427.

CPCN from the Commission for a 345 kV line are required to pay an annual impact fee and a one-time environmental impact fee to the Department of Administration (DOA). The Commission is responsible for approving the cost of the project and the base cost from which the fees represent a percentage of that base cost. DOA distributes the money to the local municipalities and counties through which the transmission line is built. The fee payments may not be used to offset any other mitigation measure that is required of the applicants in the CPCN order from the Commission.

2.4.2.1. One-time environmental impact fees

Under Wis. Admin. Code § ADM 46.05, the one-time environmental impact fee, to be paid in the calendar year when construction begins, is equal to 5.0 percent of the cost of the transmission line as determined by the Commission in the CPCN. DOA distributes 50 percent of the funds from this one-time fee to the eligible counties in proportion to the length of line that is constructed through each county. Likewise, it distributes the other 50 percent of the funds to the eligible towns, villages, and cities in proportion to the percentage of the line that is constructed through each eligible political subdivision. The Commission determines the appropriate allocation.

As stated in Wis. Stat. § 16.969(4), a county, town, village, or city that receives money for the one-time environmental impact fee may use its distribution only for park, conservancy, wetland, or other similar environmental programs. The local government can request in writing from the Commission approval of a different use for the funds, provided the use is in the public interest.

For the proposed Badger-Coulee project, 50 percent of the one-time fee would be allocated between Dane, Columbia, Jackson, Juneau, La Crosse, Monroe, Sauk, Trempealeau, and Vernon counties, and the other 50 percent would be allocated among all the towns, villages, and cities along the selected route described in the Commission's CPCN order. It should be noted that it is possible that a route could be selected for the proposed project that would not pass through Trempealeau, Jackson, or Vernon counties, and in that event those counties and the towns and municipalities in those counties would not receive one-time environmental impact fees.

2.4.2.2. Annual impact fees

Under Wis. Admin. Code § ADM 46.04, the annual fee to DOA would equal 0.3 percent of the cost of the line as determined by the Commission in the CPCN under Wis. Stat. § 196.494(3)(gm). DOA distributes the funds from the annual fee to each eligible town, village, and city in proportion to the length of line constructed through each municipality as determined by the Commission in the CPCN. After construction of the line is completed and final costs are submitted to the Commission, the annual fee may be adjusted to reflect the actual cost of the line.

CHAPTER

3

3. Project Assessment of Need and System Solutions

The following discussion of the need for the proposed Badger-Coulee project focuses on the applicants' justification of the project, as described in the project application. Commission staff anticipates that this discussion will be expanded in the final EIS as Commission staff's review of the need for the project continues, and that the need for the proposed project will be a subject of scrutiny throughout the Commission's review process, including during the public and technical hearings.

3.1. DESCRIPTION OF MIDCONTINENT INDEPENDENT SYSTEM OPERATOR, INC.

Midcontinent Independent System Operator, Inc. (MISO) is a not-for-profit, member-based organization that administers the wholesale electricity market in the mid-continental U.S. MISO is responsible for providing transmission service, coordinating daily operations of generating and transmission facilities, administering bulk energy markets, and transmission system planning. MISO manages the energy and operating reserves markets using security-constrained economic dispatch of generation. The energy and operating reserves markets include a day-ahead market, a real-time energy market, and a financial transmission rights (FTR) market.[19] These markets are operated and settled separately.[20]

Figures 3.1-1 and 3.1-2 show the MISO market and reliability coordination areas.

[19] FTRs are financial instruments may be used to provide a financial hedge to manage risk associated with congestion on the electric transmission system. The value of FTRs are determined by the transmission congestion charges that arise in the operating reserves and day ahead markets. These charges lead to differences in the marginal congestion components of locational marginal prices (LMP).

[20] https://www.misoenergy.org/Library/Repository/Communication%20Material/Corporate/Corporate%20Fact%20Sheet.pdf

Figure 3.1-1 MISO market area

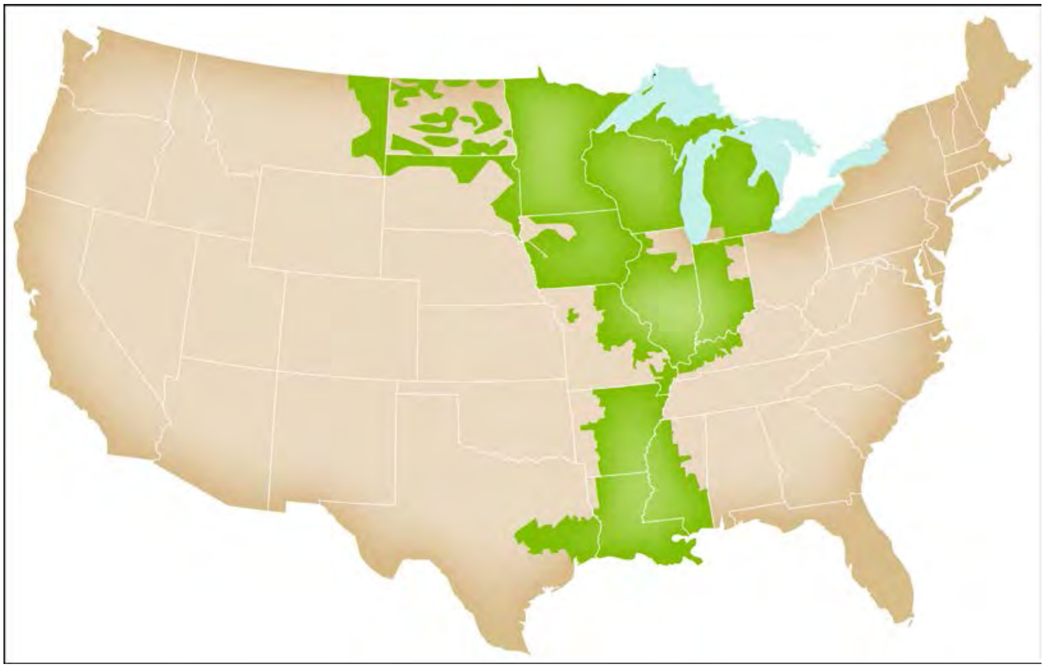
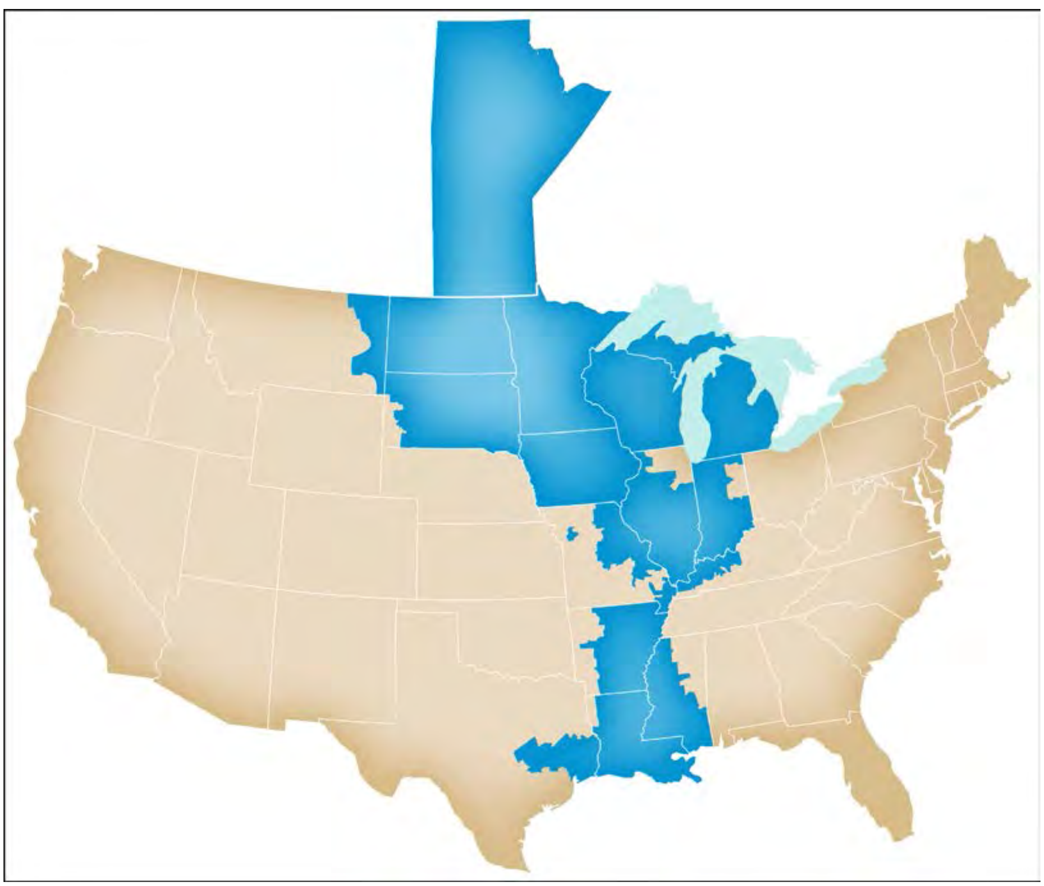


Figure 3.1-2 MISO reliability coordination area



As described in detail below, the MISO board of directors has approved the proposed Badger-Coulee project as part of its Multi-Value Project (MVP) Portfolio.

3.1.1. Transmission planning process in MISO

The transmission planning process for the MISO region is documented in the MISO Business Practices Manual Transmission Planning, BPM-020-r10.[21] The manual describes the annual process used to develop a comprehensive transmission plan to meet reliability and economic needs. Entities interested in the plan, referred to as stakeholders, participate in the evaluation of system alternatives. Each annual planning cycle results in a MISO Transmission Expansion Plan (MTEP) which is typically approved by the MISO Board of Directors each December. The Organization of MISO States (OMS)[22] is an active stakeholder and participant in this planning process. Each approved MTEP includes a list of transmission projects deemed as necessary by the MISO board.

MISO has five planning principles that guide the process with transmission owners, generation owners, load serving entities, OMS, environmental groups, marketers, other regional transmission operators (RTO), and other stakeholders. These five principles include:

- Make the benefits of a competitive energy market available to customers by providing access to the lowest possible electric energy costs.
- Provide a transmission infrastructure that safeguards local and regional reliability.
- Support state and federal renewable energy objectives by planning for access to all such resources (*e.g.* wind, biomass, demand-side management).
- Create a mechanism to ensure that investment implementation occurs in a timely manner.
- Develop a transmission system scenario model and make it available to state and federal energy policy makers to provide context and information regarding potential policy choices.[23]

It is a goal of MISO that the transmission planning process be fully compliant with planning principles presented in the Federal Energy Regulatory Commission's (FERC) Order Nos. 890 and 890-A.[24] In Order No. 890, FERC identified nine planning principles "that must be satisfied for a transmission provider's planning process to be considered compliant with the final rule." MISO has incorporated each of the FERC Order No. 890 planning principles into its transmission planning process, and describes these planning principles in BPM-020.[25] These nine planning principles include:

I. Coordination
II. Openness
III. Transparency
IV. Information Exchange
V. Comparability
VI. Dispute Resolution
VII. Regional Participation
VIII. Economic Planning Studies
IX. Cost Allocation for New Projects

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21 Available for download at https://www.misoenergy.org/Pages/Home.aspx by searching "BPM 020."
22 http://misostates.org/
23 MISO BPM-020, p. 13.
24 Available at http://www.ferc.gov/whats-new/comm-meet/2007/021507/E-1.pdf and http://www.ferc.gov/whats-new/comm-meet/2007/122007/E-1.pdf.
25 MISO BPM-020, pp. 13-14.

There are many different planning functions during the different phases of MTEP development. The major planning functions are listed below:[26]

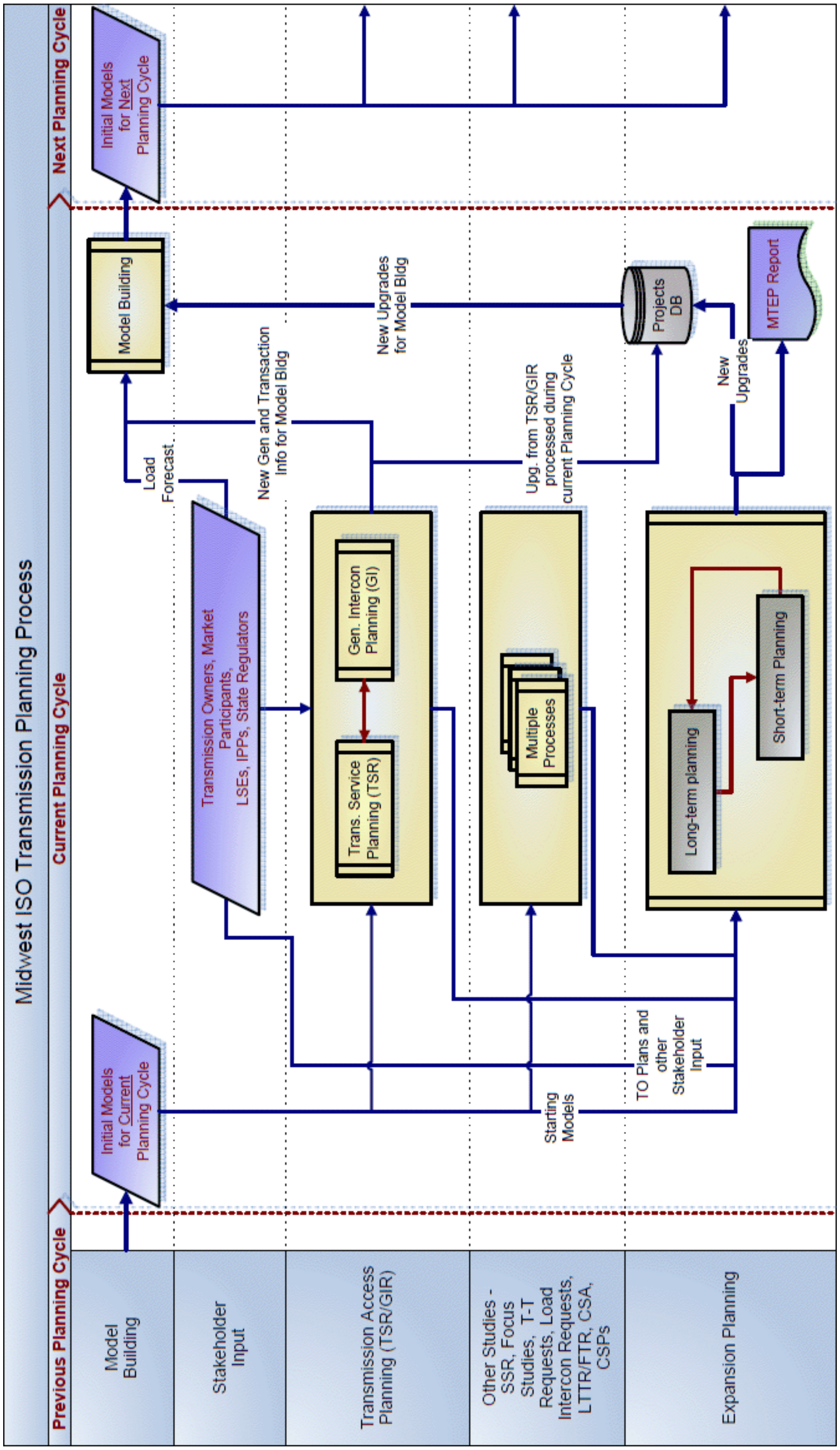
- Model Development
- Cyclical Baseline Reliability and Economic Planning
- Transmission Access Planning
- Generator Interconnection Planning
- Transmission Service Planning
- Coordinated Inter-regional Planning (with other RTOs/Regions)
- Non-cyclical Planning Needs
- System Support Resource (SSR) Studies for unit de-commissioning
- Transmission Interconnections
- Load Interconnections
- Focus Studies – Studies initiated during the cyclical baseline planning process that cannot wait until the next planning cycle (for example, North American Electric Reliability Corporation (NERC)/FERC directives, near-term critical operational issues)

Some planning functions, such as transmission access planning and generator interconnection planning, are conducted on an on-going basis.

A flow diagram of the MISO transmission planning process is included in Figure 3.1-3.

[26] MISO BPM-020, p. 14.

Figure 3.1-3 MISO transmission planning process flow diagram[27]



27 MISO BPM-020, p. 15.

3.1.2. Model building and analysis techniques

Computer models used by MISO for reliability analysis have both near-term (one to five year) and long-term (six to ten year) planning horizons. Economic studies include five-, ten-, and 15-year model runs so that conditions may be evaluated over a period of time.

The primary focus of the MTEP process is to assure compliance with NERC[28] planning and operating standards including the Regional Entities standards. One of the most significant NERC standards is the transmission planning standards included in Standards TPL-001 through 004.[29] These standards address transmission system performance under normal and emergency conditions. Standards MOD-001 through 033 prescribe methods for modeling transmission system elements to evaluate various capabilities of the transmission system.

3.1.3. Planning Advisory Committee

The MISO Planning Advisory Committee (PAC)[30] is a significant source of input for the MISO planning staff during the MTEP development process. The committee is comprised of one member from each of the following MISO stakeholder groups:

- Transmission owners
- Municipal and cooperative electric utilities and transmission-dependent utilities
- Independent power producers and exempt wholesale generators
- Power marketers and brokers
- Eligible end-use customers
- State regulatory authorities
- Representative of public consumer groups
- Environmental and other stakeholder groups
- Transmission developers

The PAC meets monthly to review the progress of the current MTEP process.

3.2. MISO MULTI-VALUE PROJECT PROCESS

3.2.1. Evolution of transmission planning for renewables - the Upper Midwest Transmission Development Initiative[31]

In late 2008, the governors of Wisconsin, Minnesota, Iowa, North Dakota, and South Dakota, formed the Upper Midwest Transmission Development Initiative (UMTDI). The overall goal of the UMTDI was to identify and begin to resolve some of the regional transmission planning design issues and cost allocation issues associated with the delivery of renewable energy from areas with better wind resources into the MISO energy market.

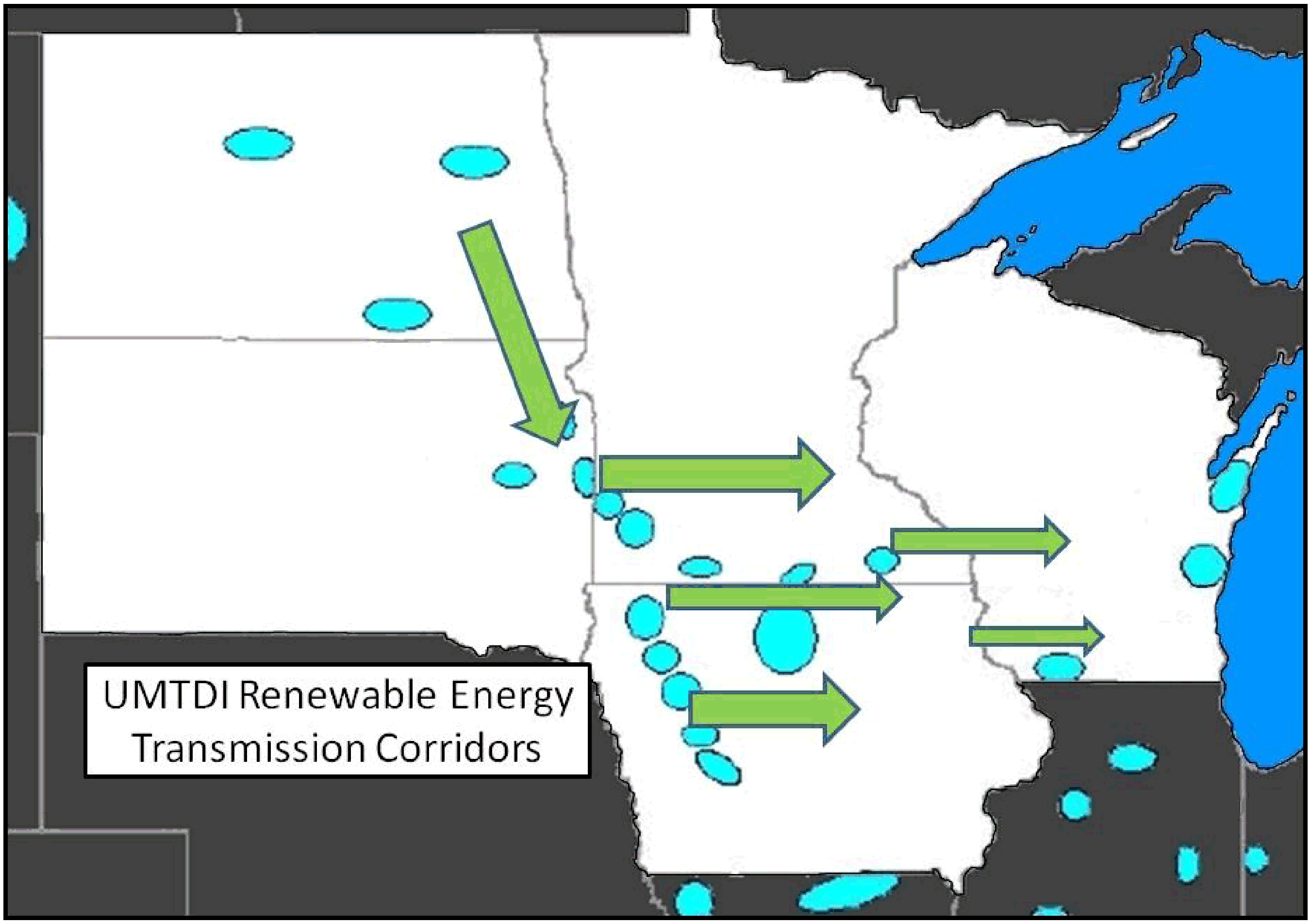
28 http://www.nerc.com
29 http://www.nerc.com/pa/Stand/Reliability%20Standards%20Complete%20Set/RSCompleteSet.pdf
30 https://www.misoenergy.org/StakeholderCenter/CommitteesWorkGroupsTaskForces/PAC/Pages/home.aspx and https://www.misoenergy.org/Library/Repository/Meeting%20Material/Stakeholder/PAC/2014/2014%20PAC%20Charter.pdf
31 http://www.misostates.org/files/UMTDISummaryReportFinal.pdf

This effort by the governors and the associated state regulatory commissions was the foundation for the further studies by MISO on the development of planning considerations for integrating non-traditional generation into the real-time, locational marginal pricing (LMP)[32] energy market of MISO and neighboring regional transmission organizations (RTO) and independent system operators (ISO). UMTDI determined the primary wind resource locations based on numerous local state siting considerations. The renewable energy zones were mapped and power flow models built with various transmission configurations to evaluate the transmission system improvement alternatives for delivering renewable energy to load centers.

It was clear from the initial work that locating wind near load centers reduced transmission requirements, but energy production of the wind electric generating facilities would be diminished because lower average wind speeds exist near loads in the eastern MISO area. Computer modeling with wind turbines placed in the higher average wind speed areas to the west resulted in much more transmission system elements necessary to deliver the energy to the load in the east, but required fewer wind electric generating facilities because of the better wind resource to the west. Power flow models were developed to evaluate where energy would flow from both expanded renewable and conventionally dispatched generation. Figure 3.2-1 illustrates the wind zones and the energy flow.

[32] Locational Marginal Pricing is used by MISO to price energy purchases and sales in the MISO market, and to price transmission system congestion costs.

Figure 3.2-1 UMTDI renewable energy transmission corridors



The UMTDI initiative was completed in the fall of 2010. The final report indicated five transmission projects in the area which would be likely first-movers.[33] Included in this list is a North La Crosse-North Madison 345 kV line and a Dubuque, IA-Spring Green-Cardinal (West Middleton) 345 kV line. The proposed Badger-Coulee project is the project listed as North La Crosse-North Madison 345 kV line, and is one of the projects listed in the UMTDI as likely to work in the MISO real-time energy market.

3.2.2. Further MISO area renewable energy integration studies

Besides the UMTDI, three other more detailed and broader transmission system expansion initiatives were conducted which considered existing individual state renewable portfolio standards (RPS) mandates and goals and the regional energy markets. These studies include:

- Strategic Midwest Area Renewable Transmission (SMARTransmission) Study[34] – The SMARTransmission Study analyzed various combinations of 345 kV, 765 kV, and high-voltage direct current (HVDC) transmission lines to deliver renewables to real-time energy markets. The study concluded that if wind energy development increased in the upper Midwest, then

[33] http://www.misostates.org/files/UMTDISummaryReportFinal.pdf, p. 9.
[34] http://www.smartstudy.biz/include/pdf/phase_one_report.pdf and http://www.smartstudy.biz/include/pdf/phase_two_report.pdf

more transmission was effective in delivery of the energy to load. The study estimated that approximately 57,000 MW of wind energy could be generated in the Midwest and be injected into the MISO and PJM systems.

- Minnesota Capacity Validation Study (MCVS) [35] – The MCVS evaluated what transmission facilities would be necessary to allow an increase of 4,000 MW to 6,000 MW of wind electric generating capacity to the Minnesota 2025 Renewable Energy Standard. The study found that the Badger-Coulee project would reduce transmission system losses when delivering this energy to the MISO market in areas outside of the state of Minnesota. The study also found that there would be additional reliability benefits from the project associated with greater stability of the MISO transmission system.
- Regional Generation Outlet Study (RGOS)[36] – The RGOS report identified the drivers of transmission expansion, including the individual state RPS mandates and goals for renewable energy, and all of the proposed generation in the MISO generation queue. The study identified a transmission plan to accommodate all of the MISO states with their individual RPS requirements and minimize real-time LMP costs. The RGOS study determined the balance of the capital investment in wind generation and extra high-voltage (EHV) transmission. This balance resulted in a blend of local and remote wind and energy supplied by conventional, synchronous generation.

Table 3.2-1 shows the RPS mandates and goals and targeted year of compliance for the upper Midwest states.

Table 3.2-1 RPS mandates or goals and targeted year of compliance for the upper Midwest states[37]

State	Targeted Year of Compliance	Mandate or Goal
Illinois	2025	25 percent
Indiana	2025	10 percent
Iowa	-	105–3,000 MW
Kentucky	-	None
Michigan	2015	10 percent
Minnesota, Xcel Energy	2020	30 percent
Minnesota, Others	2025	25 percent
Missouri	2021	15 percent
Montana	2015	15 percent
North Dakota	2015	15 percent
Ohio	2024	12.5 percent
South Dakota	2015	10 percent
Wisconsin	2015	10 percent

3.2.3. Multi-value project portfolio

In part as a result of the detailed RGOS study, a list of projects was developed for bringing renewable energy into the real-time market. These projects are referred to as the Multi-Value Project Portfolio.[38]

35 http://www.minnelectrans.com/documents/capacity-study/cvsreport.pdf
36 https://www.misoenergy.org/Planning/Pages/RegionalGenerationOutletStudy.aspx
37 Adapted from the MISO Multi Value Project Portfolio report, https://www.misoenergy.org/Library/Repository/Study/Candidate%20MVP%20Analysis/MVP%20Portfolio%20Analysis%20Full%20Report.pdf, p. 3.

The final MVP portfolio report was issued on January 10, 2012, after the projects were approved by the MISO board of directors as part of the MTEP11 process in December 2011. MVP projects are designated as such by MISO because the projects would provide reliability, public policy, and economic benefits. The MVP criteria are described in MISO Attachment FF to its tariff, which includes in summary:[39]

> Criterion 1 – The projects to be developed deliver energy in a reliable and economic manner to support the law enacted or adopted through state or federal legislation or other regulatory requirements.
> Criterion 2 – The MVP must provide multiple types of economic value across multiple pricing zones with MVP benefit to cost ratios of 1.0 or higher.
> Criterion 3 – An MVP must address at least one transmission issue associated with a projected violation of NERC or Regional Entity standard and at least one economic-based transmission issue across multiple pricing zones.

The proposed Badger-Coulee project is included in the final Multi-Value Project Portfolio report.[40]

The final Multi-Value Project Portfolio report recognizes a concept initiated in the UMTDI and RGOS. The concept is that integration of non-dispatchable wind generating facilities into the LMP real-time market requires a balance of locating wind generators in areas with better wind resources, while minimizing transmission investment by balancing the transmission system with existing and future conventional synchronous generation under various scenarios. This concept is discussed in greater detail in the Multi Value Project Portfolio report.[41]

The Multi-Value Project Portfolio report concluded that the MVP portfolio would result in benefit to cost ratios greater than one for all seven MISO north and central Local Resource Zones when considering future scenarios. These benefit to cost ratio ranges are provided in Figure 3.2-2. Benefit to cost ratios are calculated by comparing reductions in real-time market energy losses and congestion relief in the MISO footprint to the capital cost of the MVP portfolio. The 17 MVP projects approved in MTEP11 are shown in Figure 3.2-3 and listed in Table 3.2-2.

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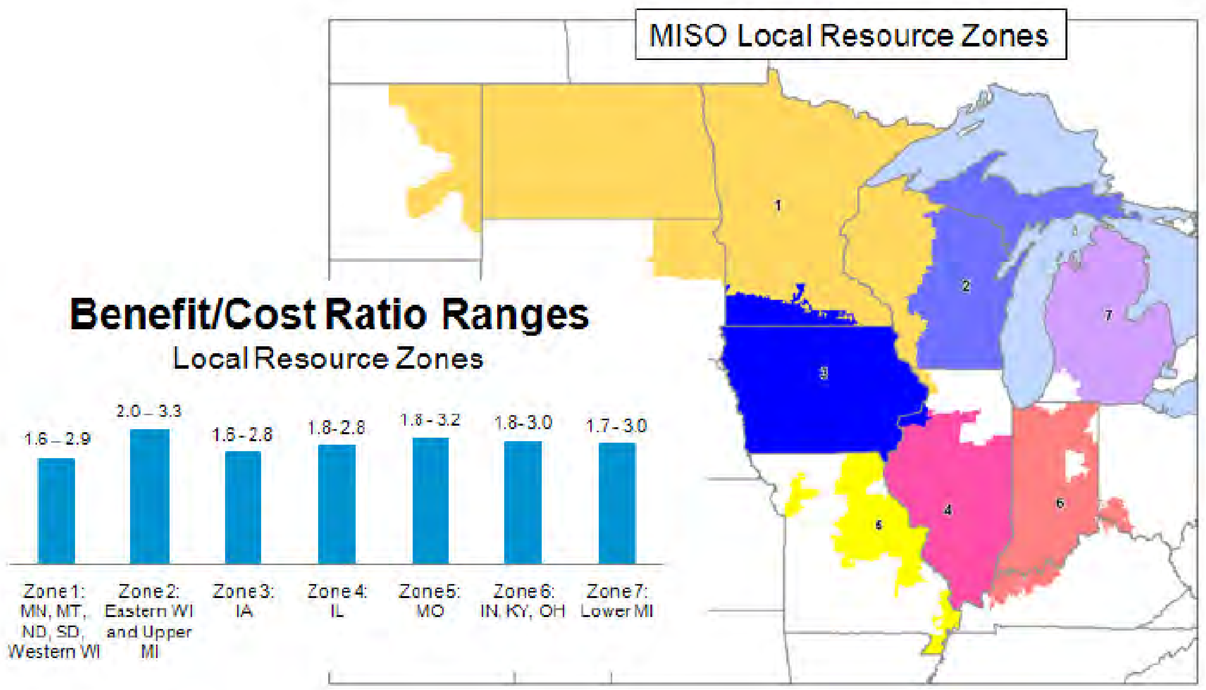
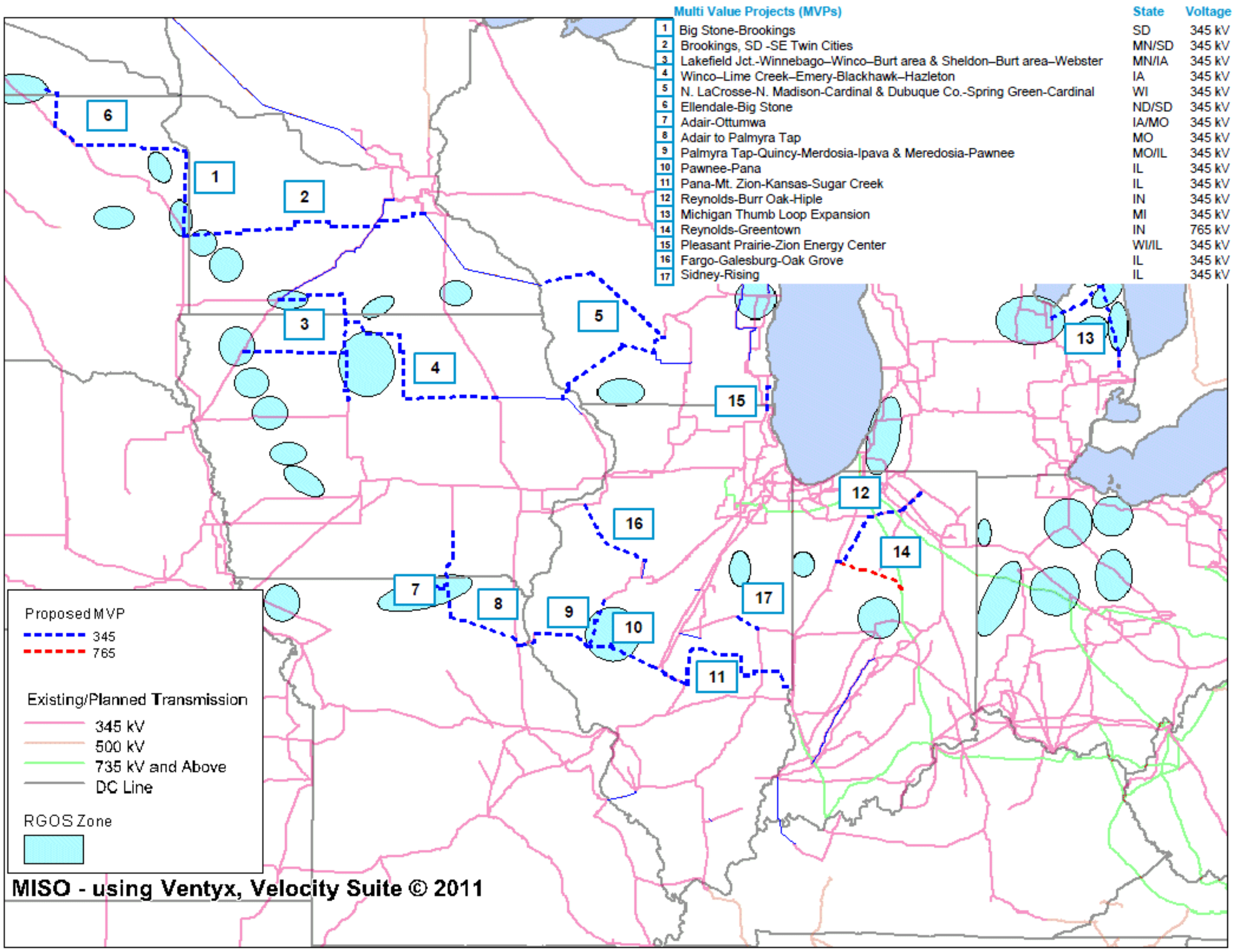
[38] MISO Multi Value Project Portfolio report, https://www.misoenergy.org/Library/Repository/Study/Candidate%20MVP%20Analysis/MVP%20Portfolio%20Analysis%20Full%20Report.pdf.
[39] Available at https://www.misoenergy.org, by searching for "MISO Attachment FF."
[40] MISO Multi Value Project Portfolio report, pp. 27-8.
[41] MISO Multi Value Project Portfolio report, pp. 16-7.

Figure 3.2-2 North and central MISO Local Resource Zones benefit/cost ratio ranges[42]



42 MISO Multi Value Project Portfolio report, p. 6.

Figure 3.2-3 MISO MVP portfolio map[43]



[43] MISO Multi Value Project Portfolio report, p. 1.

Table 3.2-2 MVP portfolio list of projects and estimated cost[44]

	Project	State	Voltage (kV)	In-Service Year	Cost (millions, 2011 dollars)
1	Big Stone-Brookings	SD	345	2017	$191
2	Brookings, SD-SE Twin Cities	MN/SD	345	2015	$695
3	Lakefield Jct.-Winnebago-Winco-Burt area and Sheldon-Burt area-Webster	MN/IA	345	2016	$506
4	Winco-Lime Creek-Emery-Black Hawk-Hazelton	IA	345	2015	$480
5	N. La Crosse-N. Madison-Cardinal & Dubuque Co.-Spring Green-Cardinal	WI	345	2018/2020	$714
6	Ellendale-Big Stone	ND/SD	345	2019	$261
7	Adair-Ottumwa	IA/MO	345	2017	$152
8	Adair-Palmyra Tap	MO/IL	345	2018	$98
9	Palmyra Tap-Quincy-Meredosia-Ipava and Meredosia-Pawnee	IL	345	2016/2017	$392
10	Pawnee-Pana	IL	345	2018	$88
11	Pana-Mt. Zion-Kansas-Sugar Creek	IL/IN	345	2018/2019	$284
12	Reynolds-Burr Oak-Hiple	IN	345	2019	$271
13	Michigan Thumb Loop Expansion	MI	345	2015	$510
14	Reynolds-Greentown	IN	765	2018	$245
15	Pleasant Prairie-Zion Energy Center	WI/IL	345	2014	$26
16	Fargo-Galesburg-Oak Grove	IL	345	2018	$193
17	Sidney-Rising	IL	345	2016	$90
Total					$5,197

3.2.4. Multi-value project cost sharing

The cost of the approximately $5.2 billion MVP portfolio is allocated to load based on load ratio share. The justification for this allocation is that all load shares in the benefits of these projects. Cost allocations are determined by a formula that balances cost with the benefits of meeting state renewable energy targets, reduced market prices, and avoided local reliability projects. The allocations in 2020, when all MVP projects are expected to be in service, for the MVP portfolio for the load balancing authorities (LBA) are included in Table 3.2-3. The formula and resulting allocations assume that load serving entities (LSE) share the benefits and costs of the MVP projects.

Table 3.2-3 Estimated MVP charges by ATC and other LBAs

LBA	Approximate Allocation (may not add due to rounding)
Alliant Energy (ALTE)	2.5%
Madison Gas and Electric Company (MGE)	0.7%
Upper Peninsula Power Company (UPPC)	0.2%
Wisconsin Electric Power Company (WEC)	6.9%
Wisconsin Public Service Corporation (WPSC)	2.9%
Total ATC	13.3%
Dairyland Power Cooperative (DPC)	1.2% (Wisconsin operations 0.6%)
Northern States Power Company-Wisconsin (NSPW)	9.6% (Wisconsin operations 1.4%)
All others	75.9%

[44] Adapted from the MISO Multi Value Project Portfolio report, p. 2.

The cost of each MVP project is allocated on a system wide basis to all transmission customers who withdraw energy from the MISO system. The annual carrying charges are set by LBA and can be found in MISO Schedule 26-A.[45] MISO Schedule 26-A is updated twice annually.

3.2.5. Regional market MVP review

Starting with MTEP14, MISO is required to conduct a full review of the benefits of the approved MVP portfolio every three years. This MVP triennial review will not change MVP cost allocation. Rather, the intent is to identify potential modifications to the MVP process for any future MVP portfolio approved by MISO. The analysis will use models with processes and benefit valuations consistent with the original business case completed in MTEP11.[46]

The MVP review will provide an updated view into the projected public policy, economic and qualitative benefits of the MVP portfolio, and provide information on the following issues:

- Public Policy Benefit – Quantify how much wind energy the MVP Portfolio enables to meet state RPS
- Economic Benefits – Refresh of six tariff-defined economic benefit metrics; benefit to cost ratios will be provided by local resource zone, including:
  - Congestion and Fuel Savings
  - Decreased Operating Reserves
  - Decreased System Planning Reserve Margins
  - Decreased Transmission Line Losses
  - Decreased Wind Turbine Investment
  - Elimination of Need for Some Future Transmission
- Social Benefits – Updated qualitative discussion of additional benefits not included in the business case, such as carbon emissions reduction, decreased natural gas price volatility, and fuel flexibility.
  - For instance, in the Business As Usual case and Low Demand and Energy the MVP portfolio was estimated to reduce fossil generation with additional wind energy and reduce the 2026 carbon emissions by 18 million tons.
- Any significant differences in assumptions between MTEP14 and MTEP11 will be quantified through sensitivity analysis, i.e. footprint changes, natural gas prices, demand and energy growth rates.
- The review will use updated project costs and in-service dates as reported in the latest MTEP quarterly status report.

The results of the MVP review will be published in MTEP14, which will be reviewed and presented to the MISO Planning Advisory Committee via the MTEP review process. The first round of stakeholder reviews is scheduled for early August 2014.

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45 Available at https://www.misoenergy.org by searching for "Schedule 26-A."
46 MISO MVP compliance filing with FERC dated April 7, 2014, available at http://elibrary.ferc.gov/idmws/search/fercgensearch.asp by searching docket "ER12-1564." See also the April 8, 2014, supplemental filing.

3.3. EXISTING BULK ELECTRIC FACILITIES IN GEOGRAPHIC AREA

3.3.1. Existing transmission system in the Badger-Coulee project study area

As shown in Figure Vol. 2-2, the La Crosse area is served by a network of 161 kV and 69 kV lines. When construction of the Alma-La Crosse (CapX) 345 kV project (docket 5-CE-136) is complete, the main 161 kV links will be Alma-Marshland-Briggs Road, Alma-Tremval-Briggs Road, Genoa-Coulee-La Crosse, and Genoa-La Crosse tap. The CapX 345 kV project will extend a new 345 kV line into the new Briggs Road Substation from Rochester, Minnesota. The remainder of western Wisconsin is currently served by a network of 161 kV and 69 kV lines with little 345 kV service.

The Madison area is served by 345 kV lines from Columbia Generating Station to North Madison and from Rockdale Substation to the Cardinal Substation. The area is also served by various 138 kV and 69 kV lines, including an existing 138 kV line from the North Madison Substation to the Cardinal Substation.

The applicants state that growing demand for electricity in the study area would exceed the ability of the current electrical system to reliably deliver power at peak load and under contingency conditions, when one or more transmission elements are out of service. In addition, the applicants state that there is a need to improve west to east power flow capability in order to relieve transmission system congestion. The applicants also state that there is wind electric generation in Minnesota that needs to be moved during times of higher wind speeds and low loads.

3.3.2. Existing electric generation in the Badger-Coulee project study area

The ability of the regional transmission system to serve the study area depends on the status of major local power plants. The names, capacities, fuel types, location, and potential retirements of major existing generating facilities in the Badger-Coulee project study area are listed Table 3.3-1 and shown in Figure Vol. 2-2.

Table 3.3-1 Major existing generating facilities in the project study area

Plant	Capacity (MW)	Fuel Type	Location	Projected to Retire?
Nelson Dewey	200	Coal	Cassville, WI	Yes, 2016
John P. Madgett	387	Coal	Alma, WI	No
Genoa Unit 3	346	Coal	Genoa, WI	No
Alma Units 4, 5	136	Coal	Alma, WI	Yes, end of 2015
Columbia	1,023	Coal	Portage, WI	No
Biron Paper Mill	62	Coal	Wisconsin Rapids, WI	No
Nekoosa Paper Mill	39	Coal	Nekoosa, WI	No
Wisconsin Rapids Paper Mill	21	Coal	Wisconsin Rapids, WI	No
Lansing Coal	314	Coal	Lansing, IA	No
French Island Peaking Units	188	Combustible Renewable	La Crosse, WI	No
Wisconsin Rapids Pulp Mill	72	Combustible Renewable	Wisconsin Rapids, WI	No
E.J. Stoneman	53	Combustible Renewable	Cassville, WI	No
Glacier Hills Wind Park	162	Wind	Randolph, WI	No
Montfort Wind Farm	30	Wind	Montfort, WI	No
Prairie du Sac Hydro Plant	31	Hydro	Prairie du Sac, WI	No
Castle Rock Hydro Plant	15	Hydro	Adams, WI	No
Petenwell Hydro Plant	20	Hydro	Necedah, WI	No
Blount Generating Station	100	Natural Gas	Madison, WI	No
West Campus Co-gen Facility	169	Natural Gas	Madison, WI	No
Fitchburg Plant	58	Natural Gas	Madison, WI	No
Nine Springs	16	Natural Gas	Madison, WI	No
Charter Street UW Madison	10	Natural Gas	Madison, Wi	No
Sycamore Plant	42	Natural Gas	Madison, WI	No
RockGen	561	Natural Gas	Cambridge, WI	No
Whitewater Co-gen	284	Natural Gas	Whitewater, WI	No
Concord	437	Natural Gas	Watertown, WI	No
Sheepskin	40	Natural Gas	Edgerton, WI	No
Juneau Peaking	16	Oil	Necedah, WI	No
Arcadia Peaking	17	Oil	Arcadia, WI	No

3.3.3. Major load centers in the Badger-Coulee project study area

Major load centers within the Badger-Coulee project study area are listed in Table 3.3-2.

Table 3.3-2 Major load centers in the project study area

Rochester, Minnesota
Minneapolis and St. Paul, Minnesota
La Crosse, Wisconsin
Eau Claire, Wisconsin
Madison, Wisconsin
Stevens Point, Wisconsin
Wisconsin Rapids, Wisconsin
Wisconsin Dells, Wisconsin
Dubuque, Iowa

3.4. AVOIDED TRANSMISSION RELIABILITY PROJECTS

3.4.1. Cost of avoided transmission reliability projects

The original project application filed by the applicants included a list of transmission projects that would no longer be necessary if the proposed Badger-Coulee project were constructed.[47] This original list of avoided reliability projects was based on modelling developed for the Wisconsin Transmission Reliability Study (WWTRS).[48]

Since the WWTRS was completed in 2010, several changes have occurred including:

- MISO has approved MVP projects across its footprint.
- Additional uprates to the existing transmission system are required to meet more stringent NERC criteria.
- Projected increases to load across the region have been reduced.
- Additional generating units are to be retired in the western Wisconsin area.
- Changes in U.S. Environmental Protection Agency (EPA) air emissions rules continue.

In response to a Commission staff data request, ATC provided an updated reliability study that included an updated list of avoided reliability projects.[49] ATC developed this updated list using different computer modelling runs with updated assumptions from those used in the original WWTRS. The total estimated cost of the identified avoided reliability projects is summarized in Table 3.4-1.

Table 3.4-1 Estimated cost of avoided reliability projects[50] (millions)

Badger Coulee ATC Avoided Reliability Projects	$91.1
Badger Coulee non-ATC Avoided Reliability Projects	$98.3
Total, in 2012 dollars	$189.4

The updated list of avoided reliability projects was identified using the 2023 Shoulder Peak power flow modelling case. It should be noted that, using the 2023 Summer Peak modelling case, the proposed Badger-Coulee project does not eliminate the need for any ATC or non-ATC reliability projects.[51]

3.4.2. Factors that may affect the avoided transmission reliability projects

The following factors may change avoided reliability projects, by either adding more projects or removing projects because they would no longer be necessary:

- MVP projects – As discussed previously, the proposed Badger-Coulee project has been approved by MISO as part of an MVP portfolio that also includes the Cardinal-Bluffs project.

[47] Original *Planning Analysis of the Badger Coulee Transmission Project*, (Original Application Appendix D, Exhibit 1), pp. 75-76 of 263, PSC REF#: 191920.
[48] Revised *Planning Analysis of the Badger Coulee Transmission Project*, (Revised Application Appendix D, Exhibit 1), Addenda A, pp. 112-261 of 346, PSC REF#: 204739.
[49] Response to Data Request Item 01.93, pp. 5-17 of 25, PSC REF#: 199617. See also revised Application Appendix D, Exhibit 1, pp. 75-79 of 346, PSC REF#: 204739.
[50] Response to Data Request Item 01.93, Tables 3 and 4, pp. 8-9 of 25, PSC REF#: 199617.
[51] Response to Data Request Item 01.93, pp. 8 of 25, PSC REF#: 199617.

By being designated as an MVP, MISO has determined that the project would provide reliability, public policy, and economic benefits. Commission staff has requested additional reliability and benefit information for this project using the assumption that the Cardinal-Bluffs project is in service.[52]

- Transmission upgrades – The Commission approved the CapX 345 kV project (docket 5-CE-136) in 2012. Since the original WWTRS, several other transmission upgrades already have occurred or will occur regardless of whether the proposed Badger-Coulee project is constructed. The MISO MTEP13 pre-planning project list includes several reliability projects in Wisconsin that will be completed in the near future.[53] Completion of these projects could reduce the number of avoided reliability projects necessary should the proposed Badger-Coulee project not be constructed. These projects could also delay the need for the proposed Badger-Coulee project.
- Generating units retired – Since the WWTRS was completed, announcements were made regarding the planned retirement of Nelson Dewey Units 1 and 2 and Alma Units 1 through 5. Additional generating units located outside the Badger-Coulee study area, such as Edgewater Units 3 and 4, Pulliam Units 5 and 6, Weston Unit 1, and Kewaunee Nuclear Power Plant have been or will soon be removed from service. These retirements could increase the number of avoided reliability projects necessary should the proposed Badger-Coulee project not be constructed.
- Peak load projections – Peak load projections have been reduced since the original WWTRS. This includes projections for the ATC, Xcel Energy, and MISO service areas. These reductions in load projections could reduce the number of avoided reliability projects necessary should the proposed Badger-Coulee project not be constructed.
- Changes in EPA rules – On June 18, 2014, EPA published a proposed rule titled Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units.[54] Clean Air Act Section 111(d) requires states to develop plans for existing sources of non-criteria pollutants, such as CO_2 for which there is no ambient air quality standard, whenever EPA promulgates a standard for a new source. These plans are subject to EPA review and approval. Each state would have the flexibility to design a program to meet its goal in a manner that reflects its particular circumstances and energy and environmental policy objectives. This could result in more renewable electric generation facilities being constructed in areas with better wind resources, such as those areas to the west of Wisconsin. This increase in wind electric generation facilities to the west could increase necessary transmission projects even if the proposed Badger-Coulee project is constructed. Additionally, the need to integrate the additional wind energy into the MISO real-time energy market while maintaining system reliability could increase the value of the proposed project.

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52 Data Request Items 02.35 and 02.36, PSC REF#: 203787.
53 Available at https://www.misoenergy.org by searching "mtep 13 spm pre-planning list."
54 Available at https://www.federalregister.gov/articles/2014/06/18/2014-13726/carbon-pollution-emission-guidelines-for-existing-stationary-sources-electric-utility-generating.

3.5. ENERGY COST SAVINGS

3.5.1. Applicants' stated benefit of access to lower cost energy[55]

ATC states that the proposed Badger-Coulee project would produce energy cost savings in the form of reductions in the cost of delivered energy for electric distribution utilities within ATC's service area. ATC also states that the project would reduce transmission system congestion charges associated with moving energy from generation sources to load.

Wisconsin utilities and other participants in the MISO market pay congestion charges when transmitting energy from low-priced nodes to higher-priced nodes, unless the difference in nodal prices is due only to losses. The applicants state that the proposed Badger-Coulee project would increase the quantity of FTRs available to utilities within ATC. Congestion charges can be hedged through offsetting revenues from FTRs that are allocated to, or bought by, Wisconsin utilities. However, such FTR revenues do not exactly offset all congestion charges. If a new transmission project like the proposed Badger-Coulee project reduces congestion, congestion charges and FTR revenues both decrease, but often not in equal and offsetting amounts. As such, ATC states that both changes in FTR revenues and changes in congestion charges are an important part of the benefit-cost analysis of new transmission projects.

3.5.2. PROMOD model description

PROMOD is a computer model that is commonly used by electric utilities as a tool for electric system economic planning. Ventyx, the PROMOD software vendor, states that the model forecasts locational marginal prices by performing security constrained generating unit commitment and economic dispatch in a manner similar to that used by independent transmission system operators in the real-time energy market.[56] PROMOD also determines costs or benefits associated with financial transmission rights, congestion revenue rights, and transmission congestion contracts by identifying significant binding system constraints and evaluating economic impacts of those constraints. It also simulates the effects of intermittent energy from wind and solar generating facilities on transmission congestion, and forecasts the amount of energy from intermittent sources that may require curtailment. PROMOD allows the evaluation of the economic and congestion impacts of proposed electric transmission projects.

PROMOD has been used previously by ATC to assess the merits of transmission projects requiring Commission review and approval.

3.5.3. Description of PROMOD modelling runs

3.5.3.1. MISO MTEP09 modeling runs

As described in detail in Section 3.8.3, ATC considered the following transmission system alternatives in its analysis of the proposed Badger-Coulee project:

- Badger-Coulee 345 kV project as proposed
- Spring Green 345 kV alternative
- 345 kV to Iowa alternative
- Combination 345 kV alternative
- 765 kV alternative

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[55] A detailed discussion of energy cost savings is included in revised Application Appendix D, Exhibit 1, pp. 41-45 of 346, PSC REF#: 204739.
[56] http://www.ventyx.com/~/media/files/brochures/promod_data_sheet.ashx.

- Low Voltage alternative

ATC states in its application that it developed PROMOD simulations based on data from MISO MTEP09. ATC simulated in PROMOD all of the transmission and generation facilities within MISO and PJM. ATC refers to the combination of these areas as the "PROMOD footprint." It modified the data to include anticipated changes in load growth and energy usage, including energy efficiency and load management strategies. ATC obtained information from utilities and other relevant stakeholders as the basis for these modifications. Using this modified dataset, ATC modelled and evaluated each of the transmission system alternatives against six different "futures" scenarios. These futures include:

- Robust Economy;
- Green Economy;
- Slow Growth;
- Regional Wind;
- Limited Investment; and
- Carbon Constrained.[57]

Each of the futures have different assumptions about load growth, energy use, fossil fuel generation, and other factors that affect demand for electricity. ATC developed low, mid and high growth rates for load and energy, both within ATC and within MISO, and included these values as they believed appropriate in the six futures. ATC ran a reference case (a modelling run without the proposed project) and a case that included the proposed Badger-Coulee project for each future.[58]

ATC used transmission system data from a NERC Multiregional Modeling Working Group (MMWG) case. To ensure that the most current ATC system is modeled, ATC strips out its own transmission data from the NERC MMWG case and replaces it with the latest data from ATC's 10-Year Assessment for the specific study year.[59]

Most of the generator input data is contained within PowerBase, which is the database provided for use with PROMOD. PowerBase contains individual generator data, such as summer and winter capacities, heat rates, forced outage rates, and other information and is provided by Ventyx. Ventyx obtains most of the data from the Platts database[60] and public information sources, like EPA and NERC. Planned future generation is added to PROMOD for future study years because sufficient new generation needs to be included in PROMOD to meet long term planning reserve margins. Minimum planning reserve requirements are set based on the assumption that other reliability regions will have generation reserves to serve as a source of supply during any generation emergency. Emergencies can occur, for example, when a large plant breaks down and insufficient generation is available to replace it locally. In this case the system is designed to rely on neighboring reliability regions to make up the shortfall at least until additional local generation can be brought onto the system. Being able to rely on generation from neighboring reliability regions lowers the overall costs for all electric customers because each region needs to build less generation to meet NERC reliability requirements.

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[57] The six futures are described in detail in revised Application Appendix D, Exhibit 1, pp. 33-6 of 346, PSC REF#: 204739.
[58] A detailed discussion of ATC's PROMOD modelling is included in the project application, pp. 26-9 of 144, PSC REF#: 204860, and Revised Application Appendix D, Exhibit 1, pp. 309-10 of 346, PSC REF#: 204739.
[59] Appendix D, Addendum D, p. 311 of 346, PSC REF#: 204739. See also ATC's 10-Year Assessment, http://www.atc10yearplan.com/.
[60] http://www.platts.com/products/world-electric-power-plants-database.

For natural gas prices, ATC used annual monthly averages of the New York Mercantile Exchange (NYMEX) futures prices for August 2009 through the end of 2021. Natural gas prices used for 2022 through 2026 are the 2021 natural gas price escalated at the nominal natural gas price change assumed in the Energy Information Administration Annual Energy Outlook 2009.[61] [62]

To determine a forward-looking estimate for energy use, ATC used a five-year moving average of the geometric mean of energy use within the ATC footprint. This calculated growth rate of 1.9 percent was rounded to 2.0 percent. ATC determined that a more reasonable range of energy growth rates would be 0.1 percent for the lower bound and 2.2 percent for the upper bound.[63]

Since the Badger-Coulee project would increase import capability into a congested area, a significant driver in evaluating the economic benefits of the project is the amount of low-cost generating capacity within the area. As such, it is important to include new generating capacity that is under construction, or has an in-service date after the original modelling was created. Retirement of some smaller, older, and less efficient coal-fired units within the ATC footprint is also assumed in some of the futures, as generation owners may choose to retire some older, smaller, coal-fired units rather than add costly pollution control equipment to meet the requirements of new and existing environmental regulations.

To account for the additional renewable energy to meet the Wisconsin RPS, ATC first calculated the existing amount of renewable energy within the ATC footprint. Renewable energy needs under the Wisconsin RPS is based on total energy sales. Incremental needs above and beyond existing and planned renewable generation were determined by multiplying the RPS percentage requirements against the total energy for each future and each study year. These numbers were used as a basis for determining the additional renewable resources that would be needed in order to meet any increases to Wisconsin load.[64]

ATC also developed generation portfolios for areas outside of ATC. ATC determined how many MW of generation were necessary along with the optimal mix of generation types. The generation capacity needs as calculated by ATC were based on the load growth rates and corresponding generation levels which vary across the futures. Calculations were done to adjust the necessary MW levels of generation both by type and regional location to meet the reserve margin requirements of the regions based on the different forecasted load levels assumed in each future. Generating units from the MISO EGEAS[65] expansion set were placed into the model to simulate adequate generation outside of ATC.[66]

3.5.3.2. MISO MTEP11 modeling sensitivity runs[67]

Evaluating transmission alternatives is a complex, lengthy process. It requires development of appropriate methodologies, computer simulations of the transmission system, and other engineering and economic analyses of proposed alternatives. There is inevitably a lapse of time between the date when

61 Revised Application Appendix D, Exhibit 1, p. 290 of 346; Appendix D, Addendum D, p. 319 of 346, PSC REF#: 204739.
62 http://www.eia.gov/
63 Revised Application Appendix D, Exhibit 1, p. 317 of 346, PSC REF#: 204739.
64 Revised Application Appendix D, Exhibit 1, pp. 317-318 of 346, PSC REF#: 204739.
65 EGEAS is a complex interactive computer model developed by the Electric Power Research Institute. Over the past decade, the Commission has consistently used and required utilities to use EGEAS to evaluate electric generation expansion plans for cost-effectiveness, and to evaluate whether expansion plans are optimum from various standpoints. See also http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000000001016192.
66 Revised Application Appendix D, Exhibit 1, Addendum D, p. 322 of 346, PSC REF#: 204739.
67 MTEP11 modeling sensitivity runs are described in detail in revised Application Appendix D, Exhibit 1, Addenda F, pp. 325-329, PSC REF#: 204739.

the relevant data and models for any planning analysis are selected and the date when a CPCN application for a proposed project is presented to the PSC.

Due to this time lapse, ATC determined that it would be appropriate to perform an additional sensitivity analysis in order to test its previous MTEP09 modeling results. It focused its analysis on one of the key benefits of the Badger-Coulee project, which is energy-cost savings for ATC customers. The sensitivity was performed to test the predictive value of ATC's Strategic Flexibility construct.[68] ATC believes that if the results show that the project yields benefits within the range of the previously established futures, there can be more confidence that the project would provide net benefits across a wide range of likely future conditions. ATC states that the key point is not whether the project still performs well under current conditions, as conditions will vary widely during the useful life of the proposed project. Rather it is whether the results of the sensitivity fall within the boundaries of the previous analysis, increasing confidence in that analysis.

After considering various options, ATC selected as its sensitivity the Business as Usual (BAU) with Mid-Low Demand and Energy Growth Rates future from MISO MTEP11. This is also known as the MTEP11 BAU-Low future. ATC chose this future for two main reasons:

1. As ATC was developing its Planning Analysis based on the MTEP09 model, MISO was evaluating potential "Candidate Multi-Value Projects" (MVP) and securing FERC approval for its MVP tariff. The proposed Badger-Coulee project is included in one of the MVP projects along with the Cardinal-Bluffs project. All of the MVP projects were analyzed by MISO using its MTEP11 model. ATC believes it was logical to select for its sensitivity the same MTEP11 model that MISO used for its analysis of the MVP portfolio that included the proposed Badger-Coulee project.

2. Second, the MTEP11 model uses more recent energy and load levels, forecasts, and regulatory information than the MTEP09 model.[69]

For MTEP11, four futures were developed:

- BAU-Low;
- BAU with Historic Demand and Energy Growth Rates;
- the Carbon Constraint Future; and
- Combined Energy Policy Future.

BAU-Low is the most conservative of the MTEP11 futures. For most reference values it models the regional power system as it exists today. It assumes no change in resource adequacy standards, renewables mandates, or environmental regulation. It also assumes a slow recovery from the recent economic downturn and uses modest demand, energy, and inflation rates. The effective MISO demand growth rate for the BAU-Low scenario is 0.78 percent and the energy growth rate 0.79 percent. These growth rates are also consistent with the growth rates included in the Commission's most recent

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[68] Strategic Flexibility is an analytical approach developed by Deloitte Consulting to assist organizations in making major investment decisions in an uncertain environment. The premise of Strategic Flexibility is that, because we cannot know the future, high-cost projects should be tested against a range of plausible futures. These plausible futures are to "bound" the range of plausible outcomes, and not to identify the most likely future. The project is tested against each of the futures and should be chosen only if it is successful in most of the futures. The objective is to identify projects that are robust across a range of plausible futures.

[69] Revised Application Appendix D, Exhibit 1, Addendum D, p. 327 of 346, PSC REF#: 204739.

Strategic Energy Assessment.[70] In the later years of the study period for the MISO BAU-Low scenario (beyond five years) MISO used the EGEAS model to select only the generation necessary to maintain the balance between load and generation and to meet the planning reserve margin target.[71]

ATC performed a PROMOD analysis of the proposed Badger-Coulee project using the MTEP11 BAU-Low database. Two PROMOD cases were developed, one with and one without the Badger-Coulee project.

The sensitivity analysis measured net energy-cost savings as a result of the proposed Badger-Coulee project for ATC customers. It did not measure the savings across the MISO footprint. As with its MTEP09 analysis, the metric ATC employed in this analysis is its Customer Benefit metric, rather than MISO's adjusted production cost or LMP measures. While energy-cost savings for ATC customers are largely dependent on the cost of generation supply, they are also affected by factors such as total congestion charges, FTR revenues, loss charges, and loss refunds. The result is a value between production cost and LMP savings. Finally, ATC's sensitivity compares only one of the major benefits of the proposed Badger-Coulee project, net energy-cost savings. It does not analyze other benefits such as insurance value, loss savings, renewable investment benefit, or the avoided cost of necessary reliability projects. These benefits were analyzed in ATC's first set of modeling based on MTEP09.

The results of ATC's sensitivity analysis show that the net energy-cost savings of the proposed Badger-Coulee project, in both study years and on a present-value basis, are greater in the MTEP11 BAU-Low case than they are in the ATC Slow Growth Future. ATC believes this outcome is consistent with the fact that the MTEP11 BAU-Low case continues the effects of the recent economic downturn while the ATC Slow Growth future also assumes a sluggish economy inside and outside of the ATC area. ATC states that in the most conservative scenarios in both MTEP11 and the original ATC MTEP09 analysis, the proposed Badger-Coulee project demonstrates substantial net energy-cost savings for ATC customers.[72]

3.5.3.3. MISO MTEP13 modeling sensitivity runs[73]

As an additional supplement to the PROMOD analysis, ATC conducted modeling sensitivity runs using MTEP13 data. Starting with updated futures and updated study models, ATC performed 12 additional PROMOD runs to analyze the base case and the proposed Badger-Coulee project, for three of the MTEP13 futures, for each of two study years. This was done in response to discussions with Commission staff regarding the availability of MISO MTEP13 information. The focus of this analysis is on one of the key benefit measures of the proposed Badger-Coulee project, energy-cost savings for ATC customers. This analysis, like ATC's MTEP11 sensitivity, tests the predictive value of ATC's Strategic Flexibility construct by utilizing updated information from MTEP13, which was not available at the time of the original MTEP09 analysis or the MTEP11 sensitivity analysis. ATC believes the results are consistent with all prior analyses, showing that the proposed project yields benefits in excess of revenue requirements. The metric ATC again employed in this analysis is its Customer Benefit metric, rather than MISO's adjusted production cost or LMP measures. ATC states that while energy-cost savings for its customers are largely dependent on the cost of generation supply, they are also affected by factors such as total congestion charges, FTR revenues, loss charges, and loss refunds. The ATC Customer Benefit metric takes into account these factors and calibrates the energy cost savings to arrive at likely actual savings to ATC customers. ATC states its result is a value in between production-cost and LMP savings.

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70 Final Strategic Energy Assessment: Energy 2018, November, 2012, PSC REF#: 176432.

71 Revised Application Appendix D, Exhibit 1, Addendum D, p. 328 of 346, PSC REF#: 204739.

72 Revised Application Appendix D, Exhibit 1, Addendum D, pp. 329-330 of 346, PSC REF#: 204739.

73 MTEP13 modelling sensitivity runs are described in detail in *MTEP 13 Futures as a Sensitivity*, PSC REF#: 201972.

The three futures defined in MTEP13 that were used for this analysis are:

- Limited Growth (LG);
- Business as Usual (BAU); and
- Robust Economy (RE).

The two study years included are the MISO developed 10-year (2023) and 15-year (2028) PROMOD models. These futures were the MTEP13 future scenarios and model assumptions developed by MISO stakeholders.

The LG future is the most conservative of the MTEP13 futures. Generally, it models the regional power system as it exists today and assumes a very slow economic recovery. It assumes no change in resource adequacy standards, renewables mandates, or environmental regulation. It also assumes a slow recovery from the economic downturn and uses modest demand, energy, and inflation rates.

The BAU future is considered the status quo future. Generally, it models the regional power system as it exists today. It assumes no change in resource adequacy standards, renewable mandates, or environmental regulation. It also assumes a moderate recovery from the economic downturn, which reflects current economic trends.

The RE future is based on a quick rebound in the economy. Like LG and BAU, it generally models the regional power system as it exists today. It assumes no change in resource adequacy standards, renewable mandates, or environmental regulation. It is different from the other two futures in that it assumes a sharp economic recovery from the recession.

The effective MISO demand growth rate for the LG scenario is 0.22 percent and the effective energy growth rate is 0.22 percent. The effective MISO demand growth rate for the BAU scenario is 0.75 percent and the energy growth rate is 0.81 percent. The effective MISO demand growth rate for the RE scenario is 1.25 percent and the effective energy growth rate is 1.34 percent.

ATC's MTEP13 modelling results show that the present value of the energy-cost savings from the Badger-Coulee project, in both study years (2023 and 2028), are positive in all three futures. In addition, the 40-Year present value of the savings exceeds the present value of the revenue requirement for the Badger-Coulee project. This is based solely on the energy-cost savings of the proposed Badger-Coulee project and does not include other benefits such as insurance value, loss savings, renewable investment benefit, or the cost of avoided reliability projects.

3.5.4. PROMOD modelling results

ATC states that its original PROMOD modeling based on MTEP09 data shows that the Badger-Coulee project has a net positive Customer Benefit for all six futures. ATC estimates energy cost savings to be between $37.09 million for the Slow Growth future and $356.26 million for the Robust Economy future. For all project alternatives and futures evaluated by ATC, energy cost savings ranges from $28.56 million for the 765 kV alternative with the Slow Growth future to $967.23 million for the Combined 345 kV alternative with the Robust Economy future.[74]

For the MTEP11 Business-As-Usual sensitivity, the annual benefit for 2021 is $3.58 million and the annual benefit for 2026 is $4.55 million. The 40-year present value benefit is $50.35 million.[75]

[74] Revised Application Appendix D, Exhibit 1, Table F2, p. 329 of 346, PSC REF#: 204739.
[75] Revised Application Appendix D, Exhibit 1, Table F1, p. 328 of 346, PSC REF#: 204739.

The MTEP13 PROMOD modeling shows that the Badger-Coulee project would have a net positive customer benefit for all three futures. The annual benefit for 2023 ranges from $1.98 to $7.38 million. The annual benefit for 2028 ranges from $1.68 to $10.27 million. The 40-year present value benefit of ranges from $19.70 to $103.89 million.[76]

In looking at the results of these various studies, it is important to remember that the analyses using MTEP11 and MTEP13 futures are different analyses than the six futures originally studied by ATC. The analyses have different starting years and study year endpoints. Additionally, the assumptions embedded in the futures vary and include updates based on changing economic conditions that occurred over the span of these various analyses and were incorporated into the various futures. Further, different assumptions and projections, including but not limited to demand and energy growth rates, generation retirements and additions, and transmission system topology changes were incorporated in each of the planning models utilized in the analysis. ATC believes this context is important for comparison purposes. Because of the differences in conditions studied, the results cannot be compared against each other to identify one that is more or less predictive of what will actually happen in the future. Rather, ATC believes studying the Badger-Coulee project across this wide range of possible future outcomes increases the likelihood that what actually occurs will be within the bounds of what was studied. The studies show positive results under a wide range of potential futures. ATC states that the Badger-Coulee project has now been analyzed across ten distinct future scenarios spanning multiple study years and incorporating updated data and trends. ATC states that the results show that under all ten scenarios (including the most conservative ones from MTEP11 and MTEP13), the proposed Badger-Coulee project has been shown to provide energy cost savings to its customers in excess of the present value revenue requirement (PVRR) for those customers.[77]

ATC states that while it is virtually impossible to predict precisely what load levels and energy usage will be in the future, it developed a range of possible outcomes with an extremely high likelihood that actual events will fall somewhere within that range. ATC states that its analysis of its futures modeling shows that the proposed Badger-Coulee project is economically justified under all six scenarios. It is confident that regardless of what actually happens in the future, the project will deliver the anticipated economic and other benefits to Wisconsin.[78]

3.6. TRANSMISSION SYSTEM RELIABILITY

3.6.1. Area load forecast

As discussed previously, modeling included in the original application for the proposed Badger-Coulee project is based on MTEP09, and did not include the MVP projects that were approved by the MISO Board of Directors in December 2011. ATC modelled six futures with varying assumptions on load growth. Since the future is uncertain, the benefits of the project were estimated under a number of different futures with different regulatory and economic conditions. The average annual load growth by future is presented in Table 3.6-1.[79]

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[76] *MTEP 13 Futures as a Sensitivity*, Table 1, p. 4 of 6, PSC REF#: 201972.
[77] *MTEP 13 Futures as a Sensitivity*, PSC REF#: 201972.
[78] Application, p. 27 of 144
[79] Revised Application Appendix D, Exhibit 1, p. 38 of 346, PSC REF#: 204739.

Table 3.6-1 Average annual load growth by future

Future Description	Load Growth Within ATC	Load Growth Outside of ATC
Robust Economy	2.50%	1.60%
Green Economy	1.40%	0.75%
Slow Growth	0.20%	0.30%
Regional Wind	1.70%	1.60%
Limited Investment	1.00%	0.75%
Carbon Constrained	0.20%	0.30%

The applicants included NSPW's Need Study for the proposed Badger-Coulee project in the original application as well. This study focused on the effects of the project on the La Crosse/Winona area.[80] Historical peak load for the La Crosse/Winona area, as included in that study, is included in Table 3.6-2. The years not included in the Need Study were submitted to the Commission during its review of the Alma-La Crosse 345 kV Transmission project (docket 5-CE-136).[81] The average annual growth rate over this time period is 1.25 percent.

Table 3.6-2 Historical peak load for the La Crosse/Winona area[82]

Year	Peak Load (MW)
2002	425
2003	438
2004	413
2005	451
2006	465
2007	448
2008	435
2009	437
2010	451
2011	465
2012	481

ATC updated the reliability study provided in the original application for the proposed Badger-Coulee project.[83] Table 3.6-3 presents the historical and 2013 forecast of the 2023 coincident peak load for the local area of the project on which the updated reliability study is based.

80 Revised Application Appendix D, Exhibit 2, PSC REF#: 204739.
81 Alma-La Crosse 345 kV Transmission Project, Final environmental Impact Statement, Volume 1, Chapter 2, Section 2.5, pp. 18-20, January, 2012, PSC REF#: 158959.
82 Revised Application Appendix D, Exhibit 2, p. 9 of 18, PSC REF#: 204739.
83 Response to Data Request Item 01.93, PSC REF#: 199617.

Table 3.6-3 Coincident Peak Load, MW[84]

Year	NSPW	DPC	ATC	Combined
2001	1,122	516	12,216	13,854
2002	1,237	526	12,287	14,050
2003	1,217	520	12,708	14,445
2004	1,205	497	11,570	13,272
2005	1,302	537	12,568	14,407
2006	1,387	589	13,059	15,035
2007	1,387	557	12,660	14,604
2008	1,337	554	11,794	13,685
2009	1,408	538	11,868	13,814
2010	1,432	556	12,048	14,036
2011	1,462	635	13,271	15,368
2012	1,422	701	13,062	15,185
2013	1,361	688	12,756	14,805
2023	1,628	719	13,924	16,271

Table 3.6-4 includes a comparison of the historical and 2013 forecast of 2023 annual average peak load growth rates. The historical average annual growth rate is 0.55 percent. The projected average annual growth rate is almost twice the historical rate. However, there is no reason to expect load growth in the future to be above historical levels since 2001.

Table 3.6-4 Annual average peak load growth rates[85]

	2001-13	2013-23
NSPW	1.62%	1.81%
DPC	2.43%	0.44%
ATC	0.36%	0.88%
Combined	0.55%	0.95%

As discussed previously, ATC provided updated PROMOD modeling based on MTEP13 which includes the MISO MVP portfolio projects. Table 3.6-5 includes the annual average growth in peak load used for the three MTEP13 Futures developed by MISO stakeholders in the Planning Advisory Committee.

Table 3.6-5 Annual average peak load growth rates used for three of the MTEP13 Futures[86]

Future Description	Load Growth Within ATC	Load Growth Outside ATC
Limited Growth	-0.02%	0.27%
Business as Usual	0.56%	0.79%
Robust Economy	1.11%	1.33%

As shown by comparing Table 3.6-4 to Table 3.6-5, the growth assumptions under MTEP13 are considerably lower than those used for the futures developed by ATC for the MTEP09 analysis. The ATC Limited Investment Future is most closely aligned with the MTEP13 Business as Usual Future.

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84 Historical coincident peak load from response to data request item 01.145, PSC REF#: 201267. The coincident peak loads of NSPW, DPCW and ATC are not necessarily coincident with each other. 2013 forecast of 2023 coincident peak load from Attachment 01.146-1 (load data from power flow models), PSC REF#: 201271.

85 Calculated based on responses to data request item 01.145, PSC REF#: 201267 and Attachment 01.146-1, PSC REF#: 201271

86 See Section 3.5.3.3 above, and also *MTEP 13 Futures as a Sensitivity*, p. 3 of 6, PSC REF#: 201972..

Experts are predicting demand to fall in the future. From 1980 to 2000 residential energy demand grew by approximately 2.03 percent per year. From 2000 to 2013, the growth rate slowed to 1.19 percent per year.[87] Over the next ten years, residential demand is expected to fall to 0.46 percent per year. Overall demand, including commercial and industrial uses, is expected to grow by 0.86 percent per year through 2035.[88]

There are a number of factors driving this reduction in load growth, including:

- increased distributed generation;
- increased energy efficiency; and
- behavioral changes.

Much of the micro-generation (rooftop solar panels, micro-turbines, fuel cells, and combined heat and power units) is being installed behind the meter, which means consumers are reducing their use of energy from the grid. Lighting and other electrical devices are getting more efficient. New homes with better insulation are using less electricity and government subsidies for home energy savings programs make existing housing more efficient. Conservation and the environmental concerns have become mainstream issues and there is at least anecdotal evidence of a growing concern for energy conservation.[89]

3.6.2. Assessment of transmission system reliability

The applicants used the following electric transmission network simulation models to perform the analysis of the proposed Badger-Coulee project:

- Power System Simulator for Engineering (PSS®E)
- Power System Simulator for Managing and Utilizing System Transmission (PSS®MUST)[90]
- The PowerTech Labs' Voltage Security Assessment Tool (VSAT)[91]

(PSS®E) and (PSS®MUST) were used for reliability and transfer capability analyses. The PowerTech Labs' VSAT was used for voltage stability analysis.

Commission staff uses PowerWorld Simulator[92] for reviewing reliability analyses.

The applicants used the power flow simulation models described below to analyze the proposed Badger-Coulee project and the transmission system alternatives described in Section 3.8.3 in accordance with NERC planning and operating standards and ATC Planning Criteria.[93] These guidelines require that an interconnected transmission system consisting of numerous elements such as generators, transformers, transmission lines, and circuit breakers successfully operate in the event of failure of one or more system elements.

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[87] Energy Information Administration, *Monthly Energy Review*, May, 2014, Table 7.6, Electricity End Use, p. 109, http://www.eia.gov/totalenergy/data/monthly/.
[88] Energy Information Administration *Annual Energy Review*, May 7, 2014, Table A2, Energy Consumption by Sector and Source, p. A-3-5, http://www.eia.gov/forecasts/aeo/.
[89] Lim, Nathan, *Why electricity demand is falling, and what it means*, http://reneweconomy.com.au/2014/why-electricity-demand-is-falling-and-what-it-means-44149.
[90] Information on both PSS®E products is available at http://w3.usa.siemens.com/smartgrid/us/en/transmission-grid/products/Pages/products.aspx.
[91] http://www.powertechlabs.com/areas-of-focus/smart-utility/dsatools-software/voltage-security-assessment-tool/
[92] http://www.powerworld.com/
[93] http://www.atc10yearplan.com/about/planning-criteria-and-tools/.

The applicants' transmission system reliability analysis, included in the WWTRS, focused mainly on its service territory and the state of Wisconsin.[94] This reliability study included:

- power flow contingency analysis of NERC Category A, Category B, and Category C contingencies;
- first contingency incremental transfer capability (FCITC) analysis to identify thermal constraints under increasing levels of west to east transfers;
- power transfer versus voltage (P-V) stability analysis to evaluate voltage stability and robustness under increasing levels of west to east transfers; and
- transient stability analysis for improving stability margins.

ATC used three 2018 study year models for the steady state power flow analysis. These models were based on MTEP08. Transmission system topologies and load in these models were updated for the western Wisconsin study area by removing non-wind types of future/conceptual generation installations and by creating security constrained economic dispatches that allowed Minnesota-Wisconsin Export Interface (MWEX) flow, the ATC western interface flow, the Midwest Reliability Organization (MRO) export, and the ATC import as shown below. The transient stability analysis used a 2014 Light Load (40 percent of peak load) based on MTEP09.[95] The three power flow models include:

Model A: 2018 Summer Peak

- Wind generation at 20 percent of nameplate capacity
- MWEX interface = 485 MW
- ATC Western Interface = 540 MW Import
- MRO Export = 1,175 MW
- ATC Import = 1,218 MW

Model B: 2018 Summer Off-peak (70 percent of peak load)

- Wind generation at 35-45 percent of nameplate capacity (45 percent in North Dakota, South Dakota, Minnesota and Iowa; and 35 percent for the rest of the MISO region)
- MWEX interface = 928 MW
- ATC Western Interface = 1,330 MW Import
- MRO Export = 1,150 MW
- ATC Import = 1,318 MW

Model C: 2018 Summer Off-peak (70 percent of peak load)

- Wind generation at 90 percent of nameplate capacity
- MWEX interface = 1,029 MW
- ATC Western Interface = 1,440 MW Import

The 2018 and 2014 study models were updated to include 13,277 MW and 9,150 MW, respectively, of wind generation in the MISO region and twelve new transmission projects.[96]

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94 Revised Appendix D, Exhibit 1, p. 16 of 346, PSC REF#: 204739.
95 The 2014 Light Load case was used because MISO only produces a single stability model representing five years into the future.
96 Revised Appendix D, Exhibit 1, pp. 129, 132, and 133 of 346, PSC REF#: 204739.

3.6.3. Transmission System Reliability Analysis results

Transmission System Reliability Analysis results are summarized below. However, it is important to note that the applicants are not proposing the Badger-Coulee project "as a reliability project to address identified concerns that violate system planning criteria."[97] Instead, the applicants performed the reliability analysis to screen alternatives and to further analyze the viable transmission system alternatives described in Section 3.8.3.

3.6.3.1. Contingency analysis

According to the applicants' analysis, the Low-Voltage alternative is the least-cost option for resolving Category B thermal loading limitations.[98] All seven alternatives described below require supporting facilities to eliminate Category B thermal loadings. Supporting facilities required for 345 and 765 kV transmission alternatives are listed in Appendix D of the application.[99] However, the voltage performance comparison between the seven alternatives under Category B and converged Category C contingencies showed that the 345 kV alternatives were more effective in improving system voltage performance.[100]

Additionally, the applicants performed the contingency analysis using 2023 shoulder peak and 2023 summer peak models developed for MTEP13.[101] The 2023 models, which included the proposed Badger-Coulee project, were modified to exclude the Cardinal-Bluffs project. The analysis used a comprehensive single and intact solution technique and monitored an area similar to the WWTRS study area. The analysis results confirmed the efficacy of the proposed Badger-Coulee project for the Wisconsin transmission system network. Commission staff verified the results of the analysis using the PowerWorld Simulator model.

3.6.3.2. First Contingency Incremental Transfer Analysis[102]

The applicants' FCITC analysis was used to compare transmission alternatives for their effectiveness for increasing west to east transfers. The three transfer directions from Minnesota to Wisconsin, Iowa to Wisconsin, and Minnesota and Iowa to the MISO central and east planning sub-regions were analyzed using Model B described in Section 3.6.2 above. Model B included supporting facilities required to eliminate Category B thermal loadings as discussed in Section 3.6.3.1. The FCITC analysis found that the 345 kV alternatives are more effective than the Low Voltage Option in improving the west to east transfer capability, and the Combination 345 kV alternative was most effective of the transmission system alternatives evaluated.

3.6.3.3. Power transfer vs. voltage stability analysis[103]

The applicants' voltage stability analysis was used to determine the robustness of the transmission system network under increasing west to east transfers. Power transfer vs. voltage (P-V) charts were developed for power transfer for the two interfaces: through the ATC western tie lines; and an interface which included all ATC tie lines and represented ATC imports. The performance of the proposed Badger-Coulee project was ranked at 2 and the Combination 345 kV alternative, described below,

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[97] Revised Application, p. 28 of 144, PSC REF#: 204860.
[98] Revised Application Appendix D, Exhibit 1, Table 5.2, p. 146 of 346, PSC REF#: 204739.
[99] Revised Application Appendix D, Exhibit 1, Appendix D, pp. 214-221 of 346, PSC REF#: 204739.
[100] Revised Application Appendix D, Exhibit 1, pp. 147-148 of 346, PSC REF#: 204739.
[101] Response to data request item 01.93, PSC REF#: 199616.
[102] A detailed discussion of the FTITC analysis is included in revised Application Appendix D, Exhibit 1, pp. 153-155 of 346, PSC REF#: 204739.
[103] A detailed discussion of the PV analysis is included in revised Application Appendix D, Exhibit 1, pp. 155-174 of 346, PSC REF#: 204739.

ranked at 5 on a scale of 1 to 5. A ranking of 1 represents the worst performance and 5 represents the best performance.

3.6.3.4. Transient stability analysis[104]

The parameters selected for the transient stability analysis, such as generating stations, system conditions, and contingencies are described in WWTRS. The performance of the proposed Badger Coulee project was ranked at 4 and the Combination 345 kV alternative ranked at 5 on a scale of 1 to 5. A ranking of 1 represents the worst performance and 5 represents the best performance.

3.7. APPLICANTS' STATED OTHER BENEFITS

3.7.1. Renewable investment benefit[105]

Wisconsin's RPS is structured in terms of the percentage of total electrical energy sales that must be produced from renewable resources.

Generating facility capacity factor is a measure of actual energy generated by an electric generating facility compared to the amount of energy it could produce if it ran at full capacity. It is typically calculated on an annual basis by dividing the actual annual energy produced by the facility by the total annual energy if the facility were operated at full capacity for the entire year.

For wind energy facilities, capacity factors vary across the Midwest based on the wind resource where the facility is located. Annual capacity factors for wind energy facilities in states to the west of Wisconsin can be significantly higher than those for facilities located in Wisconsin. The wind resource in areas including Iowa, Minnesota, North Dakota, and South Dakota is more favorable for wind energy development. As such, fewer wind turbines of similar generating capacity are needed if they are located in those areas than if similar wind turbines were located in areas with a lesser wind resource.

ATC designed the renewable investment benefit (RIB) to estimate the value of this lowered wind energy generating capacity. ATC defines RIB as the value created by constructing wind generation in higher capacity wind production areas when there is sufficient transfer capability to deliver wind energy to load centers. ATC calculates the RIB considering the following components:

- Revenue requirement savings realized by constructing fewer wind electric generating facilities to produce the same amount of energy
- Adjusting for the increase in transfer capability resulting from the new electric transmission project; and
- Adjusting for the difference in estimated LMP payments that wind generation located in Wisconsin would receive from the MISO market compared to wind generating capacity located outside of Wisconsin.

Using estimates for each component of the calculation described above, ATC estimated the 40-year present value of the RIB for each future and for each project alternative. For the proposed Badger-Coulee project, ATC estimates the RIB to be between $52.81 million for the Slow Growth future and $347.87 million for the Carbon Constrained future. For all transmission system alternatives and futures evaluated by ATC, the RIB ranges from $52.71 million for the Spring Green 345 kV

[104] A detailed discussion of the transient stability analysis is included in revised Application Appendix D, Exhibit 1, pp. 175-179 of 346, PSC REF#: 204739.
[105] A detailed discussion of the RIB is included in revised Application Appendix D, Exhibit 1, pp. 54-68, PSC REF#: 204739.

alternative with the Slow Growth future to $805.10 million for the Combined 345 kV alternative with the Carbon Constrained future.

3.7.2. Energy loss savings[106]

Energy losses on the electric transmission system result in increased costs to utilities and ratepayers, because more energy must be generated to cover transmission losses. To the extent that new transmission additions change generation dispatch and energy flow patterns, transmission losses will also change. If transmission losses decrease, utilities will not have to operate existing generation facilities as much or install new generation facilities in order to meet system energy needs.

ATC has developed a tool which utilizes outputs from PROMOD simulations to estimate the total annual energy losses on the ATC transmission system with and without the proposed Badger-Coulee project. The value of these losses is then priced at the appropriate locational marginal price, which is also taken from PROMOD. Using PROMOD and ATC's system loss evaluation tool, ATC estimated the 40-year present value of energy loss savings for each future and each project alternative.

For the proposed Badger-Coulee project, ATC estimates the net present value of energy loss savings to be between $17.01 million for the Slow Growth future and $67.63 million for the Green Economy future. For all project alternatives and futures evaluated by ATC, the net present value of energy loss savings ranges from $1.96 million for the Low Voltage alternative with the Carbon Constrained future to $155.19 million for the Combination 345 kV alternative with the Green Economy future.

3.7.3. System failure insurance benefit[107]

ATC defines system failure insurance benefit as the positive effect a project has in mitigating the cost impacts of severe generation or transmission outages. New transmission projects can reduce the likelihood and extent of loss of load by improving the stability of the system, increasing access to additional resources, or both. Such projects improve the ability of the transmission system to respond to emergencies.

Even though the stated purpose of the proposed Badger-Coulee project is primarily economic, it may also improve system reliability by reducing the likelihood or magnitude of load-shedding events under certain contingencies or system conditions. As load grows, a project initially justified on the basis of economics could later help to satisfy reliability requirements. ATC estimates the economic value of these reliability benefits by estimating the quantity of load-shedding events avoided by a proposed project and estimating the avoided economic harm associated with such events.

ATC states that the PROMOD runs used to evaluate energy cost savings are consistent with NERC standards, which require the continued stable operation of the system and continuity of service to all load and generation in the event of a forced outage of single system elements and generation units. Given past actual system events, ATC considered the performance of the system with and without the project when confronted with more severe multiple outages to generation units and transmission elements.

ATC identified transmission outage scenarios based on locations where multiple circuits share the same rights-of-way (ROW), structure, or substation. Three risk levels were evaluated, including: one high voltage circuit and one EHV circuit; two EHV circuits; and a complete substation outage.

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[106] A detailed discussion of energy loss savings is included in revised Application Appendix D, pp. 51-2, PSC REF#: 204739.
[107] A detailed discussion of system failure insurance benefit is included in revised Application Appendix D, pp. 49-51, PSC REF#: 204739.

ATC identified generation outage scenarios based on locations that share a common campus with shared facilities, or common design basis which might result in a common regulatory mandate requiring the shutdown of multiple plants until the regulatory deficiencies are resolved. Two risk levels were evaluated, including: system failure at a coal generation campus; and a regulatory mandate across three nuclear units. A third risk level for generation is already embedded in the PROMOD software. This risk level includes removal of single units on the basis of their forced outage characteristics.

To determine the system failure insurance benefit of the proposed project, ATC used standard insurance valuation methods to evaluate its identified transmission and generation outage scenarios. ATC defines the value of the system failure insurance benefit as:

- The energy and congestion cost impacts on the load served as evaluated when each of the major contingencies was run through the PROMOD model, plus
- The value of load not served.

Because the PROMOD model does not estimate the magnitude of unserved energy, ATC did not calculate the additional cost per MWh value of load not served.

ATC assumed the system failure insurance value for all of the high voltage system alternatives would be the same as that for Badger-Coulee alternative. ATC states that this is appropriate because each of the alternatives is anticipated to perform similarly in each of the evaluated insurance value scenarios. The low voltage alternative is not assumed to provide any insurance value because of the limited amount of new infrastructure added in this alternative that would be capable of providing system support during the various insurance value scenarios.

Based on its analysis, ATC estimates the 40-Year present value system failure insurance value benefits of the proposed Badger-Coulee project to be $23.63 million.

3.8. ALTERNATIVES TO THE PROPOSED PROJECT

3.8.1. Non-transmission options[108]

ATC considered several non-transmission alternatives to the proposed project. These alternatives were modelled at the electric distribution system level in ATC's PROMOD analysis, both within ATC's transmission system and throughout MISO. The non-transmission alternatives considered include:

- Energy efficiency and load reduction[109] – Focus on Energy (Focus) and utility demand response programs have historically reduced energy usage and load. ATC states that it considered reduced energy consumption and peak load above that achieved historically in the futures it used to evaluate transmission system alternatives using PROMOD computer modelling. At the low end, ATC assumed energy and load growth rates of 0.1 and 0.2 percent, respectively. This

[108] A detailed discussion of non-transmission alternatives savings is included in revised Application Appendix D, pp. 102-105, PSC REF#: 204739.
[109] Focus is the existing statewide energy efficiency and renewable resource program for Wisconsin. For 2012, Focus reported a net demand reduction of 66.8 MW, and net energy savings of 461 gigawatt-hours. This represents approximately 0.5 percent of Wisconsin's total electric load. As such, Focus programs are decreasing electric growth rates in Wisconsin by approximately 0.5 percent compared to what would be expected in the absence such a program. This level of savings is embedded into the historic load data and growth trends used by ATC in its PROMOD modelling for the proposed Badger-Coulee project. Program spending in 2012 was $81.7 million.

compares to mid-range energy and load growth rates of 1.0 and 1.4 percent, respectively. ATC states that it used these levels in the Carbon Constrained future to reflect possible increased energy efficiency and demand-side management as a result of utility, customer, and policy conservation measures. Similarly, in the Green Economy future ATC assumed load growth would be less than energy growth because of an increased focus on Smart Grid demand measures. ATC also included interruptible loads and direct load control within its analyses. In its PROMOD modelling, ATC reflected these reduced loads by selectively placing system resources at various substation locations and price points where ATC states studies have shown customers are willing to consider load reductions.

- Generation – ATC included additional generation resources in the futures it used to evaluate transmission system alternatives in its PROMOD modelling, including natural gas, coal, and combustible and non-combustible renewable resources. Low, middle, and high levels of coal retirements were used within the ATC service area and for overall generation additions. For example, ATC's 2026 Carbon Constrained future adds substantial photovoltaic and biomass capacity in Wisconsin. The 2020 and 2026 Green Economy and Carbon Constrained futures include an estimate for distributed renewable generation within ATC, and in its PROMOD modelling ATC placed this generation at appropriate substation locations within ATC. Similarly, the generation portfolios outside ATC include three different MISO generation expansion scenarios: a scenario consisting primarily of coal and gas units, a gas-only scenario, and a scenario that would comply with carbon constraints. ATC also considered renewable generation alternatives in its analysis. Within the ATC service area low, middle, and high percentage of total energy from renewable resources were modelled based on current and potential future renewable energy use. A similar set of renewable generation alternatives was included for the MISO region. Multiple locations for renewable energy resources were evaluated, both within the region and within the states to which the renewable energy is allocated for RPS compliance purposes.
- Distributed resources – ATC developed and applied a PROMOD modelling technique to consider distributed resources within the ATC system. This technique mimics demand response and distributed-generation technologies that may serve to offset load in the future. Distributed resources modeling used by ATC included components to address both energy efficiency as well as behind-the-meter renewable generation that may exist across the scenarios analyzed. ATC used price points to develop a dispatch curve for the distributed resources that would mimic energy efficiency programs and consumer response to electric market conditions. The resources were located across the ATC service area to model impacts with various types of load and system configurations. The resources were included in both the base models and project models and the impacts of the resources were subsequently accounted for within the project savings metrics.
- No build alternative – ATC used the no-build alternative as the base case for evaluating the quantitative and qualitative benefits of the proposed Badger-Coulee project and the other transmission system alternatives. In these evaluations, ATC analyzed the transmission system with and without each alternative, and if the analysis produces more favorable results with a particular alternative then the no-build option is economically inferior to that alternative. In addition to economic factors, reliability and transfer capability impacts were considered. Since the no-build option provides poorer reliability and electrical supply performance compared to any of the transmission system alternatives, it would have to be significantly economically

superior to justify selecting the no build alternative. ATC states that the no build alternative was not a viable alternative to the proposed Badger-Coulee project because no such economic advantage exists.

3.8.2. ATC's evaluation of non-transmission system alternatives

ATC dismissed the energy efficiency and load reduction alternative for the following reasons:

- It is uncertain what level energy efficiency and load reduction is necessary to equal the quantitative and qualitative benefits of the proposed Badger-Coulee project. For example, ATC states that to eliminate the need for lower-voltage reliability projects, energy efficiency and load reduction would have to be targeted to each of the substations where NERC violations are expected to occur in the WWTRS.
- Energy efficiency and load reduction would not serve as an adequate substitute for the proposed Badger-Coulee project because it would not provide energy cost savings for Wisconsin customers regardless of the level of additional load reduction achieved.
- Energy efficiency and load reduction would not provide the increased transfer capability from the west and into the ATC service area, and corresponding renewable investment benefit that results from the proposed Badger-Coulee project.
- Since ATC does not offer energy efficiency or load management programs to retail electric customers, nor does it have the ability to curtail retail load except through actions of load serving entities under emergency conditions, energy efficiency and load reduction programs are outside of ATC's control.
- Energy efficiency and load reduction would have to function as reliable, continuous, firm resources. ATC states that most energy efficiency and load reduction programs are voluntary and lack the firmness of a hard asset like the proposed Badger-Coulee project.
- Energy efficiency and load reduction resources would have to be shown to be technically feasible and cost-effective. Based on its review of publicly available data, ATC states that it is unable to conclude that any combination of energy efficiency and load reduction would be feasible and cost-effective and provide the same package of benefits as the proposed Badger-Coulee project.

ATC dismissed the generation and distributed resources alternatives for the following reasons:

- Generation and distributed resources would not serve as an adequate substitute for the Badger-Coulee project because it would not provide energy cost savings for Wisconsin customers.
- They would not provide the increased transfer capability from the west and into the ATC service area, and corresponding renewable investment benefit that results from the Badger-Coulee project.
- Generation and distributed resources would be outside of ATC's control.

3.8.3. Transmission system alternatives[110]

ATC considered several transmission system alternatives, including:

- Badger-Coulee 345 kV project as proposed – As described previously, the proposed Badger-Coulee project consists of a new 345 kV electric transmission line from the currently under construction Briggs Road Substation near La Crosse, Wisconsin to the existing North Madison Substation, near Madison, Wisconsin. An additional 345 kV line would extend from the North Madison Substation to the Cardinal Substation, near Middleton, Wisconsin. The overall length of the project is between 155 and 185 miles, depending on the route chosen. The applicants estimate the cost of the proposed Badger-Coulee project to be between $540 and $580 million, also depending on the route chosen.
- Spring Green 345 kV alternative – This 345 kV transmission line alternative would originate at the Briggs Road Substation, extend to the existing Spring Green Substation near Spring Green, Wisconsin, and continue to the existing Cardinal Substation. The overall length of this alternative is approximately 130 miles. The applicants estimate the cost of the Spring Green 345 kV alternative to be $459 million.
- 345 kV to Iowa alternative – This 345 kV transmission line alternative would originate at the existing Cardinal Substation, extend west to the existing Spring Green Substation, and continue to the Dubuque, Iowa area. The overall length of this alternative would be approximately 110 miles. A new 345 kV Dubuque, Iowa, area substation would be required, to accommodate a new tap into the proposed Hazleton-Salem 345 kV transmission project, to be located entirely in Iowa. The applicants estimate the cost of the 345 kV to Iowa alternative to be $370 million.
- Combination 345 kV alternative – This 345 kV transmission line alternative would incorporate all aspects of the proposed Badger-Coulee project and the 345 kV to Iowa alternative. The overall length of this alternative would be approximately 240 miles. The applicants estimate the cost of the Combination 345 kV alternative to be $920 million.
- 765 kV alternative – This 765 kV alternative is a combination of 345 kV and 765 kV transmission lines that would connect multiple points in Western Wisconsin and Minnesota to points in South Central Wisconsin. New 345 kV lines would extend from the existing Adams Substation near Adams, Minnesota to the existing Genoa Substation near Genoa, Wisconsin and from the Briggs Road Substation to the Genoa Substation. A new 765 kV line would originate at the Genoa Substation and extend to the existing North Monroe Substation, near Monroe, Wisconsin. A new double-circuit 345 kV line would originate at the North Monroe Substation and extend to the existing Paddock Substation, near Beloit, Wisconsin. The overall length of the alternative would be 275 miles, including 130 miles of 765 kV transmission line and 145 miles of 345 kV lines. The applicants estimate the cost of the 765 kV alternative to be $1,071 million.
- Low Voltage alternative – This alternative is a large combination of new, rebuild, and uprate construction of 161 kV, 138 kV, 115 kV, and 69 kV transmission facilities to eliminate violations of NERC Category B reliability requirements, and reactive compensation to eliminate NERC Category C reliability requirements. The only new transmission line included in this alternative is an 18-mile 161 kV line from the existing Liberty Substation near Dubuque, Iowa to the Nelson

[110] A detailed discussion of transmission system alternatives is included in revised Application Appendix D, pp. 18-28, PSC REF#: 204739.

Dewey Substation near Cassville, Wisconsin. All other transmission line projects would either be rebuilds or uprates of existing transmission lines. Several transformers at existing substations would be replaced. ATC estimates the cost of this alternative to be $429 million in year-of-occurrence dollars. Also, ATC estimates the present value (discounted to 2012) of the change in net transmission charges to ATC network customers over the 40-year life of the projects to be an increase of $467 million.

3.8.4. ATC's evaluation of transmission system alternatives[111]

ATC states that it performed a full evaluation of each transmission system alternative by comparing all identified benefits and costs each alternative, both quantitative and qualitative. Quantitative benefits and costs considered include:

- PVRR for construction costs of each alternative and any supporting projects
- Energy-cost savings derived from PROMOD modeling
- RIB
- Energy loss savings
- System failure insurance value

ATC considered the following qualitative benefits:

- whether the alternative would provide access to renewable resources
- whether the alternative would provide a second 345 kV source to the La Crosse area to increase electric reliability in that area
- whether the alternative is supported by the Minnesota Capacity Validation Study (CVS)[112] and Renewable Energy Standard (RES) Study[113] [114]
- performance in the competitive Herfindahl-Hirschman Index (HHI) analysis[115]
- improvement in reliability indices resulting from the alternative
- improvement in the transient stability benefit resulting from the alternative
- the number of avoided reliability projects in the ATC service area resulting from the alternative

While the Low Voltage alternative has net positive values in four out of the six futures, ATC did not bring this alternative forward for further consideration for the following reasons:

- It would not receive MISO MVP cost sharing because its voltage level is below the eligibility threshold.
- It would not provide a regional wind outlet to the upper Midwest.
- It would not provide a second 345 kV source for the La Crosse area.

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111 A detailed discussion of ATC's evaluation of transmission system alternatives is included in revised Application Appendix D, pp. 105-109, PSC REF#: 204739.

112 The Minnesota CVS report is available at http://www.minnelectrans.com/documents/capacity-study/cvsreport.pdf.

113 The Minnesota RES report is available at http://mn.gov/commerce/energy/images/2013RESLegReport.pdf.

114 ATC states that the proposed Badger-Coulee project is one of three projects identified in the Minnesota CVS report as a project that utilities should focus expansion efforts on to meet Minnesota renewable energy standards requirements. ATC also states that the Minnesota RES report states that the proposed Badger-Coulee project significantly reduces losses, and that it would result in significant energy cost savings.

115 ATC describes the HHI as a commonly used metric to evaluate the extent of competition in power markets. In its Need Study, ATC has provided the change in the HHI score for the ATC footprint as a result of the proposed Badger-Coulee project.

- The Minnesota CVS and RES analyses concluded it would not support the implementation of the Low Voltage alternative, but would support an alternative with a 345 kV extension from La Crosse.
- It scores much lower than any of the 345 kV alternatives in providing system support.

Table 3.8-1 includes a comparison of the monetized benefits and costs of the transmission system alternatives considered by ATC. Table 3.8-2 includes a sample calculation showing how the net PVRR was calculated. A detailed PVRR analysis was not performed for the Spring Green 345-kV, 345-kV to Iowa, Combination 345-kV, and 765-kV alternatives. Instead, ATC assumed in its analysis that these alternatives would all be eligible for MISO MVP cost sharing and estimated the PVRR of each alternative based on the detailed PVRR estimate for the Badger-Coulee project. ATC notes that transmission system alternatives analyzed are not subject to the same joint development agreement between ATC and NSPW that applies to Badger-Coulee project, and as such the PVRR may vary based on this assumption of project ownership.

Table 3.8-1 Comparison of monetized benefits and costs of transmission system alternatives

	Badger-Coulee 345 kV	Spring Green 345 kV	345 kV to Iowa	Combination 345 kV	765 kV	Low Voltage
Total Estimated Project Cost	($579.79)	($458.96)	($396.87)	($920.09)	($1,070.75)	($428.73)
PVRR of Total Estimated Project Cost, 2012 dollars	($11.88)	$32.69	$24.47	$20.21	$70.83	($466.91)
All Futures						
Insurance value	$23.57	$23.57	$23.57	$23.57	$23.57	$0.00
Robust Economy						
Energy Cost Savings	$356.26	$322.88	$747.77	$967.23	$241.29	$500.83
Loss Savings	$61.21	$25.92	$97.32	$136.99	$19.03	$33.75
RIB	$309.93	$347.38	$553.68	$755.74	$65.15	$408.60
Net PVRR, 2012 dollars	$739.10	$752.44	$1,446.80	$1,903.74	$419.87	$476.27
Green Economy						
Energy Cost Savings	$285.45	$128.33	$461.94	$603.45	$79.80	$267.11
Loss Savings	$67.63	$25.92	$123.49	$155.19	$19.03	$32.67
RIB	$335.33	$371.89	$596.56	$791.61	$74.17	$450.08
Net PVRR, 2012 dollars	$700.10	$582.41	$1,230.03	$1,594.03	$267.39	$282.95
Slow Growth						
Energy Cost Savings	$37.09	$80.06	$77.30	$90.80	$28.56	$34.58
Loss Savings	$17.07	$25.92	$19.29	$28.29	$19.03	($8.59)
RIB	$52.81	$52.71	$55.56	$53.41	$52.25	$52.39
Net PVRR, 2012 dollars	$118.66	$214.95	$200.19	$216.29	$194.23	($388.54)
Regional Wind						
Energy Cost Savings	$212.06	$147.46	$392.22	$521.46	$113.23	$277.34
Loss Savings	$33.12	$25.92	$53.48	$73.99	$19.03	$8.00
RIB	$340.04	$373.19	$601.84	$779.55	$74.27	$458.52
Net PVRR, 2012 dollars	$596.91	$602.84	$1,095.57	$1,418.78	$300.93	$276.96
Limited Investment						
Energy Cost Savings	$146.85	$113.65	$242.63	$312.49	$61.48	$140.50
Loss Savings	$56.49	$25.92	$71.07	$98.70	$19.03	$3.49
RIB	$155.59	$159.47	$161.42	$163.48	$151.26	$152.69
Net PVRR, 2012 dollars	$370.63	$355.31	$523.15	$618.45	$326.17	($170.23)
Carbon Constrained						
Energy Cost Savings	$112.10	$119.23	$155.00	$213.63	$84.26	$135.29
Loss Savings	$36.98	$25.92	$36.71	$53.29	$19.03	$1.96
RIB	$347.87	$381.35	$605.65	$805.10	$75.17	$452.40
Net PVRR, 2012 dollars	$508.65	$582.77	$845.39	$1,115.80	$272.85	$122.74

Table 3.8-2 Sample calculation for the Combination 345 kV alternative and the Green Economy future

PVRR of Total Estimated Project Cost, 2012 dollars	$20.21
plus Insurance Value	$23.57
plus Energy Cost Savings	$603.45
plus Loss Savings	$155.19
plus RIB	$791.61
Equals Net PVRR, 2012 dollars	$1,594.03

ATC selected its preferred transmission system alternative by evaluating each alternative, and selecting one that provides significant quantitative benefits and achieves as many of the qualitative benefits as possible. ATC states that the Badger-Coulee alternative has excellent quantitative benefits, and scores well in all of the important qualitative measures. In addition, ATC states that when the Badger-Coulee project and the 345 kV to Iowa alternative are combined to create the Combination 345 kV alternative, the quantitative results have the highest level of benefits of all transmission system alternatives. As such, ATC concluded that the proposed Badger-Coulee project is the applicants' preferred transmission system alternative.

CHAPTER

4

4. Typical Environmental Impacts and Construction Methods for Transmission Line Projects

This chapter provides general background information about the range of analyses used to evaluate proposed electric transmission projects. It discusses how impacts are assessed and how they might be mitigated,[116] including specific statutory rights of landowners. It also describes phases of construction of a transmission line. The majority of the chapter is a discussion of the environmental and community effects that might occur during construction or operation of a transmission line. The list of potential environmental and community issues is organized alphabetically. For each issue, the most common methods to minimize and mitigate the associated impacts are discussed.

4.1. ASSESSING TRANSMISSION LINE IMPACTS

4.1.1. Quantifying potential impacts

The impact from the construction of a transmission line can be measured in several different ways. Useful measurements of impacts may be area (acreage), distance (miles or feet), or the number of transmission structures.

The effect of a new transmission line on an area may depend on the topography, land cover, and existing land uses. In forested areas for example, the entire ROW width is cleared and maintained free of tall-growing trees for the life of the transmission line. The result is a permanent change to the ROW land cover. In agricultural areas, heavy construction vehicles traverse the ROW and temporarily suspend the use of the land for crop production. After construction ends and the fields are properly restored, however, the land beneath the line can be cropped or pastured. For this reason, the area permanently affected by the line is usually much smaller than the area temporarily affected during construction. Where transmission lines are routed through areas that are valued for their scenic qualities, the visual impacts of the line (the area affected) may extend well beyond the ROW.

4.1.2. Determining the degree of potential impacts

In general, the degree of impact of a proposed transmission line is determined by the quality or uniqueness of the existing environment along the proposed route. The quality of the existing environment is influenced by several factors.

[116] Mitigation in this context means to lessen an impact's force or intensity, to moderate the impact, or to make the impact less severe.

- **The degree of disturbance that already exists**
  The significance of prior disturbances can be evaluated by comparing how close the area resembles pre-settlement conditions. This can be determined by reviewing such items as historical photographs, historical sources, or through conversations with local residents. Many areas have been substantially altered by logging, the installation of drain tiles, residential developments, or conversion to cropland.
- **The uniqueness of the resource**
  Proposed transmission line routes are reviewed for the presence of species or community types that are uncommon or in decline in the region or state. The environmental review evaluates whether the land along a proposed route possesses features that would make it unique, such as its size, species diversity, or whether it plays a special role in the surrounding landscape.
- **The threat of future disturbance**
  The resource is compared to surrounding land uses that may affect the quality of the existing resource over time. Considerations include whether the current and likely future land uses may threaten some aspect of the resource or whether the resource is valued by adjacent community and whether the existing resources and quality of the land is likely to be preserved.

4.1.3. Identifying the duration of potential impacts

The construction of a transmission line involves both long-term and temporary impacts. Long-term impacts can exist as long as the line is in place and might include land use restrictions, loss of woodland, and aesthetic impacts. Temporary impacts occur during construction or at infrequent intervals such as during line repair or ROW maintenance. They can include noise or crop damage during construction. Short-term impacts can become long-term impacts if not properly managed or mitigated.

Both short-term and long-term impacts are considered in this EIS.

4.2. MITIGATING POTENTIAL IMPACTS

4.2.1. General

It may be possible to lessen or mitigate potential environmental, landowner, and community impacts by adjusting the proposed route, choosing a different type of pole structure, using different construction methods, or implementing any number of post-construction practices. The Commission can require the project applicants to incorporate specific mitigation methods into the project design, construction process, and/or maintenance procedures. Examples of common mitigation techniques are listed in Table 4.2-1.

Table 4.2-1 Examples of mitigation strategies

Project Phase	Feature	Example Design Phase Mitigation Methods
Design Phase	Route	Using corridor-sharing to minimize new ROW requirements.
	Transmission Structure	Choosing a different transmission pole with different construction requirements and aesthetic appeal. • H-frame structures have longer span widths which may make it easier to cross rivers, wetlands, or other resources with fewer impacts. • The darker color of oxidized steel structures may blend-in better with forested backgrounds. • Low profile poles can be used near airports to avoid interference with flight approaches.
	Pole Placement	Making minor adjustments in pole locations to avoid archeological sites or minimize effects on agricultural operations.
	Add-ons	Adding flight diverters to conductors to minimize bird collisions with the wires.
Construction Phase	Timing	Alter the timing of the construction periods. • Constructing when the ground is frozen and vegetation is dormant to minimize impacts to wetland habitat. • Delaying construction in agricultural areas until after harvest to minimize crop damage.
	Specific Construction Equipment	Using wide-track vehicles and matting to reduce soil compaction and rutting in sensitive soils and natural areas.
	Erosion Control	Installing and maintaining proper erosion controls during construction to minimize run-off of top soil and disturbances to natural areas.
Post-Construction Phase	Invasive Species Management	Annual surveying for new populations of invasive species (*e.g.* purple loosestrife) caused by construction disturbances. Early detections of invasive species increase the likelihood of successful outcomes.
	Restoration	De-compacting agricultural soils so that impacts to crop yields are minimized. Re-vegetate ROWs in natural areas with DNR-approved seed mixes.

Three of the above features are discussed in more detail in the subsections below: corridor sharing, structure design, and construction timing. The other features are discussed below in particular categories of impacts, or in particular route chapters of this EIS where they might apply.

4.2.2. Corridor sharing

It is the policy of the state (Wis. Stat. § 1.12(6)) to site new transmission lines, to the greatest extent feasible that is consistent with economic and engineering considerations, reliability of the electric system, and protection of the environment, utilizing corridors in the following order of priority: (a) existing utility corridors; (b) highway and railroad corridors; (c) recreational trails with limitations; and (d) new corridors.

When properly evaluated as part of routing decisions, corridor sharing can be a useful method in mitigating environmental, property, and community impacts of a new transmission line. Transmission line ROWs can be shared all or in part with other electric transmission lines, roads or highways, gas or oil pipelines, or railroad corridors. ROW-sharing with some of these types of corridors has more advantages than others. The more a ROW overlaps an existing ROW, the more benefits are possible. Side by side placement of ROWs with no overlap has fewer benefits than true corridor sharing. Some types of corridor sharing are not beneficial in reducing impacts, and some actually create additional impacts.

Sharing corridors with existing facilities may reduce impacts by:

- Reducing the amount of new ROW needed;
- Concentrating linear land uses and reducing the number of new corridors that fragment the landscape;
- Creating an incremental rather than new impact.

Often, the most preferred type of corridor sharing is with an existing transmission line. An existing line may be double-circuited with a new transmission line and therefore require little or no expansion of the existing ROW. However, in some situations corridor sharing has drawbacks. Some examples of these disadvantages are described below in Table 4.2-2.

Table 4.2-2 Examples of possible disadvantages of corridor sharing

Existing ROW	Examples of Corridor Sharing Drawbacks
Railroads	• Some railroad ROWs have long distances between road crossings, and additional access roads would be needed for the construction of a transmission line. • Railroad corridors that pass through wetlands are generally berms that are too narrow to support transmission structures. Structures would have to be located off the berm, resulting in additional impacts to wetlands. • Some railroad companies require transmission lines to be located at the edge or outside of the railroad ROW, which may put structures so far away that they eliminate the potential benefits of corridor sharing).
Gas Pipelines	• Pipeline ROWs often run cross-country with little or no visual or agricultural effects. However, transmission lines constructed cross-country can interfere with farm operations and produce a negative visual impact. • For reasons of safety, gas pipelines often require a transmission line ROW to parallel the pipeline ROW with no or very minimal overlap. This minimizes the potential benefits of corridor sharing.
Rural Roads	• Along local roads, large trees may form a scenic canopy over the road. The construction of a transmission line ROW that overlaps the road ROW would require clear cutting these trees and negatively impact aesthetic views and residential properties. • Where wind-blown soil is a problem, a transmission ROW requiring clear cutting of windbreak trees could lead to soil loss and traffic hazards from “brown-outs.” • Rural roads typically do not have sufficient ROW available so additional ROW must be obtained from adjacent landowners, with associated impacts.
Existing Transmission Lines	• Locating a new transmission line ROW parallel with an existing line on separate structures can increase impacts to agricultural operations. • New double-circuited structures may be taller than the existing transmission structure and create increased hazards for bird or airport flyways. • Increasing the width of an existing corridor can increase edge effects and barriers to wildlife.

Corridor-sharing with an existing utility may require some modification to the proposed transmission structures resulting in additional costs to the project. For example, corridor sharing with a railroad may require the installation of underground communication circuits for the railroad. Sharing a corridor with a gas pipeline may require the installation of cathodic protection to prevent pipeline corrosion caused by induced currents. Transmission structures located within a highway ROW must be moved at the ratepayers’ expense if a highway improvement project requires that the transmission line be relocated.

One additional drawback to corridor sharing is that landowners who have agreed to an easement for one facility may be unfairly burdened by the addition of more facilities. Additional utility easements may further limit their rights and the use of their property. The property owner would then be responsible for negotiating a new easement contract in order to receive proper compensation from the utility.

4.2.3. Structure design

Transmission line structures can be designed with alternate designs, heights, materials, and colors. Different design solutions will result in different costs and impacts.

Structures can consist of a single pole or multiple poles (such as an H-frame with two poles). Single-pole structures are generally taller than two-pole structures for similarly sized conductors. Two-pole structures with conductors mounted in a single plane can be used in situations where structure height is a concern, such as near an airport or along important bird migratory flight paths. Single-pole structures may be more desirable when crossing agricultural fields or in wetlands because two-pole structures disturb and take up more surface area than single-pole structures. See Figures Vol. 2-8 and 2-9.

The pole material (*i.e.*, wood, laminated wood, steel) and the type of insulators and conductors used can affect the appearance of the transmission line. Steel poles can be unpainted galvanized steel (gray), painted (often light blue), or unpainted steel that is designed to oxidize to a brown color. Poles can be directly embedded into the soil surface or bolted onto buried concrete foundations.

The spacing of the conductors on a pole can affect the magnetic field levels produced by the line and how quickly those levels dissipate with distance.

4.2.4. Construction timing

The seasonal timing of construction can determine the severity of construction impacts to cropland, wetlands, high-quality natural areas, endangered and threatened species, and the potential spread of invasive species and plant diseases (*e.g.* oak wilt). Limiting construction to winter months or to times of year when plants are dormant and the ground is frozen can reduce many adverse impacts. On the other hand, the urgency of some projects, the need to perform construction during scheduled electric outages, and the availability of skilled labor cannot always accommodate winter scheduling, especially on long or complex projects.

Some limitations on construction activity, however, may still be necessary. One way to avoid impacts to threatened or endangered species is to avoid construction during the active nesting or spawning period. To protect fish habitat during spawning seasons, activities such as bridge placement or dredging that would occur below the ordinary high water mark are restricted for trout streams and navigable tributaries to trout streams. DNR has developed construction protocols that minimize or eliminate construction-related impacts on certain protected species. These measures include seasonal restrictions, movement barriers, and other methods. Each project and each species must be evaluated in the context of the entire project and project schedule to ensure protection of resources.

4.2.5. Environmental and agricultural monitors

Independent third-party environmental monitors (IEM) could be required by the Commission to monitor construction of the transmission line. The IEM typically reports directly to PSC staff rather than the applicants or construction subcontractors. Construction activities subject to monitoring and reporting by the IEM could include activities that could impact wetlands and bodies of water, habitats and occurrences of protected species, archeological sites, agricultural fields, state and federal properties, or private properties with specific issues such as organic farming practices or the disposition of cleared trees. The IEM is responsible for reporting incidents or stopping work, if appropriate, when construction practices violate any applicable permit, approval, order condition, or agreement with regulatory agencies, or are likely to cause unanticipated impacts to the environment or private properties.

For some transmission construction projects, it is appropriate for a agricultural monitor to be retained as well. The monitor could be an independent third party similar to the IEM but more typically, the monitor is hired and funded by the applicant with input from DATCP. The monitor reports to the applicant, DATCP, and the Commission. The agricultural monitor is responsible for auditing the applicants' compliance with agreements developed between the applicants and DATCP and compliance with the Commission order. Additionally, the monitor works to minimize potential impacts of transmission line construction on agricultural lands and facilitate communication between property owners and the applicant.

4.3. LANDOWNERS' STATUTORY RIGHTS

4.3.1. Rights specified in Wisconsin statutes

Landowners whose property is directly affected by the construction of high-voltage transmission lines greater or equal to 100 kV, longer than 1.0 mile, and built after 1976 have rights which are specified in Wis. Stat. § 182.017(7)(c) through (h). Many of these rights relate to potential mitigation measures to reduce impacts and are expressed as utility requirements.

The applicable statute is as follows:

(c) In constructing and maintaining high-voltage transmission lines on the property covered by the easement, the utility shall:
   1. If excavation is necessary, ensure that the topsoil is stripped, piled, and replaced upon completion of the operation.
   2. Restore to its original condition any slope, terrace, or waterway which is disturbed by the construction or maintenance.
   3. Insofar as is practicable and when the landowner requests, schedule any construction work in an area used for agricultural production at times when the ground is frozen in order to prevent or reduce soil compaction.
   4. Clear all debris and remove all stones and rocks resulting from construction activity upon completion of construction.
   5. Satisfactorily repair to its original condition any fence damaged as a result of construction or maintenance operations. If fence cutting is necessary, a temporary gate shall be installed. Any such gate shall be left in place at the landowner's request.
   6. Repair any drainage tile line within the easement damaged by such construction or maintenance.
   7. Pay for any crop damage caused by such construction or maintenance.
   8. Supply and install any necessary grounding of a landowner's fences, machinery or buildings.

(d) The utility shall control weeds and brush around the transmission line facilities. No herbicidal chemicals may be used for weed and brush control without the express written consent of the landowner. If weed and brush control is undertaken by the landowner under an agreement with the utility, the landowner shall receive from the utility a reasonable amount for such services.

(e) The landowner shall be afforded a reasonable time prior to commencement of construction to harvest any trees located within the easement boundaries, and if the landowner fails to do so, the landowner shall nevertheless retain title to all trees cut by the utility.

(f) The landowner shall not be responsible for any injury to persons or property caused by the design, construction or upkeep of the high-voltage transmission lines or towers.

(g) The utility shall employ all reasonable measures to ensure that the landowner's television and radio reception is not adversely affected by the high-voltage transmission lines.

(h) The utility may not use any lands beyond the boundaries of the easement for any purpose, including ingress to and egress from the right-of way, without the written consent of the landowner.

4.3.2. Waiving landowner rights during easement negotiations

Easements are private contracts between the utility and the property owner. As contracts, they should be written in legally precise language. The landowners' statutory rights listed above are generally included by the utility as part of the offered contract and labeled as an "Exhibit." The offered contract may state that marked or crossed out rights are "waived." When negotiating the easement contract, a landowner may agree to waive one or more of these rights but is not required to do so. All parts of the easement contract except those required by law are negotiable. The landowner may negotiate additional stipulations from the utility which may include specific clearing or remediation obligations, notifications, timing of activities, or payments.

4.4. CONSTRUCTION PHASES

This section describes in general the construction phases of a transmission line. The figures referenced in this section are contained in Volume 2, Figures 2-10 through 2-40. Specific construction methods and conditions of routes proposed for this project are described in Chapters 6-11 of this EIS.

4.4.1. Pre-construction activities

Different locations and soil conditions will require different construction equipment and techniques as well as a variety of mitigation measures. Soil conditions and stability are tested prior to the start of actual construction using preliminary bore holes. Local variations in some conditions, such as the depth to bedrock, depth to the water table, or volume of rainfall, may require specific engineering or environmental solutions and mitigation measures during project construction.

Most state and federal permits must be acquired prior to the start of construction. Conditions of these approvals usually require a number of pre-construction environmental surveys. Environmental surveys include the finalization of wetland boundaries, the presence or absence of specific protected species, the presence or absence of invasive species, or archeological site boundaries that are likely to be impacted by construction activities.

To ensure that the company has a complete and intact route, most negotiations with landowners are concluded prior to the start of construction.

4.4.2. ROW marking and clearing

All erosion control measures needed to maintain stable site conditions (*e.g.* silt fences, slope breakers) are installed. ROW boundaries are staked and any special land use or environmental features, (*e.g.* recreational trails, streams, wetlands, and general locations of protected species or other sensitive resources) are flagged prior to the start of clearing activities. Clearing in upland shrubby grasslands and cropped fields is done with a mower. ROW in sedge meadows and shrub/scrub wetlands might also be mowed as needed to provide a stable work surface.

In upland and wetland forests, several types of equipment might be used to clear the ROW. Whole tree processors capable of cutting a standing tree at its base, removing all limbs, and sawing the tree trunk into consistent log lengths or poles are a very efficient way to clear open mature woodlands (Figure Vol. 2-10). In woodlands that have a thick cover of immature or understory trees, hand clearing with chainsaws may be done to open the forest and provide space for the tree processors to clear the larger trees. Chainsaws may also be used to clear smaller diameter trees adjacent to stream channels as shown in Figure Vol. 2-11.

Generally, any pole timber or saw logs are stacked on the edge of the ROW in upland locations, and the smaller diameter limbs and branches (often referred to as slash) are chipped or burned on the ROW. These activities are illustrated in Figures Vol. 2-12 and 2-13. According to the landowner's wishes, the wood chips may be spread on the ROW,[117] piled to allow transport by the landowner to specific locations, or chipped directly into a truck and hauled off the ROW. Local permits may be required for burning slash on the ROW.

During the clearing process, matting may be installed, as needed, to ensure stable work conditions in wetlands or to provide temporary bridges across waterways.[118] Mats also can reduce rutting and excessive soil disturbance, and impede the spread of invasive species. Timber mats are the most common type of matting used, although new plastic composite mats are also available. The mats are portable and can be installed and picked up as needed. In many cases, these mats would be left in place through all phases of construction, *i.e.* ROW clearing, foundation installation, tower erection, and wire stringing. The matting would be removed at the completion of the project. After re-contouring the ground as necessary, the underlying perennial vegetation usually reestablishes within one growing season.

If the new transmission line follows an existing transmission ROW, existing transmission structures might need to be removed before new ones can be installed. The construction company would utilize bucket trucks, cranes or digger derricks, backhoes, pulling machines, pole trailers, or dumpsters as needed. Existing wood poles would be cut into segments. On uplands, the underground portions of the poles would be pulled from the ground and the holes backfilled. In wetlands, these holes would normally close as the pole is removed or after a freeze/thaw cycle. Sometimes in sensitive or high quality wetlands, the old poles are cut off even with the ground to avoid the additional disturbance caused by equipment needed to remove the pole bases. Pulled or cut poles would be removed from the site and either recycled, taken to a landfill, or given to the landowner with a waiver of liability. Steel structures would be removed in a similar way. If the steel structures have concrete foundations, the foundations would be removed down to a depth of about two feet.

4.4.3. Augering and blasting

In most soils, the excavation for the transmission line pole can be augered using a standard drilling rig (Figure Vol. 2-14). The augered soils are temporarily piled off to the side of the excavation. In wetlands and agricultural fields, the topsoil is segregated from the subsoils. In wetland locations, the subsoils are often piled on timber matting, as shown in Figure Vol. 2-15, or on a geotextile fabric for disposal at a later time. In cropped agricultural fields, the subsoils are often placed on a layer of straw or geotextile fabric separating them from the topsoil below. This enables easier removal and disposal without the potential for disturbing or removing topsoil. After a foundation is completed, the excavated topsoil is spread around the base of the foundation to ensure optimal conditions for re-vegetation.

If the water table is encountered during the augering process, de-watering may be needed. Options for dewatering include pumping the water from the excavation to a suitable upland area and allowing it to slowly percolate into the soil, pumping water into silt-cells or bags to allow silt to drop out, or pumping the water directly into a tanker truck and transporting it to a suitable upland for release onto the soil surface.

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[117] Except in wetland areas unless approved by DNR and USACE.
[118] Examples of mats can be viewed in the illustrations in Figures Vol. 2-11, Vol. 2-13, Vol. 2-15, Vol. 2- 19, Vol. 2- 20, Vol. 2-30, Vol. 2-39, and Vol. 2-40.

When subsurface soils consist of unconsolidated materials, such as gravel or cobbles, the excavation might need to be continually flooded to prevent the side walls from collapsing (Figure Vol. 2-16). The water pressure keeps the walls of the excavation intact during the augering process. When the appropriate depth is reached, a casing is inserted into the excavation and the water is pumped out. Depending on the location of the excavation and the soil characteristics, the water may be slowly released into a drain field and left to percolate into the soil surface, pumped into silt-cells or bags to allow silt to drop out, or pumped into a tanker truck and removed to an upland location where it would be allowed to slowly percolate into the ground. It should be noted that, in agricultural fields, flooding can have long-lasting adverse effects and should be avoided or specifically controlled.

When bedrock is close to the soil surface or when subsoils primarily consist of large boulders and large cobbles, blasting might be required to complete the tower excavation. Explosives are placed in holes drilled into the rock and the tower site is covered with blasting mats to keep the rock and debris loosened by the blast from scattering over a wide area. Following the blast, the blasting mats and loosened debris are removed and the drilling rig is used to auger through the broken rock until the appropriate depth is reached. In cropped agricultural fields and wetlands, the topsoil would be stripped from the area around the tower site and stockpiled off to the side. When the excavation was completed and the foundation poured, the topsoil would be replaced around the tower site. This practice would prevent the subsoil from mixing with topsoil and would preserve the rootstocks of native vegetation, enhancing the success of post-construction restoration in wetland locations. Photographs in Figures Vol. 2-17 through 2-19 illustrate some of the steps in the blasting process.

4.4.4. Foundation installation

The excavated hole might be cased and a rebar framework installed to stabilize and strengthen the concrete that fills the hole (Figures Vol. 2-20 through 2-22). Depending on the depth and diameter of the excavation, multiple loads of concrete might be needed. After the concrete is poured, a series of bolts are embedded in the foundation to secure the tower structure when it is installed on top of the foundation.

When the foundation is completed, the tower site is cleaned up (Figure Vol. 2-23). If the tower is in a cropped agricultural setting or a wetland site, the spoils are moved to an upland location designated by the landowner or to a suitable upland site where permission to dispose of the soils has been obtained by the contractor. In other upland locations, subsoils may be spread across the soil surface around the tower site and graded to ensure drainage away from the tower. In non-agricultural upland areas, the disturbed soils are usually mulched and/or seeded with annual oats or rye grass which germinate quickly and help to stabilize the soil surface giving native vegetation an opportunity for reestablishment (Figure Vol. 2-24).

Several alternative foundation designs have been successfully used where conventional drilling, the deposition of concrete, the generation of spoils, or dewatering would cause significant impacts to large wetlands or wetlands that are deemed environmentally sensitive. In addition, these foundations can be constructed with specially equipped helicopters or marsh buggies to further prevent impacts that are traditionally caused by extensive matting used for the movement of heavy construction equipment and personnel to and from the transmission structure foundation sites.

In wet environments, hollow steel caissons can be installed with a high frequency vibration hammer (see Figure Vol. 2-25). The caisson is installed to a predetermined height above the ground and becomes the platform for the transmission structures. The vibratory hammer can be transported to and from the site by helicopter. Another alternative foundation uses helical pier systems which can be installed with adapted marsh buggies (Figure Vol. 2-26). A central hollow larger pile supported by several smaller inclined hollow piles are augered into the subsurface and capped with a plate designed to accommodate the above-ground structure.

4.4.5. Tower erection and wire stringing

The tower sections are transported to the foundation locations from a staging site in the project area where they are initially stored. The establishment of staging and laydown sites along the approved ROW is a typical step in the construction of a transmission line. Often these sites are on agricultural lands that are temporarily taken out of production (with compensation to the landowner) for the purpose of temporarily storing tower sections, reels of conductor, and other necessary components.

Steel transmission structures are erected in sections (Figures Vol. 2-27 and 2-28). Cranes are used to lift the tower sections into place. First, the lower section is lifted into place and bolted onto the concrete foundation. The upper sections of the tower, with the arms already attached, are then lifted onto the lower tower section. Sometimes large pulleys that facilitate wire stringing are also attached to the tower arms before they are raised into position. Alternatively, the pulleys can be attached after the tower erection is completed.

In areas, where ground-based cranes are not suitable due to soft or wet ground, steep terrain, or environmentally protected areas, helicopters can be used to transport and erect the steel structures. This may reduce the need for extensive access roads or matting and the resulting environmental impacts.

Large reels of rope are staged on the ROW, and the individual ropes are drawn through the pulleys from tower to tower. The wire conductor is then attached to the ropes and pulled into place (Figure Vol. 2-30). The pulleys are removed and the conductors are attached to the insulators and properly tensioned. If the conductors are double-bundled, spacers may be inserted at appropriate distances along the wires.

Helicopters can be used to string wire and then later to clip the conductors to the insulators (see Figure Vol. 2-31).

Sometimes when it is necessary to maintain reliability during construction, temporary transmission lines and poles may be constructed on one side of an existing ROW. Temporary lines are typically supported by wood poles directly embedded into the ground, with post insulators. These lines are removed when the new line construction is complete and they are no longer needed.

4.4.6. Site restoration

During site restoration, disturbed soils are graded so that the topography and slopes are matched to surrounding conditions. All ruts and depressions are restored. Stockpiled topsoils and subsoils are put back in place wherever soils had been stripped and segregated. New topsoil is brought in and spread at agricultural locations where topsoil has been lost or seriously mixed with subsoils. Compacted agricultural soils are decompacted to return the soil structure to its original condition.

Areas where crops are not present, such as roadsides, pastures, old fields, upland woods, and wetlands, may be seeded with native seed mixes (or other appropriate seed mixes approved by the landowner) and mulched with certified weed-free mulch. In some cases, where it is reasonable to allow the natural ground cover to re-establish itself, annual grasses may be sown to minimize the potential for erosion while re-establishment is occurring. In wetlands, excavated surface soils or the organic layer containing the plant parts and rootstocks of native wetland vegetation might be spread around the foundation enhancing the re-establishment of the original wetland vegetation.

Any drainage tiles or other agricultural features that were damaged by the construction activities need to be repaired, replaced, or the landowner compensated. Also, all landowner protections listed in Wis. Stat. § 182.017(7)(c) must be met unless waived by the landowner in the easement contract (see Section 4.3).

In residential and urban areas where all vegetation has been removed, negotiated easements may require replacing the vegetation with landscaping and low-growing shrubs and grasses. This could enhance the appearance of the property and reduce the potential for property value impacts related to the new transmission line. These plantings need to comply with the utilities vegetation management plans, however, and must not impede maintenance activities for the new line. Any driveways, curbs, or roads damaged during the construction of the line need to be repaired or replaced.

Erosion control and ROW monitoring continues until there is sufficient vegetative growth in the ROW. Following completion of restoration and re-establishment of vegetation within the ROW, all temporary restoration erosion control devices not designed to be left in place (*e.g.*, erosion control blankets, silt fencing) are removed and properly disposed. All temporary bridges are removed. All construction-related materials are removed.

4.4.7. Vegetative maintenance of ROW

NERC has established a reliability standard for ROW vegetation management on transmission systems. This standard applies to all transmission owners in North America. NERC is also responsible for compliance review and enforcement. Because of the NERC reliability standards, the type of vegetation allowed to regrow in the new ROW will be based on its potential for interference with the conductors and each property owner's easement contract. The ROW under the conductors and any additional ROW width that is deemed necessary for wire maintenance and repair is maintained in low-growing non-woody plants. The remaining ROW width typically is allowed to contain non-dense vegetation with a maximum height of 15 feet. Easement rights vary depending on the language used in the contract. In many cases, the utility reserves the right to trim and remove all trees and shrubs in an easement.

4.5. IMPACTS ASSOCIATED WITH TRANSMISSION LINES

This section describes many of the usual environmental, landowner, and community impacts related to the construction and operation of transmission lines. The issues are listed in alphabetical order. This section is meant to provide background information for the route-specific impacts described in later chapters of this final EIS and may be referenced in some of those chapters.

4.5.1. Aesthetics

4.5.1.1. Potential aesthetic impacts

The overall aesthetic effects of a high-voltage transmission line are likely to be negative to most people, especially where proposed new lines would cross natural landscapes and private properties. New tall steel or wide H-frame structures may seem out of proportion and not compatible with agricultural landscapes or residential neighborhoods. Landowners who have chosen to bury the electrical distribution lines on their property may find transmission lines bordering their property particularly disruptive to scenic views.

Some people, however, do not notice transmission lines or do not find them objectionable from an aesthetic perspective. To some, the lines or other utilities may be viewed as part of the infrastructure necessary to sustain everyday lives and activities.

Aesthetic impacts depend on:

- The physical relationship of the viewer and the transmission line (distance and sight line);
- The activity of the viewer (*e.g.,* living in the area, commuting through, sightseeing);
- The contrast between the transmission structures and the surrounding environment, such as whether the line stands out or blends in.

The transmission line can affect aesthetics by:

- Removing a resource, such as clearing fencerows;
- Degrading the surrounding environment (*e.g.*, intruding on the view of a landscape);
- Changing the context of the view shed (*e.g.*, evoking an image of development in a previously rural area).

4.5.1.2. Mitigation of aesthetic impacts

Electric transmission lines sometimes can be routed to avoid areas considered scenic. Routes can be chosen that pass through commercial/industrial areas or along land use boundaries.

The form, color, or texture of a line can be modified to somewhat minimize aesthetic impacts. There are some choices available in transmission structure color and/or construction material. Structures constructed of wood or of rust brown oxidized steel may blend better with wooded landscapes. Stronger conductors can minimize line sag and provide a sleeker profile.

ROW management can also mitigate some of the visual impacts of transmission lines. Some of these techniques include planting vegetative screens to block views of the line, leaving the ROW in a natural state at road or river crossings, and placing or piling brush from the cleared ROW so that it provides wildlife habitat. The Wisconsin Public Trust Doctrine identifies natural scenic beauty as viewed from a waterway. Wisconsin Stat. ch. 30 allows for the analysis of impact to natural scenic beauty as viewed from a navigable waterway.

In the end, aesthetics are to a great extent based on individual perceptions. Siting, design, construction materials, and ROW management can mitigate some of the adverse aesthetic effects of a line. It is in the interest of the applicant and the affected landowners to discuss and consider these measures early in the planning and design process. Comments by local residents or visitors during EIS preparation or public hearings can help decision-makers understand local concerns about the existing landscape and potential aesthetic impacts.

4.5.2. Agricultural lands

4.5.2.1. Potential impacts to agricultural lands

Transmission lines can affect farm operations and increase costs for the farm operator. Potential impacts depend on the design of the transmission line and the type of farming. Transmission lines can affect field operations, irrigation, aerial spraying, wind breaks, and future land uses. For new transmission lines 100 kV or greater and longer than 1.0 mile, state law requires the utility to repair much of the damage that can occur during construction and/or provide monetary compensation (see Section 4.3).

The placement of transmission structures can cause the following agricultural impacts:

- Create problems for turning field machinery and maintaining efficient fieldwork patterns;
- Increase soil erosion by requiring the removal of windbreaks that were planted along field edges or between fields;
- Create opportunities for weed and other pest encroachment;
- Compact soils and damage drain tiles;
- Result in safety hazards due to pole and guy wire placement;
- Hinder or prevent aerial spraying or seeding activities by planes or helicopters;
- Interfere with moving irrigation equipment;
- Hinder consolidation of farm fields or residential development of the farmland.

Windbreaks consist of rows of trees that can help reduce wind erosion by providing a barrier on the windward side of a field. Depending on soil conditions and supporting practices, a single row of trees protects for a distance downwind of approximately 10 to 12 times (or more) the height of the windbreak. The removal of windbreaks because of transmission line construction, especially in agricultural soils highly susceptible to wind erosion, could result in reduced crop productivity due in part to a permanent loss of top soil.

In recent years there has been discussion about the potential for construction projects to spread farm pests and diseases or to otherwise affect the health of farming operations. Concerns have been raised about Johne's disease, soybean cyst nematode, the spreading of ginseng diseases to plots reserved for future ginseng production, and pesticide contamination of soils on organic farms. Issues of biosecurity can be a concern to many farm operators.

Soil mixing, erosion, rutting, and compaction are interrelated impacts commonly associated with transmission construction and can greatly affect future crop yields. Soils may be mixed during the excavation of pole foundations or during the undergrounding of electrical lines. The excavation depth for transmission structure foundations can vary greatly, but in some projects may be more than 50 feet deep. Excavated parent material or subsoils should not be mixed with topsoils and spread on the surface of the ROW. Significant rutting can occur when soils become saturated or in areas of sensitive soils. This may impact agricultural lands by increasing the mixing of soils, eroding topsoils during rain events, and compacting soils. The degree to which soils are compacted by heavy construction equipment again depends on the type of soil and its saturation level. Ineffective erosion controls may wash valuable topsoils downhill and impact wetlands and waterways. Agricultural soils that have been improperly protected or mitigated may suffer decreased yields for several years after the construction of the transmission line is completed.

4.5.2.2. Agricultural Impact Statement

An Agricultural Impact Statement (AIS) is required when the builders of a public construction project have the power to condemn property (eminent domain) and will acquire more than five acres of land from any farm operation. Wis. Stat. § 32.035 specifies what DATCP is required to include in an AIS. The AIS is prepared to help farmers determine appropriate compensation for their losses. Easement agreements should include a discussion of anticipated damages and mutually agreed-upon reparation.

4.5.2.3. Mitigation of agricultural impacts

The utility should work with agricultural landowners as early in the design process as is appropriate to help identify potential impacts, well in advance of construction. Landowners and utilities may work out solutions that include minor changes in pole heights, specific pole locations, construction timing, and other significant land use concerns. By incorporating these solutions in written agreements, agricultural impacts can be prevented or minimized.

Agricultural monitors are sometimes retained. For more information about the use of agricultural or independent environmental monitors, see Section 4.2.5.

A utility working with landowners can:

- Avoid or minimize construction through sensitive farmland;
- Identify, address, and document concerns before construction begins;
- Find resolutions for anticipated impacts (*e.g.*, payments to temporarily suspend farming activities or the installation of a temporary fence).

Problems with pole placement can be mitigated to some extent if the utility works with farmers to determine optimal pole locations. The following approaches might be useful:

- Using single-pole structures instead of H-frame or other multiple-pole structures so that there is less interference with farm machinery, less land impacted, and fewer weed encroachment issues.
- Locating the transmission line along fence lines, field lines, or roadsides to minimize field impacts.
- Using transmission structures with longer spans to clear fields;
- Orienting the structures with the plowing pattern to make farm equipment less difficult to use.
- Minimizing the use of guy wires and, where necessary, keeping the guy wires out of crop and hay lands and placing highly visible shield guards on the guy wires.
- Minimizing pole heights and installing markers on the shield wires above the conductors in areas where aerial spraying and seeding are common.
- Locating new transmission lines along existing transmission line corridors.
- Using special transmission designs to span existing irrigation systems or, if necessary, reconfiguring the irrigation system at the utility's expense.

Problems with the spread of farm pests or diseases and contamination of soils can be reduced by:

- Having the farmer avoid spreading manure or pasturing livestock in the transmission line ROW prior to construction. (This is the most cost-effective method to prevent the spread of animal disease.)
- Avoiding access through or construction in areas that may contain manure.
- Learning about individual farm activities such as planting, tillage, and crop rotations so that construction methods and timing can be adapted to the timing of crop work.
- Installing exclusion fencing to keep livestock away from construction activities or installing markers to identify where construction is occurring, in consultation with the farmer, so that field activities and construction do not overlap.
- Putting barriers between equipment and manure or disease-contaminated soil.
- Physically removing manure or contaminated soil from equipment in compliance with existing farm disease control efforts.

Protection of organic farm certifications requires critical communication with the farmer and a thorough understanding of his operations along the ROW.[119]

Mitigation of farm impacts includes prevention of mixing topsoils with subsoils and the underlying parent material. Wisconsin Stat. § 182.017(7)(c) requires utilities that construct transmission lines that are 100 kV or larger and longer than 1.0 mile to ensure that topsoil is stripped, piled, and replaced upon completion of the construction operation (see Section 4.3).

If construction activity occurs during wet conditions and soils are rutted, repairing the ruts as soon as possible can reduce the potential for impacts. However, if improperly timed, mitigation work on rutted soil could compound the damage already present. Allowing a short time for the soil to begin drying and then using a bulldozer to smooth and fill in the ruts is a common mitigation approach. The Atterberg field test should be used to determine when the soil is friable enough to allow rutting to be remediated safely. Figures Vol. 2-32 through Vol. 2-35 illustrate how ruts made by heavy equipment can be repaired.

To minimize soil compaction during construction in low-lying areas, saturated soils, and/or sensitive soils, low-impact machinery with wide tracks can be used. DATCP has recommended that such machinery and tires also be used across agricultural land if it must be worked during wet conditions.

When construction of the line is complete, the soil in the ROW in fields that were accessed by heavy construction traffic should be checked for compaction with a soil penetrometer and compared to penetrometer readings on soils outside of the ROW. If compaction within the ROW is detected, appropriate equipment should be used to restore the soil tilth. A soil with good tilth has large pore spaces for adequate air infiltration and water movement. (Roots only grow where the soil tilth allows for adequate levels of soil oxygen.) DATCP can provide guidance on the best methods or equipment to be used.

Problems with potential damage to soil productivity from the impacts of soil mixing, soil compaction, and soil erosion can be lessened by:

- Identifying site-specific soil characteristics and concerns from the landowner and farm operator before construction begins.
- Avoiding areas where impacts might occur by altering access routes to the construction sites.
- Using existing roads or lanes utilized by the landowner.
- Using construction mats, ice roads, or low ground pressure or tracked equipment to minimize compaction, soil mixing, rutting, or damage to drainage systems.
- Segregating top soils or soil horizons during excavation and construction to minimize soil mixing.
- De-compacting soils following construction with appropriate equipment until the degree of soil compaction levels on the ROW is similar to soils off the ROW.
- Avoiding construction and maintenance activities during times when soils are saturated.
- Avoiding the removal of critical windbreaks and replanting windbreaks with lower growing woody species to minimize soil erosion due to wind.

[119] An organic farmer is also protected during ROW maintenance by the requirements in Wis. Stat. § 182.017(7)(c) through (h), particularly those related to soil management and pesticide use.

4.5.2.4. Wis. Stat. § 182.017(7)(c)

This statute describes a number of restoration practices that the utility must employ when building a high-voltage transmission line on private property (see Section 4.3). This statute includes requirements, such as: removing rock and all construction debris; restoring all disturbed slopes, terraces, and waterways to their original condition; repairing drainage tile lines and fences damaged by construction; and paying for crop damage. Unless landowners waive their rights in an easement agreement, the utility is required to implement these mitigation practices. If a route that passes primarily through agricultural land is selected, DATCP has recommended that, to aid enforcement of the statute requirements, detailed Best Management Practices (BMP) should be incorporated into the project construction manuals and agricultural specialists should be available to consult with the environmental monitors employed to oversee the contractors and ensure that these protections are implemented.

4.5.2.5. USDA Conservation Reserve Program lands

There are farmlands in Wisconsin enrolled in U.S. Department of Agriculture (USDA) Farm Service Agency (FSA) programs established to preserve wetlands, grasslands, and farmlands. Federal easements on these lands may have restrictive land uses not consistent with the construction of a transmission line. For example, a finding of incompatibility by the FSA could affect Conservation Reserve Program (CRP) payments to the landowner.

CRP is a federal voluntary program established to protect cropped lands that are vulnerable to erosion. CRP provides participants with an annual per-acre rent plus half the cost of establishing a permanent land cover (usually grass or trees). In exchange, the participant retires highly erodible or environmentally sensitive cropland from farm production for 10 to 15 years. Sensitive lands would also include land converted from crops to wildlife habitat or special shallow water areas, filter strips along surface waters, and grass covers for erosion control.

Federal funding for the program is limited. Offers for CRP contracts are ranked according to an index which includes the following factors:

- Wildlife habitat benefits resulting from covers on contract acreage;
- Water quality benefits from reduced erosion, runoff, and leaching;
- On-farm benefits from reduced erosion;
- Benefits that will likely endure beyond the contract period;
- Air quality benefits from reduced wind erosion;
- Cost.

Each transmission structure located in CRP land would require that one-tenth of an acre be removed from the contract. A repayment of past payments, damages, and interest on the removed area would need to be made by the landowner. If the transmission line requires the removal of trees and the CRP contract requires that the trees remain, the area where the trees would be removed would also need to be removed from the contract and previous CRP payments, damages, and interest repaid. If the CRP land is acquired through eminent domain, the repayment would not be required.

Since the applicant does not contact the landowner prior to obtaining a CPCN that describes an approved route, it would not know until then whether the affected farmland is in the CRP.

4.5.3. Airports and airstrips

Transmission lines are a potential hazard to aircraft during takeoff and landing. To ensure safety, local ordinances and FAA guidelines limit the height of objects in the vicinity of the runways. Utilities can route transmission lines outside of the safety zone, use special low-profile structures, construct a portion of the line underground, or install lights or other attention-getting devices on the conductors.

Large brightly colored balls or markers may be installed on overhead transmission line conductors to improve their visibility to pilots and lessen the risk of collision. These markers are often employed near airports or airstrips, in or near fields where aerial applications of pesticides or fertilizers occur, and in areas where tall machinery, such as cranes, are frequently operated.

4.5.4. Archeological and historic resources

Archeological and historical sites are protected resources. They are important and increasingly rare tools for learning about the past. They may have religious significance. Transmission line construction and maintenance can damage sites by digging, crushing artifacts with heavy equipment, uprooting trees, exposing sites to erosion or the elements, or by making the sites more accessible to vandals. Impacts can occur wherever soils will be disturbed, at pole locations, or where heavy equipment is used.

WHS has the primary responsibility for protecting archeological/historical resources. WHS manages a database that contains the records of all known sites and is updated as new information becomes available. The database is searched for any sites that might be located along any of the proposed transmission line facilities.

The PSC is required to notify WHS if the construction of a transmission line has the potential for encountering any archeological resource. Archeological surveys might be required in these areas. The results of the surveys are reported to WHS. WHS will then make recommendations for avoiding and minimizing impacts to the sites. It is the responsibility of the PSC to ensure that construction practices follow all WHS recommendations. Route changes are seldom necessary. Judicious transmission pole placement can often be used to span resources and avoid impacts to the sites.

If during construction an archeological site is encountered, construction at the site must immediately stop and WHS and the PSC must be notified by the utility. WHS will then make recommendations on how construction should proceed so that impacts to the resource are managed or minimized.

4.5.5. Cultural concerns

Protection of archeological and historic resources is often discussed in terms of "cultural resource" impacts. However, there are other cultural factors that occasionally surface during a transmission project review. A cultural concern can occur when an identifiable group or community has practices or values that may conflict with a new transmission line.

An example of a cultural concern that has been addressed in past transmission line cases is the routing of a proposed transmission line through an Amish community. Because the Amish do not use electric service, wish to remain non-confrontational, and tend not to become involved in government processes, a concerted effort was made to avoid impacts on this community.

Cultural impacts may also be related to property impacts and general social concerns such as fairness. These issues are discussed under "Property Owner Issues" in Section 4.5.11.

4.5.6. Electric and magnetic fields

4.5.6.1. Sources of fields

Electricity produces two types of fields, electric and magnetic. These fields are often combined and referred to as electromagnetic fields (EMF). Whereas common objects such as trees, fences, and walls easily provide a shield from electric fields, magnetic fields pass through most non-metallic materials. Therefore, most scientific studies concentrate on magnetic fields and not electric fields. Magnetic fields are created whenever electric current flows through any line or wire, including the electrical wiring in a home. Sources of magnetic fields include electrical appliances such as power tools, vacuum cleaners, microwaves, computers, electric blankets, fluorescent lights, and electric baseboard heat. Because there are so many common sources of magnetic fields, everyone is exposed to many magnetic fields every day.

4.5.6.2. Results of magnetic field research

Starting in the late 1970s, researchers began to investigate the possibility that exposure to magnetic fields might have an adverse effect on human health. Since then, scientists have conducted many studies designed to determine whether or not exposure to magnetic fields affects human health. Scientists have uncovered only weak and inconsistent epidemiological associations between exposure to transmission line magnetic fields and adverse health effects. Several epidemiological studies have shown a weak statistical association with the risk of childhood leukemia. However, other epidemiological studies have found no link to leukemia. Cellular studies and studies exposing test animals to magnetic fields have shown no link between magnetic fields and disease. Taken as a whole, the biological studies conducted to-date have not been able to establish a cause-and-effect relationship between exposure to magnetic fields and human disease, nor have scientists been able to identify any plausible biological mechanism by which magnetic field exposure might cause human disease. For the past decade, there is a growing consensus within the scientific community that exposure to magnetic fields are not responsible for human disease.

A common method to reduce magnetic fields is to bring the lines (conductors) closer together. The magnetic fields interfere with one another, producing a lower field. The conductors can be brought closer together by using different types of structures or double-circuiting two lines on the same structures. However, there are electrical safety limits to how close together conductors can be placed. Conductors must be far enough apart so that arcing cannot occur and so that utility employees can safely work around them. Additionally, the closer conductors are to one another, the closer together poles must be constructed. Increasing the number of poles per mile increases private property land impacts and costs.

A more detailed review of magnetic field research and human health can be found in Appendix B. Details about the expected magnetic field levels associated with the proposed transmission line project can be found in in later, route-specific chapters of this EIS.

4.5.6.3. Pacemakers and implantable medical devices

Implantable medical devices are becoming increasingly common. Two such devices, pacemakers and implantable cardioverter defibrillators (ICD), have been associated with problems arising from interference caused by EMF. This is called electromagnetic interference (EMI).

EMI can cause inappropriate triggering of a device or inhibit the device from responding appropriately. Documented sources of EMI include radio-controlled model cars, slot machines, car engines, cell phones, anti-theft security systems, radiation therapy, and high-voltage electrical systems. It has been estimated that up to 20 percent of all firings of ICDs are inappropriate, but only a very small percentage are caused by external EMI.

ICD manufacturers' recommended threshold for modulated magnetic fields is 1 gauss. One gauss is five to ten times greater than the magnetic field likely to be produced by a high-voltage transmission line. Research shows a wide range of responses for the threshold at which ICDs and pacemakers responded to an external EMI source. The results for each unit depend on the make and model of the device, the patient height, build, and physical orientation with respect to the generated field.

Transmission lines are only one of a number of external EMI sources. Exposure to magnetic fields produced by the proposed power line generally will not affect pacemakers and implantable defibrillators. All pacemakers and ICD patients are informed of potential problems associated with exposure to EMI and must adjust their behavior accordingly. Moving away from a source is a standard response to the effects of exposure to EMI. Patients can shield themselves from EMI with a car, building, or the enclosed cab of a truck. Individuals concerned with potential issues associated with their implantable medical devise should consult their physician.

4.5.7. Endangered/threatened and protected species

The state's Endangered Species Law, Wis. Stat. § 29.604, makes it illegal to take, transport, possess, process, or sell any wild animal that is included on the Wisconsin Endangered and Threatened Species List. In addition, it is illegal to remove, transport, carry away, cut, root up, sever, injure or destroy a wild plant on the Wisconsin Endangered and Threatened Species List on public lands. Forestry, agricultural, and utility practices are exempted from the taking prohibitions of listed plant species.

The Wisconsin Endangered Species law allows DNR to authorize the taking of a threatened or endangered species if the taking is not for the purpose of, but will be only incidental to, the carrying out of an otherwise lawful activity and the taking meets the requirements outlined in Wis. Stat. § 29.604. Authorization generally occurs through an Incidental Take Permit. If the activity is conducted by DNR itself or if another state agency conducts, funds, or approves the activity, authorization would occur through an Incidental Take Authorization.

Endangered species are any species whose continued existence is in jeopardy. Threatened species are species that are likely to become endangered. Special Concern species are those species about which some problem of abundance or distribution is suspected but not yet proved. The main purpose of the Special Concern category is to focus attention on certain species before they become threatened or endangered. Special concern species are not covered by Wisconsin's Endangered Species Law, but they may be protected by other state and federal laws.

The DNR Bureau of Natural Heritage Conservation manages the Natural Heritage Inventory (NHI) database, which lists current and historical occurrences of rare plants, animals, and natural communities. The database includes the location and status of these resources. However, most areas of the state have not been surveyed extensively or recently, so the NHI database should not be relied upon as a sole information source for rare species.

4.5.7.1. Potential impacts to rare species and their habitats

Construction and maintenance of transmission lines might destroy individual plants and animals or might negatively alter their habitat so that it becomes unsuitable. Potential impacts may include:

- Destroying individual plants or animals or their habitat by crushing or digging with heavy equipment, blasting for construction of foundations, surface disturbance of soil and vegetation during clearing, drilling, or from traffic.

- Degrading water quality through soil erosion and siltation into rivers and wetlands that provide habitat for rare plants or animals.
- Introducing and encouraging the growth of invasive or common species resulting in a reduction in species diversity.
- Clearing trees used as perching or nesting sites by rare birds and creating an open area out of a closed canopy that allows more predation or the expansion of invasives.
- Disturbing habitats during the active nesting or spawning period of protected species.
- Degrading woodland or wetland quality through removal of trees and brush and increasing edge effects, making the area unsuitable for rare plants or animals.

4.5.7.2. Pre-construction surveys

If preliminary research and field assessments indicate that rare species or natural communities may be present in the project area, specific, appropriately-timed surveys may be conducted prior to construction. Pre-construction surveys may be used to make relative comparisons of the nature and magnitude of impacts to rare species between different routes. They may also be used to identify whether a particular species is present in the affected area or to what extent suitable habitat for a species is present along a route. If a threatened or endangered species is observed during the surveys, measures such as those described in the next section may be employed to avoid or minimize impacts to the species and its habitat. These strategies may include, among others, altering the construction schedule to avoid critical life cycle events, relocating or modifying the width of the ROW at that location, or installing exclusionary devices.

4.5.7.3. Mitigation of impacts to rare species and their habitats

Impacts to rare and protected species can usually be avoided or minimized by modifying the route, changing the design of the transmission line, reducing the workspace at a particular location, employing special construction techniques, or utilizing exclusionary devices. The PSC has the authority to order transmission construction applicants to conduct surveys, require an expert be present during construction activities, and implement mitigation measures.

An example of a common mitigation measure is turtle fencing in areas where habitat is likely to support rare turtles, snakes, or salamanders. During times when the animal may be present or enter into the construction zone, fencing is installed to exclude these animals. The fencing prevents the animal from entering into harm's way. Immediately before work begins in suitable turtle habitat, a ground survey is conducted and any turtles found in the area are relocated to a nearby suitable habitat. When the area is known to be clear of turtles, plastic fencing is placed around the work area to keep rare turtles out. Figure Vol. 2-36 shows an area fenced to keep rare turtles away from the construction zone. This fencing is removed when construction and restoration in the area is completed.

Bird flight diverters (BFD) are another common mitigation method used to mitigate impacts to protected species. BFDs may be installed on shield wires when overhead transmission lines are built in areas heavily used by rare birds or large concentrations of birds or in specific areas within known migratory flyways. The purpose of BFDs is to make the line more visible, so birds can see it and fly around or over the conductors to avoid colliding with them. Several designs of BFDs are available. They are typically attached to either the conductors or the static wire. See Figure Vol. 2-37. Ideally, BFDs should be noticeable by birds, but should not draw unwanted attention by people. Installed BFDs need to be inspected periodically and replaced when necessary.

An applicant can also apply for an Incidental Take Permit if it is possible that construction activities could result in the harm or "take" of a threatened or endangered species. If granted, the permit would allow the applicant to take certain actions that may be harmful to a threatened or endangered species, within the conditions and limitations of the permit.

The utility should consult with DNR so that the appropriate methods to avoid impacts to rare species are incorporated into an avoidance plan and properly conducted during construction. If impacts to a species cannot be avoided using construction practices or timing, the applicant may be required to undergo additional consultation to minimize impacts as part of the Incidental Take Authorization process.

4.5.7.4. Positive impacts to habitats

In some limited cases, transmission line ROWs have been managed to provide or improve habitat for some rare species or communities. For example, some ROWs in Wisconsin are being actively managed to provide habitat for the Karner blue butterfly, a federally-listed species. Close cooperation between the utility and DNR is necessary to protect listed species and their habitat.

4.5.8. Highway impacts

Wisconsin Stat. §§ 86.07 and 86.16 allow utilities to locate their facilities along and across highway ROW with the written consent of the highway maintaining jurisdiction, subject to any conditions that may be placed on the installation.

Wherever the line would need to share ROW or cross a state or federal highway, a permit must be obtained from WisDOT. The line would need to comply with the WisDOT Utility Accommodation Policy.[120] The policy emphasizes that permitted use and occupancy of highway ROW for non-highway purposes like an electric transmission line is subordinate to the primary interests and safety of the traveling public. WisDOT could permit utility facilities on a state highway if the following three conditions are met:

1. Such use and occupancy would not adversely affect the primary functions of the highway or materially impair its safety, or operational or visual qualities.
2. There would be no conflict with the provisions of federal, state or local laws or regulations.
3. The occupancy would not significantly increase the difficulty or future cost of highway construction or maintenance.

A WisDOT utility permit is required for utility work within state highway ROWs. Utility work includes surveying, excavating, placement of fill material, grading, installation of the line, and traffic control for any new or upgraded utility line or to replace a significant portion of an existing line.

The Federal Highway Administration allows transmission facilities to be located within interstate and freeway ROWs under state procedures provided they do not adversely affect the safety, efficiency, and aesthetics of the highway, interfere with its present use or future expansion, or require access for future maintenance directly from the highway lanes or shoulder.

4.5.9. Invasive species

4.5.9.1. Potential impacts by invasive species

Non-native plants, animals, and microorganisms found outside of their natural range can become invasive. Many non-native species are harmless because they do not reproduce or spread abundantly in their new

[120] WisDOT Bureau of Highway Maintenance. Facilities Development Manual, December 2010. Chapter 9, "Right-of-Way Use and Permits." Section 15, "Utility Accommodation." See also Section 7-55-1, "Scenic Easements," and Real Estate Program Manual, Section 6.8, Scenic Easements.

surroundings. Some non-native species have been introduced intentionally, such as the Norway maple *(Acer platanoides)* for landscaping and the ring-necked pheasants for hunting. However, a small percentage of non-native species are able to become quickly established, are highly tolerant of a wide range of conditions, and are easily dispersed. The diseases, predators, and parasites that kept their populations in check in their native range may not be present in their new locations. Over time, non-native, invasive species can overwhelm and eliminate native species, reducing biodiversity and negatively affecting both ecological communities and wildlife habitats.

Human actions are the primary means of invasive species introductions. Transmission line construction causes disturbance of ROW soils and vegetation through the movement of people and vehicles along the ROW, access roads, and laydown areas. These activities can contribute to the spread of invasive species. Parts of plants, seeds, and root stocks can contaminate construction equipment and essentially "seed" invasive species wherever the vehicle travels. Infestation of invasive species can also occur during periodic transmission ROW maintenance activities, especially if these activities include mowing and clearing of vegetation. Once introduced, invasive species will likely spread and impact adjacent properties with the appropriate habitat.

Some common invasive species and their habitats are listed in Table 4.5-1.

Table 4.5-1 Common exotic and invasive plant species found in Wisconsin

Common Name	Scientific Name	Habitat
Bella Honeysuckle	*Lonicera x bella*	Forest Savanna Prairies
Bull Thistle	*Cirsium vulgare*	Disturbed Areas
Common Reed	*Phragmites australis*	Wetlands
Common Buckthorn	*Rhamnus cathartica*	Disturbed Areas, Forests, and Prairies
Common Tansy	*Tanacetum vulgare*	Sunny Disturbed Areas
Garlic Mustard	*Alliaria petiolata*	Forests and Savanna Prairies
Glossy Buckthorn	*Rhamnus frangula*	Forests and Wetlands
Morrow's Honeysuckle	*Lonicera morrowii*	Forest Savanna Prairies
Multiflora Rose	*Rosa multiflora*	Varied
Purple Loosestrife	*Lythrum salicaria*	Wetlands
Reed Canary Grass	*Phalaris arundinacea*	Wetlands
Spotted Knapweed	*Centaurea maculosa*	Sunny Disturbed Areas
Tartarian Honeysuckle	*Lonicera tatarica*	Forest Savanna Prairies
Wild Parsnip	*Pastinaca sativa*	Varied - Prefers Sunny Areas

4.5.9.2. Best management practices

To better address the control of invasive species, an Advisory Committee for the Wisconsin Council on Forestry was formed in 2008 and included representatives from public and private organizations, including highway departments, electric and gas utilities and pipelines, and state technical staff. They produced in 2010, the "Invasive Species Best Management Practices for Transportation and Utility Rights-of-Way." This best practices manual can be found online at, http://council.wisconsinforestry.org/invasives/transportation. It identifies effective and realistic voluntary practices that can be integrated into ROW construction and maintenance activities.

As of September 2009, Wis. Admin. Code ch. NR 40 became effective and established a classification system for invasive species and prohibits activities that result in the spread of invasive species in certain categories. It also establishes preventive measures to help minimize their spread.

4.5.9.2.1. During construction

The BMP manual identifies many methods that can be used during construction to limit the introduction and spread of invasive species. These measures include:

- Prior to the start of construction, survey and mark locations of invasive species so they can be avoided during construction.
- Prior to the start of construction, remove or control isolated populations of invasive species.
- Schedule construction activities during periods of the year when invasive species are less likely to be encountered or spread.
- Choose construction access points and staging areas so that ground disturbances are minimized.
- Properly dispose woody material from ROW clearing to avoid and/or minimize the spread of invasives.
- Clean equipment that may have come in contact with invasives so that they are not spread.
- Properly dispose soils, seeds, plant parts, or invertebrates found during inspection and cleaning.
- Use soil and aggregate material from sources free of invasive species.
- Use effective erosion control and storm water management practices to stabilize exposed soils, as soon as possible.
- Use non-invasive or native seed cover crops for the re-vegetation of areas disturbed by construction activities.

4.5.9.2.2. Post-construction

Because construction measures may not be completely effective in controlling the introduction and spread of invasives, post-construction activities are required. Sensitive areas such as wetlands and high quality forests and prairies should be surveyed for invasive species following construction and site re-vegetation. If new infestations of invasive species are discovered, then measures should be taken to control the infestation. Each exotic or invasive species requires its own protocol for control or elimination. Techniques to control exotic/invasive species include the use of pesticides, biological agents, hand pulling, controlled burning, and cutting or mowing. DNR should be consulted to determine the best methods for control of encountered invasive species.

4.5.10. Noise and light impacts

4.5.10.1. During construction

During each phase of construction of the transmission line, noise will be generated by the construction equipment and activities. Initially, vegetation in the ROW is mowed or cut using whole tree processors and/or chainsaws. Wood brush and logs may be chipped or burned in the ROW. Trucks are used to haul away material that can't be stockpiled or disposed of on-site and to bring in necessary construction materials. Typical construction vehicles include bucket trucks, cranes or digger derricks, backhoes, pulling machines, pole trailers, or dumpsters.

Transmission structures are constructed by first using a standard drill rig to bore a hole to the required depth. If water is encountered, pumps will be used to move the water to either adjacent upland areas or to waiting tanker trucks for proper disposal. When bedrock is close to the surface or when subsoils primarily consist of large boulders and large cobbles, blasting may be required. Concrete trucks carry concrete to the boreholes to construct the foundations of the transmission structures. Cranes then erect the towers on the foundations. Finally, the wire is strung between the towers using large pulleys. After the construction is completed, the ROW is graded, agricultural soils are de-compacted, and the ROW cleaned up.

All of these operations produce noise that may impact adjacent landowners. However, normal work schedules and local ordinances usually restrict noise producing activities to daytime hours.

4.5.10.2. During operation

Vibrations or humming noise can be noticeable and is most often associated with older transmission lines. It is usually the result of conductor mounting hardware that has loosened slightly over the years and can be easily repaired by the utility. This is a maintenance issue that can be identified and repaired.

The other types of sounds caused by transmission lines are sizzles, crackles, or hissing noises that occur during periods of high humidity. These are usually associated with high-voltage transmission lines and are very weather dependent. They are caused by the ionization of electricity in the moist air near the wires. Though this noise is audible to those very close to the transmission lines, it quickly dissipates with distance and is easily drowned out by typical background noises. This noise is at its highest levels in foul weather conditions when other factors, such as high winds and precipitation, would increase overall background noise.

Ionization of transmission lines in foggy conditions can also cause a corona, which is a luminous blue discharge of light usually where the wires connect to the insulators. A corona indicates the loss of power where it occurs, which indicates inefficiency and economic loss, and therefore power transmission equipment is designed to minimize the formation of corona discharge. Corona emissions can cause small amounts of radio-frequency interference (RFI), primarily to AM radio signals; however, this effect is low even in proximity to the ROW and meets reception guidelines of the Federal Communications Commission.

A corona may also indicate areas of wear or damage on the transmission line, again a good reason for utilities to identify, examine, and repair any damage if observed. The attachment of bird deflectors may increase the angular edges on the transmission lines that increase corona emissions. Birds may also be deterred from landing on lines that are experiencing corona emissions due to the noise and ultraviolet light.[121] [122]

Substation noise and light may impact residential properties located in close proximity to those facilities.

4.5.11. Property owner issues

4.5.11.1. ROW easements

Property owner issues are often raised by individuals or communities along proposed transmission line routes. One concern relates to how some property owners bear the burden so that everyone else can use the electricity, pitting property owner rights versus public good. Another concern relates to who should be considered as affected by the new line.

There is often a feeling of unfairness between those that use electricity and those that bear the impacts of the facilities required to support that use. The money paid to landowners for ROW easements is meant to compensate them for having a transmission line cross their property. These easement payments are negotiated between the landowner and the utility. Some landowners do not regard the payments as

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[121] Hurst, Neil. 2004. Corona Testing of Devices Used to Mitigate Bird Collisions. EDM International, Inc. California Energy Commission, PIER Energy-Related Environmental Research. 500-04-086F.
[122] Hayes, Brian. 2005. Infrastructure – a Field Guide to the Industrial Landscape, WW Norton & Company, New York.

sufficient to truly compensate for the aesthetic impacts and the loss of full rights to their own land. This is especially true if the landowner is not compensated for the "highest and best use" of the affected parcel.

The policy of corridor sharing favors the placement of new transmission lines within or next to existing infrastructure, causing some landowners to be burdened by multiple easements. These individual hardships must be balanced against the additional environmental or social impacts caused by the development of new transmission corridors.

Property owners who live near the line but not on the ROW might be affected but are not compensated. Subsequent owners of the property in the ROW, although they purchased the property knowing that the easement already existed, would not be compensated directly either because the easement payment is most commonly a one-time payment paid at the time of the easement acquisition.

Compensation is paid to towns, municipalities, and counties through which a 345 kV or higher voltage transmission line is constructed via payment of one-time environmental and/or annual impact fees. Wis. Stat. § 196.491(3g)(a). The amount can be considerable and is proportional to the percentage of the line constructed within a specific political subdivision and the cost of the project. No portion of it, however, is paid directly to the property owner.

4.5.11.2. Property value studies

The potential change in property values due to the proximity to a new transmission line has been studied since the 1950s by appraisers, utility consultants, and academic researchers. It is very difficult to predict how a specific transmission line will affect the value of a specific property. Of issue are changes to the "fair market" value of a property and not the "assessed" value. To date, no study has shown how the construction of a new transmission line negatively affects the "assessed" value of a property. Additionally, studies have been conducted mostly on residential or undeveloped properties and not commercial properties.

A power line may increase, decrease, or have no effect on an individual's perception of a property's worth. This perception is indicative of how much one is willing to pay for the property (the fair market value) when it is put up for sale. The marketability of a property includes the final sale price and the amount of time required to sell the property.

Initial property value studies were primarily surveys or attitudinal studies of small numbers of homeowners. However, substantial differences could exist between people's perceptions about how they would behave and their actual behavior when confronted with the purchase of property supporting a power line.

Because of this uncertainty, attitudinal studies were replaced by "valuation" studies involving the comparison of sales prices for properties similar in most respects, except for proximity to a power line. There are two major shortcomings in conducting this type of study: 1) the subjective nature of identifying a pair of properties that were considered "identical" for the purpose of the study; and 2) the restrictive nature of finding "identical" property pairs, which results in a data set too small for meaningful statistical analysis.[123]

[123] Kinnard, W. Jr. and S. A. Dickey. 1995. A Primer on Proximity Impact Research: Residential Property Values Near High-Voltage Transmission Lines. Real Estate Issues 20(1):23-29.

A third type of research involves large sample sizes, a high number of variables, and multiple regression analysis. These studies, which can better account for numerous variables that affect sales, provide the best information to-date on the effects of power lines on property values. Individuals buying property are likely to consider many factors, such as schools, community services, scenic beauty, recreational opportunities, or distance to work. The relative importance of each of these factors varies greatly among individuals. Likewise, the importance of a nearby power line varies greatly among people. The presence or potential presence of a transmission line could lead potential buyers to perceive a decrease in the property's value or have no affect at all. The statistical analyses might help illustrate which factors best predict differences in marketability.

4.5.11.3. Potential impacts to property values

In some situations, value can be increased. In rural areas, especially in the vicinity of large wooded parcels, a utility ROW might provide improved access to large land tracts for hunting, snowmobiling, or other recreational activities. White-tailed deer and some other animals often use forest openings for foraging and travel. In urban or suburban residential areas, lots on or adjacent to power line corridors are often sized larger than neighboring lots but are similarly priced, allowing residents to benefit from the added buffer and space the ROW provides. Integrating the open space of the utility corridor into a neighborhood and developing it as usable space can also diminish or avoid adverse effects on property values.[124]

Conversely, the perceived value of property may decrease in value because of:

- Concern or fear of possible health effects from electric or magnetic fields.
- The potential noise and visual unattractiveness of the transmission line.
- Potential interference with farming operations or foreclosure of present or future land uses.

While there is no conclusive evidence of the effects of magnetic fields on health, it is recognized that people's concerns about EMF can influence their decisions related to the purchase of a property. In *Criscuola v. Power Authority of the State of New York*,[125] the New York State Court of Appeals ruled that whether the danger of EMF is a scientifically genuine or verifiable fact should be irrelevant to the central issue of its market value impact. The visual profile of transmission line structures and wires can also decrease the perceived aesthetic quality of property. These conclusions have been cited in several court cases and legal opinions.

On farmed properties, installation of a transmission line can remove portions of the land from production, interfere with equipment operation, create safety hazards, and foreclose the opportunity to consolidate farmlands or develop the land for another use. The greatest impact on farm property values is likely to occur on intensively managed agricultural lands, where the new line would interfere with farm operation and management.

4.5.11.4. Research results

While the data from many of the studies reviewed are often inconclusive, some general conclusions among the studies have been made. In 2003, the Electric Power Research Institute (EPRI) conducted an

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[124] Ignelzi, Patrice and Thomas Priestley. A Statistical Analysis of Transmission Line Impacts on Residential Property Values in Six Neighborhoods. Southern California Edison, 1991.

[125] *Criscuola v. Power Authority of the State of New York*, 81 NY2d 649, 602 NYS2d 588, 621 NE2d 1199 (1993).

assessment of the researched relationship between electric transmission facilities and property values.[126] Their conclusions do not differ substantially from previous analyses.

- The potential reduction in sale price for single-family homes in the U.S. may range from 0 to 14 percent. For states within the Midwest (Minnesota, Wisconsin, and the Upper Peninsula of Michigan), the average decrease appears to be between 4 and 7 percent. EPRI reported a potential overall decrease between 0 and 6.3 percent.
- Higher-end properties are more likely to experience a reduction in selling price than lower-end properties.
- Adverse effects on the sale price of smaller properties could be greater than effects on the sale price of larger properties.
- Amenities such as proximity to schools or jobs, lot size, square footage of a house, and neighborhood characteristics tend to have a much greater effect on sale price than the presence of a power line.
- The degree of opposition to an upgrade project may affect the size and duration of the sales-price effects. Furthermore, adverse effects on price and value appear to be greatest immediately after a new transmission line is built and appear to diminish over time and generations of property owners.
- Effects on sale price are most often observed for property crossed by or immediately adjacent to a power line, but effects have also been observed for properties farther away from a line. Homes not directly adjacent to the ROW or beyond 200 feet from the ROW, however, were affected to a much lesser degree than those abutting the line or ROW.[127] [128]
- Setback distance, ROW landscaping, shielding of visual and aural effects, and integration of the ROW into the neighborhood can significantly reduce or eliminate the impact of transmission structures on sales price.
- Where appreciation of property does not appear to be affected, proximity to a transmission line can sometimes result in increased time for the property to sell.
- The value of agricultural property is likely to decrease if the power line structures are placed in an area that inhibits farm operations.

4.5.12. Radio and television reception

Transmission lines do not usually interfere with normal television and radio reception. In some cases, interference is possible at a location close to the ROW due to weak broadcast signals or poor receiving equipment. If interference occurs because of the transmission line, the electric utility is required to remedy problems so that reception is restored to its original quality as per Wis. Admin. Code § PSC 113.0707(3).

4.5.13. Recreation

Recreation areas include parks, trails, lakes, waterways, or other designated areas where public recreational activities occur. Transmission lines can affect recreation areas in several ways:

- Limiting the location of buildings;

[126] Goodrich-Mahoney, J. Transmission Line and Property Values: State of the Science. EPRI, November 2003.
[127] Kung, H. and C. Seagle, "Impact of Power Transmission Lines on Property Values: A Case Study," Appraisal Journal, July 1992.
[128] Hamilton, S. and G. Schwann. 1995. Electric Transmission Lines and Property Value. Land Economics 71(4):436-444.

- Repelling potential users of recreational areas whose activities depend on the aesthetics of natural surroundings (*e.g.,* backpackers, canoeists, hikers, birdwatchers);
- Altering the types of wildlife found in an area by creating more edge habitat or additional mortality risks to birds;
- Providing paths or better access to previously inaccessible areas for those who snowmobile, ski, bicycle, hike, or hunt;
- Posing potential safety risks by locating new poles or wires in the path of recreational vehicles such as snowmobiles and ATVs without adequate markings.

Some of these effects can be mitigated by locating lines along property edges, using pole designs that blend into the background and reduce aesthetic impacts, or designing recreation facilities to take advantage of already cleared ROWs.

4.5.14. Safety

4.5.14.1. Safety standards

Transmission lines must meet the requirements of the Wisconsin State Electrical Code.[129] The code establishes design and operating standards, and sets minimum distances between wires, poles, the ground, and buildings. While the Wisconsin State Electrical Code represents the minimum standards for safety, the electric utility industry's construction standards are generally more stringent than the Wisconsin State Electrical Code requirements.

The National Electrical Safety Code (NESC) specifies minimum horizontal clearances required between buildings and 345 kV conductors. Wisconsin Admin. Code § PSC 114.234A4 prohibits the construction of transmission lines over occupied residential dwellings or residential dwellings intended to be occupied. Although they may not be prohibited by code, building other structures within a transmission line ROW is strongly discouraged.

4.5.14.2. Contact with transmission lines

The most significant risk of injury from any power line is the danger of electrical contact between an object on the ground and an energized conductor. Generally, there is less risk of contact with higher voltage transmission lines as opposed to low-voltage lines due to the height of the conductors.

When working near transmission lines, electrical contact can occur, even if direct physical contact is not made, because the electricity can arc across an air gap. The most important safety practice is to avoid placing yourself or any object you may contact too close to a high-voltage overhead line. As a general precaution, no one should be on an object or in contact with an object that is taller than 15 to 17 feet while under a high-voltage electric line. Individuals with specific concerns about whether it is safe to operate their vehicles or farm equipment near an electric transmission line should contact their electric provider.

4.5.14.3. Fallen lines

Transmission lines are designed to automatically trip out-of-service (become de-energized) if they fall or contact trees. This is not necessarily true of distribution lines. However, transmission lines are not likely to fall unless hit by a tornado or a vehicle.

[129] Wisconsin adopts the most recent edition of the NESC with certain changes, deletions, and additions. Volume 1 of the Wisconsin State Electrical Code is found in Wis. Admin. Code. ch. PSC 114, which is administered primarily by the Commission.

4.5.14.4. Lightning

New transmission lines are built with a grounded shield wire placed along the top of the poles, above the conductors. Typically, the shield wire is bonded to ground at each transmission structure. This protects the transmission line from lightning. Transmission poles, like trees or other tall objects, are more likely to intercept lightning strikes, but do not attract lightning. Lightning is not more likely to strike houses or cars near a transmission line. Shorter objects under or very near a line may actually receive some protection from lightning strikes.

4.5.14.5. Induced voltages

Landowners in both rural and urban settings often express concerns about shocks from metal objects in the immediate vicinity of an overhead transmission line. An ungrounded metal object (*e.g.* a tractor or a fence) under or very near an energized transmission line may become charged with low-level voltage caused by an electrostatic induction process. When a person or animal touches the object, a shock may be felt, similar to that felt after crossing a carpet and then touching a metal object. The voltage discharge can be a painful nuisance. Dissipation of such charges occurs when contact is made with the ground. This might happen when people, livestock, or some other conductive material makes an effective electrical contact between ground and the charged object. The magnitude and strength of the charge is directly related to the mass of the ungrounded metal object and its orientation to the line.

Concerns have most often been addressed by grounding the objects in question. For example, fences located directly under and parallel to transmission lines should be grounded to earth. This can be achieved through the use of a simple ground rod with an insulated lead and a wire clamp attached. Energized electric fences with a properly installed fence grounding electrode system should continue to function properly even when subjected to induced voltage. Energized electric fences directly under or parallel to a transmission line may also have filters installed to discharge the induced voltage to earth.

When it is necessary to move or work on such fences, the fences should remain solidly grounded while the work is being done. Additional protection may be obtained by installing an approved lightning protection system on the fence that also provides a means for the discharge of induced voltage. More information may be obtained from a Midwest Rural Energy Council publication, *"Installation and Operation of Electric Fences, Cow Trainers and Crowd Gates"* (http://www.mrec.org/pubs.html).

Tractors or other equipment operated under a transmission line can drag a short metal chain to "ground it" to earth. This is a very low-cost, effective mitigation technique. An equally low-cost alternative is to attach a chain to the metal frame of the equipment and drop that chain to the ground before getting off of the equipment. The chain can be pulled up while the vehicle is moving to reduce the risk of a broken chain causing damage to the equipment. The most direct mitigation measure is to avoid parking this type of equipment under high-voltage power lines.

Refueling vehicles directly under a high-voltage transmission line is not a good practice. A spark from a discharging metallic structure with induced voltages to earth could ignite the fuel. The risk of such ignition is higher with gasoline-powered vehicles than for diesel-powered vehicles.

DATCP's AIS for this project will provide additional information regarding safety issues when farming near transmission lines. See Section 4.5.2.2 in this chapter. DATCP AIS staff can provide general published information and references as well. Individuals with specific concerns regarding the operation of equipment or placement of fences under an electric transmission line should contact their electricity provider.

4.5.15. Stray voltage and dairy livestock

4.5.15.1. Causes of stray voltage

Stray voltage and its impacts on livestock and other confined animals have been studied in detail by state and federal agencies, universities, electric utilities, and numerous scientists since the late 1970s. The PSC has opened investigations, encouraged the upgrade of rural distribution systems, established measurement protocols, and compiled a stray voltage database to track investigations, all in order to develop successful strategies for minimizing stray voltage in farm operations.[130] Over the decades, significant resources have been allocated to understand this issue.

Electrical systems, including farm systems and utility distribution systems, are grounded to the earth to ensure safety and reliability, as required by the NESC and the National Electrical Code (NEC). Because of this, some current flows through the earth at each point where the electrical system is grounded and a small voltage develops. This voltage is called neutral-to-earth voltage (NEV). When NEV is measured between two objects that are simultaneously contacted by an animal, a current will flow through the animal. Animals may then receive a mild electrical shock that can cause a behavioral response. At low voltages, an animal may flinch with no other noticeable effect. At higher levels, avoidance or other negative behaviors may result. Stray voltage may not be noticeable to humans.

Low levels of alternating current (AC) voltage on the grounded conductors of a farm wiring system are a normal and an unavoidable consequence of operating electrical farm equipment. Some levels of stray voltage will always be found on a farm. For example, a dairy cow may feel a small electric shock when it makes contact with an energized water trough. The issue of concern is stray voltage that occurs at a level that negatively affects an animal's behavior, health, and more specifically, milk production.

Stray voltage can be caused by a combination of on-farm and off-farm causes. One off-farm contributor to stray voltage is the operation of transmission lines in close proximity and parallel to a distribution line. As a means to minimize new transmission line impacts, new lines are often co-located near a distribution ROW or the distribution line is underbuilt on the new transmission poles. This configuration can contribute to stray voltage issues. To minimize the likelihood of stray voltage occurrences, utilities sometimes propose to relocate these paralleling distribution lines further away from the transmission line and/or burying the distribution line underground. Additionally, the PSC may require the utility to conduct pre-construction and post-construction testing of potentially impacted farms and lines.

4.5.15.2. Potential impact of stray voltage

Herd problems can be difficult to diagnose. There are many factors to consider such as the herd's environment, diet, and health. Dairy cow behaviors that may indicate the presence of stray voltage include nervousness at milking time, increased milking time, decreased milk production, increased defecation or urination during milking, hesitation in approaching watering stations or feeders, or an eagerness to leave the barn. Some of these symptoms are interrelated. For example, a dairy cow that does not drink sufficient water due to shocks may have decreased milk production. However, these same symptoms can be caused by other factors that are unrelated to stray voltage such as increased mastitis or milk-withholding problems for farms with milking parlors or in barns with milk pipelines. If stray voltage is suspected to be the cause of herd problems, the farm should be tested.

[130] Commission stray voltage information can be found on its web site at http://psc.wi.gov/utilityinfo/electric/strayvoltage.htm.

In 1996, the PSC established a stray voltage "level of concern" of two milliamps (PSC docket 5-EI-115).[131] This level of concern is not intended as a "damage" level, but a very conservative, below the injury level, below the point where moderate avoidance behavior is likely to occur, and well below where a cow's behavior or milk production would be affected. DATCP and PSC consider that at this level of current, some form of mitigation action should be taken on the farmer's behalf.

The level of concern is further defined with respect to how it should be reduced. If a utility distribution system contributes one milliamp or more to stray voltage on a farm, the utility must take corrective action to reduce its contribution to below the one milliamp level. If the farm electrical system contributes more than one milliamp, the farmer may want to consider taking corrective measures to reduce the level below one milliamp.

4.5.15.3. Mitigation of stray voltage

When stray voltage is a concern, electrical measurements in confined livestock areas should be done using established PSC-approved testing procedures with the appropriate equipment. These testing protocols have been developed to collect a reasonable set of data useful in the analysis of the quantity and quality of stray voltage that may be present under a variety of conditions, and the source (including on-farm versus off-farm sources) of the stray voltage.

Field research shows that cow contact current is often dependent on both on- and off-farm electrical power systems. A common on-farm source of stray voltage is the inappropriate interconnection of equipment grounding conductors with the neutral conductors of the farm wiring system. Mitigation of stray voltage can be achieved through a variety of proven and acceptable methods, such as additional grounding or the installation of an equipotential plane.

Farm operators may receive technical assistance from the Wisconsin Rural Electric Power Services (REPS) program (as defined and authorized by Wis. Stat. §§ 93.41 and 196.857). The REPS program is jointly managed by PSC and DATCP.[132] DATCP provides an ombudsman, veterinarian, an energy technical advisor, and a program assistant to the REPS program. REPS staff provides information about stray voltage and power quality issues; work to answer regulatory questions; conduct on-farm and distribution system investigations that can assist farmers in working with the utility or electrician to resolve a power quality concern; provide a format for dispute resolution; and continue to research electrical issues. REPS staff also works with farmers, their veterinarians, and nutritionists to resolve herd health and production problems.

4.5.16. Water resources

4.5.16.1. Potential impacts to rivers, lakes, and streams

Waterways in the form of creeks, streams, rivers, and lakes are abundant throughout Wisconsin. Many of the rivers have been designated as special resources that have state, regional, or national significance. Construction and operation of transmission lines across these resources may have both short-term and long-term effects. The type and significance of the impact is dependent on the characteristics of the water resource and the transmission line design. Waterway use, physical features such as channel width,

[131] The level of concern was established at 2 milliamps, AC root mean squared (rms), steady state or 1 volt AC rms steady state across a 500 ohm resistor in the cow contact area. Steady state is defined by the Institute of Electrical and Electronics Engineers as the value of current or voltage after all transients have decayed to negligible value.
[132] DATCP REPS and stray voltage information can be found on its website under the Wisconsin Farm Center page, http://datcp.wi.gov/Farms/Wisconsin_Farm_Center/Farm_Rewiring/Stray_Voltage/index.aspx

herbaceous plant cover, and water quality, recreational use, and the scenic quality of the river and its surrounding landscape are important factors in assessing potential impacts.

Water quality can be impacted not only by work within a waterway but also by nearby vegetation clearing and construction activities. The removal of adjacent vegetation can cause river water temperatures to rise and negatively affect aquatic habitats, especially cold-water systems. It can also increase erosion of adjacent soils causing sediment to be deposited into the waterway, especially during rain events. Construction often requires the building of temporary bridges that, if improperly installed, may damage banks and cause erosion or be overtopped or dislodged, and back up water. Overhead transmission lines across major rivers and streams may have a visual impact for river users and pose a potential collision hazard for waterfowl and other large birds, especially when located in a migratory corridor. Recreational use such as sight-seeing, boating, fishing, or bird watching could be adversely affected.

4.5.16.2. Areas of special natural resource interest

Certain waters of the state possess significant scientific value and are identified by DNR as Areas of Special Natural Resource Interest (ASNRI) for their protection (Wis. Admin. Code § NR 1.05). ASNRI-identified waters include:

- State natural areas (Wis. Stat. §§ 23.27 through 23.29);
- Trout streams (Wis. Admin. Code § NR 1.02(7));
- Outstanding resource waters (ORW) or exceptional resource waters (ERW) (Wis. Stat. § 281.15);
- Waters or portions of waters inhabited by an endangered, threatened, special concern species or unique ecological communities identified in the NHI;
- Wild rice waters as identified by DNR and the Great Lakes Indian Fish and Wildlife Commission;
- Waters in areas identified as special area management plan or special wetland inventory study (Wis. Admin. Code § NR 103.04);
- Waters in ecological significant coastal wetlands along lakes Michigan and Superior as identified in the coastal Wetlands of Wisconsin;
- Federal or state waters designated as wild or scenic rivers (Wis. Stat. §§ 30.26 and 30.27).

There are approximately 10,000 miles of trout streams in Wisconsin categorized as Class 1, 2, or 3. High-quality trout streams (Class 1) have sufficient natural reproduction to sustain populations of wild trout, at or near carrying capacity. These streams are often small and may contain small or slow-growing trout, especially in the headwaters. Approximately 40 percent of the trout streams are Class 1 trout streams. Class 2 trout streams may have some natural reproduction but not enough to utilize available food and space, and stocking is required to maintain a desirable sport fishery. However, these streams have good survival and carryover of adult trout, often producing some fish larger than average size. Class 2 trout streams comprise about 45 percent of Wisconsin's total trout stream mileage. Class 3 waters are marginal trout habitat with no natural reproduction occurring. They require annual stocking of trout to provide trout fishing. Generally, there is no carryover of trout from one year to the next. Class 3 trout streams comprise 15 percent of Wisconsin's total trout stream mileage. Degradation of trout habitat is caused by siltation from erosion, decreased groundwater flow from irrigation, drained wetlands, and poor watershed management. High oxygen demand from organic pollution, channelization, cattle grazing, and increased temperatures from both man-made (*i.e.* stormwater discharges) and natural sources are other common causes of trout habitat deterioration. State laws protect trout streams from pollution and other harmful effects.

ORWs and ERWs are characterized as being valuable or unique for various features including fisheries, hydrology, geology, and recreation. Regulations require that these shall not be lowered in quality without good justification. By assigning these classifications to specific streams, high quality waters receive additional protection from point source pollution. Of the some 42,000 stream/river miles in the state, over 3,000 stream miles or approximately 8 percent have been designated as ORW and more than 4,500 stream miles or approximately 11 percent have been designated as ERW. Of Wisconsin's 15,000 lakes and impoundments, 103 are designated as ORW.

4.5.16.3. Mitigation of impacts to surface waters

Techniques for minimizing adverse effects of constructing transmission lines in river and stream environments, especially in the vicinity of ASNRI-designated waterways include avoiding impacts, minimizing impacts, and/or effective remediation of the impacts. Impacts to waterways can be avoided by rerouting the line away from the waterway, adjusting pole placements to span the resource overhead, constructing the line under the resource, or constructing temporary bridge structures across the resource. Methods to minimize impacts include avoiding pole placements adjacent to the resource, using DNR-approved erosion control methods, using alternative construction methods such as a helicopter construction, landscaping to screen the poles from the view of river users, and maintaining shaded stream cover. After construction, some impacts can be remediated.

There are several methods and cable types for constructing a transmission line under a resource. While potentially feasible for the construction of lower-voltage and distribution lines, at higher voltages, there are substantial engineering, cost, and operational hurdles that would need to be overcome to be a feasible alternative to overhead construction.

The use of properly designed temporary bridge structures avoids the necessity of driving construction equipment through streams (see the example in Figure Vol. 2-38). Temporary bridges consist of timber mats that can allow heavy construction traffic to cross streams, creeks, and other drainage features without damaging the banks or increasing the potential for soil erosion. Temporary bridges should be located to avoid unique or sensitive portions of these waterways, *i.e.*, riffles, pools, spawning beds, etc. They span from top-of-bank to top-of-bank and may include a support structure under the bridge, placed on the bed of the waterway, to support heavy vehicle use.

Proper DNR-approved erosion control is necessary for all construction activities, especially those that may affect water resources. DNR BMPs should be employed before, during, and immediately after construction of the project to reduce the risk of excess siltation into streams. Erosion controls must be regularly inspected and maintained throughout the construction phase of a project until exposed soil has been adequately stabilized.

Woodlands and shrub/scrub areas along streams are a valuable buffer between adjacent land uses such as farm fields and corridors of natural habitats. The vegetation maintains soil moisture levels in stream banks, helps stabilize the banks, filters nutrient-laden sediments and other runoff, maintains cooler water temperatures, and encourages a diversity of vegetation and wildlife habitats. The removal of vegetative buffers from ASNRI-designated shoreland zones will raise the temperature of the water. Cool water temperatures are necessary for good trout stream habitat. Existing vegetative buffers should be left undisturbed or minimally disturbed, whenever possible. For areas where construction impacts cannot be avoided, low-growing native tree and shrub buffers along these streams should be allowed to regrow and/or should be replanted so as to maintain the pre-construction water quality in the streams.

4.5.16.4. Permitting for river and stream crossings

DNR is responsible for regulating public waterways, including stream crossings. For certain protected areas, USACE and/or USFWS might require additional permits and approvals. The discussion below outlines these legal protections and the permitting requirements for activities affecting streams.

- Wis. Stat. § 30.29 prohibits motor vehicle crossings of navigable waters (below the ordinary high water mark (OHWM)) but allows DNR to issue permits for special purposes.
- Wis. Stat. § 30.025 describes the process for permitting utility projects with respect to wetlands, navigable waterways and stormwater management.
- Wis. Stat. § 30.12 requires permits for structures placed on the bed of navigable waterways.
- Wis. Stat. § 30.123 requires permits for bridges or culverts in, on, or over navigable waters.
- 33 USC § 403 Section 10 of the Rivers and Harbors Act of 1899 prohibits the unauthorized obstruction or alteration of any navigable waters of the U.S.
- 16 USC §§ 1271-1287 prohibit federal agencies from authorizing a water resources project that would have a direct and adverse effect on the values for which a river protected by the Wild and Scenic Rivers Act was established.

CPCNs granted by the Commission are often contingent upon the applicant's ability to secure all necessary permits from state and federal agencies. Likewise, any permit granted by DNR or USACE could be contingent on the implementation of all mitigation procedures ordered by the Commission in its CPCN authorization.

4.5.17. Wetland resources

4.5.17.1. Types and functions of wetlands

There are many different types of wetlands. Some wetland meadows and marshes consist primarily of grasses, sedges, reeds, and cattails. Some wetlands may contain permanent areas of open water or are wet for only a portion of the year. Shrub-carr wetlands support a mixture of grasses and sedges interspersed with shrubs, such as willows, alders, or dogwood, and may or may not have any open water. Wooded wetlands consisting of conifers or deciduous hardwoods represent another type of wetland common in Wisconsin. Tamarack, cedar, and black spruce swamps and bogs occur in many isolated low-lying areas in northern Wisconsin. These swamps are particularly sensitive to disturbance because conditions do not support rapid growth or recruitment. Forested wetlands of deciduous hardwoods, such as black ash (*Fraxinus nigra*), black willow (*Salix negra*), elm *(Ulmus spp.),* silver maple (*Acer saccharinum*), and red maple (*Acer rubrum*), tend to occur along creeks, rivers, and streams throughout southern Wisconsin, and are also highly sensitive to disturbance because they take significant time to grow and mature. Calcareous fens are one of the rarest wetland plant communities in Wisconsin and often have a disproportionate number of rare, threatened, and endangered plant species.

Certain wetlands are considered sensitive if they are within the boundary of an ASNRI waterway or have a direct hydrologic connection to an ASNRI waterway (Wis. Admin. Code § NR 103.04). Sensitive wetlands include wetlands that are part of:

- Cold water communities including all trout streams and their tributaries and trout lakes;
- Lakes Michigan and Superior and the Mississippi River;
- State- and federally-designated wild and scenic rivers, designated state riverways, and state designated scenic urban waterways;

- Environmentally sensitive areas or environmental corridors identified in an area-wide water quality management plan, special area management plan, special wetland inventory study, or an advanced delineation and identification study;
- Calcareous fens;
- Habitats used by state- or federally-designated threatened or endangered species;
- State parks, forests, trails, and recreation areas;
- State and federal fish and wildlife refuges and fish and wildlife management areas;
- State- and federal-designated wilderness areas;
- State natural areas;
- Wild rice waters;
- ORWs and ERWs.

Wetlands provide vital functions that benefit society. Wetlands detain stormwater runoff, enabling the slow recharge of groundwater resources and lowering downstream peak flood levels. Wetlands filter sediments and pollutants from the air, precipitation, and upstream sources which results in higher water quality downstream. Wetlands provide food, cover, and nesting habitat for many species of fish and wildlife. It is estimated that between one-quarter and one-third of all rare species in Wisconsin are found in wetlands. Wisconsin has lost almost 50 percent of its original 10 million acres of wetlands. Avoidance and minimization of impacts to wetlands followed by proper mitigation is necessary to preserve the remaining 5.3 million acres of Wisconsin wetlands.

4.5.17.2. Potential impacts to wetlands

4.5.17.2.1. Long-term versus short-term impacts

The degree and nature of impacts to wetlands depend on the type of wetland, weather conditions at the time of construction, soil type, and the type of construction activities. Short-term wetland impacts can become long-term impacts if the construction phase is not well managed or mitigation techniques are not properly applied. Examples of long-term impacts include the loss of wetland acres due to the placement of transmission structures in wetlands, the unintended spread of invasive species due to inadequate cleaning of construction equipment, the conversion of forested wetland complexes to sedge meadow complexes, and the fragmentation of wetland types.

Certain wetland types are more susceptible to long-term impacts due to transmission line construction. They can have a more fragile habitat (such as a calcareous fen) that is difficult to re-create, or the requirements of the ROW prevent full mitigation efforts. Forested wetlands are an example of a type of wetland that can never fully recover from the construction process. Line construction and future maintenance operations require that transmission ROWs be maintained free of trees. Following construction of the line, the forested wetlands will be remediated as wet meadows with full sun. This permanently changes the vegetation and species diversity of the wetland in the ROW.

More in-kind recovery is probable for deciduous shrub-scrub wetlands (supporting willows, alders, and sedges) and wet meadows.[133] In a ten-year study of three wetland types following construction of a transmission line in Massachusetts, species diversity and richness were similar to pre-construction levels

[133] Grigal, D. F.1985. Impact of Right-of-Way Construction on Vegetation in the Red Lake Peatland, Northern Minnesota. Journal of Environmental Management. 9(5):pp. 449-454.

within one year in a cattail marsh but damage was still apparent after 10 years in a bog dominated by leatherleaf shrubs and sphagnum moss.[134]

4.5.17.2.2. Impacts to function and wetland habitats

Construction and maintenance of transmission lines can damage the ability of wetlands to function as they should. Heavy machinery used for clearing trees and brush, drilling holes, hauling cement, and setting poles can crush wetland vegetation and compact wetland soils. Soil compaction reduces the water-holding capacity of the soil and may result in increased runoff. Wetland soils consist of primarily organic matter (decomposed plant material) which forms very slowly. If disturbed by digging, filling, and compaction, these soils do not readily recover and are not easily repaired. Proper segregation of topsoil and subsoil is essential to minimizing long-term impacts and allowing natural vegetation and hydrologic conditions to recover.

Changes in hydrology (the vertical and horizontal movement of water through the soil) caused by trenching, drilling holes, de-watering soils, installing foundations, and compacting soils can alter the vegetation, reduce plant diversity, and promote the growth of invasive species. Driving equipment in wetlands can stir up sediments, endangering amphibians and other aquatic life. In large wetland areas where access is limited, soil compaction and hydrologic function can be further affected if fill is deposited in the wetland for the construction of roads or bridges.

In wetlands with large areas of open water, such as shallow marshes, or that have floating mats of vegetation, construction equipment access can be very difficult. Movement of construction vehicles within the wetland can result in significant rutting. Rutting and compaction of soils can permanently alter the wetland's soil structure and hydrologic function.

Large open water areas or wetlands with extensive organic matter emit methane, and may not fully freeze during winter months (a result of thermal loading). Construction during winter months in these environments can be dangerous and cause significant damage to the resource and the equipment. Ice and snow that may be used to construct roads may thaw from underneath, leading to equipment getting stuck, delays in construction sequencing, and the need to relocate access roads.

A secondary effect of disturbance is the opportunistic spread of invasive weedy species such as reed canary grass. These invasive species provide little food and habitat for wildlife.

4.5.17.3. Mitigation of impacts to wetlands

Techniques for minimizing adverse effects on wetlands especially in ASNRI-designated wetlands include avoiding impacts, minimizing impacts, and/or effective remediation of the impacts. After construction, some impacts can be remediated.

Impacts to wetlands can be avoided, for example, by:

- Routing the transmission line away from wetlands or the edges of wetlands;
- Adjusting pole placements to span wetlands or limit equipment access in wetlands, wherever possible;
- Using DNR-approved erosion control methods on adjacent lands.

Construction methods that can reduce impacts to wetlands include:

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[134] Nickerson, N. H., R.A. Dobberteen, and N.M. Jarman, 1989. Effects of Power-Line Construction on Wetland Vegetation in Massachusetts, USA. Journal of Environmental Management. 13(4): pp. 477-483.

- Conducting construction activities when wetland soils and water are frozen or stable and vegetation is dormant;
- Using construction matting and wide-track vehicles to spread the distribution of equipment weight when crossing wetlands during the growing season or when wetlands are not frozen.
- Using alternative construction methods and equipment such as helicopters, marsh buggies, and vibratory caisson foundations (see Section 4.4.4);
- Careful cleaning of construction equipment and mats after working in areas infested by invasive species;
- Using vibratory caisson foundations that eliminate the need for concrete or other fill.

Matting (see Figure Vol. 2-39) can provide a safe, stable work surface and travel lane for cranes, cement trucks, and other equipment needed during transmission line construction. Mats provide protection by spreading the weight of the equipment over a broader area to reduce compaction and prevent deep ruts from forming. While the mats may cause some depression of the underlying soils and crushing of the perennial vegetation, this impact is less than if matting is not used. Matting generally preserves native plant rootstocks so that the pre-construction vegetation can reestablish more quickly after construction is completed. Figure Vol. 2-40 shows a wide track vehicle placing mats in a wooded wetland. Tracked vehicles and high flotation tires can be used in some instances in lieu of mats.

Alternative construction equipment such as marsh buggies and helicopters and alternative foundations can be used to further reduce the impact of construction in wetlands. Helicopters have been successfully used for the construction of the foundations, the erection of the towers, and for wire stringing (see Figures Vol. 2-25, 29, and 31).

Ice roads can provide some of the same benefits as matting when used in wetlands. Ice roads are intended to create a stable surface for driving heavy equipment. They are usually created by clearing the initial layer of snow. This allows for frost to accumulate deep into the soil. A track vehicle (bombardier, bulldozer, etc.) is repeatedly driven across the ROW to drive the frost deeper into the soil. Sometimes the ROW can be flooded with water to provide an additional ice layer to the surface. Snow that falls on an ice road is usually cleared. However, compressing snow on top of the road can serve as insulation to keep the frost in the soil.

For construction projects which include the replacement of existing transmission structures in wetlands, structure types, construction timing, construction methods, and the wetland types are reviewed to determine the least impact to the resource. While the holes left in wetland soils normally close as the existing transmission pole is removed, it is sometimes more appropriate to cut the pole off at, or just below the ground surface. The utility would need permission from the landowner before leaving a pole stub in the ground.

If a steel structure on a concrete foundation needs to be removed from a wetland, the concrete would be removed to a depth of about two feet and wetland soils from adjacent new foundation locations would be used to backfill the old foundation holes. The wetland soils would then be graded to approximate the original wetland contours.

4.5.17.4. Permitting process for wetlands

Local, state, and federal laws regulate certain activities in wetlands. When fill material is proposed to be placed in a wetland, a permit is routinely required from the USACE under the Clean Water Act (CWA), Section 404. DNR must determine if the proposed activity is in compliance with applicable state water quality standards (Wis. Admin. Code ch. NR 103 and 299). If the proposal is found to be in compliance with state standards, DNR issues a wetland permit and a water quality certification to the applicant. If the project would result in impacts to wetlands associated with waters of the state, then DNR may have primary authority under Wis. Stat. ch. 30.

The general process for obtaining a permit is:

1. The applicant submits a permit application to USACE and DNR.
2. USACE reviews the project according to federal guidelines and determines their jurisdiction including consideration of potential impacts on endangered species, cultural resources, and tribal trust concerns.
3. USACE determines if the project is exempt from the CWA, or issues a permit decision contingent on DNR providing water quality certification.
4. DNR reviews the project for compliance with state water quality standards. The project-specific review may require field work to assess wetland function and values (including surveys for threatened and endangered species, hydrologic conditions, invasive species, etc.) in order to avoid and/or minimize potential impacts from the proposed project.

Both the federal and state processes allow for legal challenge of decisions.

In addition to the protections for water resources provided by law that are described above, the Commission has the authority, in its final order, to require avoidance of specific streams or wetlands, mitigation procedures for specific streams or wetlands, and independent monitoring of construction in all or specific streams and wetlands.

4.5.17.5. Wetlands Reserve Program lands

Some properties in Wisconsin are enrolled in the Wetlands Reserve Program (WRP), a voluntary program overseen by the Natural Resource Conservation Service (NRCS) of USDA. Farmers are provided the opportunity to retire marginal agricultural lands, and reap the economic and social benefits of having wetlands on their property. The program offers a landowner payment for restoring, protecting, or enhancing wetlands on the property in consultation with NRCS, USFWS, DNR, and local conservation districts.

The law allows the purchase of permanent easements, 30-year easements, or 10-year cost-share agreements (without an easement). The landowner maintains ownership of the land and is responsible for taxes on easement lands. Public access is not allowed unless desired by the landowner. Eligibility for enrollment into the program is granted according to: 1) duration of the easement offer; 2) hydrology restoration potential; 3) habitat value for migratory birds and other wildlife; 4) wetland functions and values; 5) location significance; 6) wetland management requirements; 7) physical site condition; and 8) overall cost. Applications with the most environmental benefits and least cost are selected.

After WRP easements are established, use of the land is limited to those uses that would not diminish or degrade the wetland values. WRP easements have significant restrictions. Acceptable uses may include hunting, fishing, timber harvesting, haying, or grazing, depending upon the situation. Cropping or other alterations that would harm the wetlands are not allowed.

WRP easements or cost-share agreements do not necessarily prohibit the construction of a transmission line across a wetland. A biologist or the central NRCS office in Washington would likely decide if a proposed line or access road were a “compatible” land use. Landowners can make “compatible use” requests throughout the life of the easement or agreement.

4.5.18. Woodlands

4.5.18.1. Potential impacts to woodlands

Wisconsin forests provide recreational opportunities, wildlife and plant habitats, and timber. Building a transmission line through woodlands requires that all trees and brush be cleared from the ROW. One mile of 100-foot ROW through a forest results in the loss of approximately 12 acres of trees. Transmission construction impacts can include forest fragmentation and the loss and degradation of wooded habitat, a reduction of aesthetic enjoyment of the resource, and/or the loss of income.

Different machines and techniques are used to remove trees from the transmission ROW depending on whether the woodlands consist of mature trees, have large quantities of understory trees, or are in sensitive environments such as a wooded wetland. These can range from large whole tree processors which can cause rutting and compaction of the forest floor to hand clearing with chainsaws in more sensitive environments. These activities are illustrated in Figures Vol. 2-10 and 2-11.

Wisconsin statutes (Wis. Stat. § 182.017(7)(e)) require that all timber removed for construction of a high-voltage transmission line remains the property of the landowner. Thus, the landowner should discuss with the ROW agent at the time of easement negotiations (see Section 4.3) the disposition of all timber to be cut. Larger timber might be stacked on the edge of the ROW for the owner. Smaller diameter limbs and branches are often chipped or burned. According to the landowner's wishes, wood chips may be spread on the ROW, piled to allow transport by the landowner to specific locations, or chipped directly into a truck and hauled off the ROW. See Figures Vol. 2-12 and 2-13.

4.5.18.2. Forest fragmentation

Forest fragmentation occurs when large unbroken areas of natural forest are cut into increasingly smaller woodlands. Corridors are cleared for infrastructure such as highways, pipelines, and power lines. Wooded parcels are increasingly cut into smaller pieces and converted to agricultural, urban, and commercial uses. Forest fragmentation results in the increase of linear edge relative to the area of internal forest. As fragmentation continues, a forest will suffer a permanent reduction in its vegetative and wildlife diversity and its ability to function as an ecological unit.

Fragmentation makes interior forest species more vulnerable to predators, parasites, competition from edge species, and catastrophic events. It also causes a permanent reduction in species diversity and suitable habitat for some species which require large undisturbed blocks of interior forest habitat for necessary activities such as nesting or breeding. Because large blocks of undisturbed forest are relatively rare, many of these species are also rare. Further loss of interior habitat and creation of increasingly smaller patches of suitable habitat can greatly affect the long-term survival of some species. For example, in Wisconsin, the pileated woodpecker will not breed in woodlands smaller than 250 acres and the cerulean warbler has been shown to avoid forest blocks smaller than 340 acres.[135] [136] Species that require forest interior for long-term survival include fishers, pine martens, timber wolves, red-shouldered hawks, many passerine birds such as warblers and flycatchers, and a number of woodland plants.

New clearings alter the vegetation and animal life both within the ROW and up to several hundred feet outside of the ROW. Studies of transmission ROW in forested habitat show a decrease in the density of

[135] Ambuel, B. and S. A. Temple. 1983. Area-Dependent Changes in the Bird Communities and Vegetation of Southern Wisconsin Forests. Ecology 64:1057-1068.
[136] Robbins, C. S., and B. A. Dowell. 1989. Habitat Area Requirements of Breeding Forest Birds of the Middle Atlantic States. Wildlife. Monographs No. 103. 34 pp.

interior forest species with increasing proximity to the ROW, while the density of edge species increased along the forest-edge interface.[137] Increased sunlight and wind penetrate the forest edge and create conditions that favor plant species more tolerant of light and drier conditions. Many of the plants and the animals that prefer edge habitat are very common species that can readily out-compete native plants and animals because of their opportunistic behaviors and greater tolerance to a wide range of environmental conditions. In bird populations, the increase in forest edge has been correlated with increases in nest predators such as blue jays, raccoons, and skunks and an increased nest parasitism from brown-headed cowbirds. Examples of species which proliferate in edge habitat include raccoons, skunks, cowbirds, blue jays, crows, white-tail deer, garlic mustard, buckthorn, and boxelder trees.

Cleared corridors may also create a barrier to movement for some species. This eventually leads to a decrease in genetic variability, leaving the remaining species and populations more susceptible to disease and less able to respond to change.

4.5.18.3. Other types of woodland impacts

Three other woodland impact examples are notable enough to mention here.

The activities associated with clearing trees and constructing a transmission line through or along the edge of forested areas can destroy and degrade forest habitat. Seeds and other propagating parts of non-native plants may be carried into a forest inadvertently by construction equipment. Disturbance caused by construction can then encourage aggressive growth of these invasive species (see Section 4.5.9). Habitat providing food and cover for local wildlife may be altered or lost if these invasive species out-compete existing native plants, resulting in a loss of plant and animal diversity.

Trimming and clearing can promote diseases such as oak wilt and annosum root rot in specific tree species. Red oak (*Quercus rubra*), black oak *(Quercus velutina)*, and northern pin oak (*Quercus ellipsoidalis*) are especially susceptible to oak wilt and will often die within one year of infection. The cause of the disease is a fungus that is carried by sap-feeding beetles or spread through common root systems. In the upper Midwest, pruning or removal of oaks should be avoided from late spring to midsummer, when the fungus most commonly produces spores.

In addition to oak wilt, annosum root rot, another fungal disease, can affect conifer woodlands, particularly plantation-grown pine, when stumps are left behind after ROW clearing. It is considered among the most important and destructive diseases affecting conifers in the north temperate regions of the world. The infection is caused by the fungus, *Heterobasidion irregular*, whose spores can be carried by the wind over many miles. Cut stumps offer a surface for the spores to land and grow. The infection can spread through root contact to healthy trees nearby. Red pine (*Pinus resinosa*) and white pine (*Pinus strobus*) are most commonly affected, although other tree species can also be infected. The symptoms typically appear in nearby trees two to three years after stumps are infected. Treating stumps of cut pines with recommended fungicides as soon as possible after cutting will prevent new infections. Treatment should occur no later than the end of each cutting day. Recent research indicates that higher numbers of viable spores are in the air in spring and fall, followed by summer.

4.5.18.4. Pulp and timber losses

The production of trees for pulp and timber use is an important industry, occurring mostly on land owned by corporations associated with the pulp and paper industry and also on privately held lands. Because

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[137] Kroodsma, R.L. 1982. Edge Effect on Breeding Forest Birds along a Power-line Corridor. Journal of Applied Ecology 19:361-370.

transmission line ROWs must be kept clear of tall woody vegetation, the area within a ROW is permanently lost as a site for pulp and timber production.

4.5.18.5. Mitigation of impacts to woodlands

Impacts to woodlands can be minimized by a variety of methods. Example methods include:

- Avoiding routes that fragment major forest blocks.
- Adjusting pole placement and span length to minimize the need for tree removal and trimming along forest edges.
- Allowing tree and shrub species that reach a maximum height of 12 to 15 feet to grow within the ROW.
- Following DNR guidelines for preventing the spread of exotic invasive plant species and diseases such as oak wilt and annosum root rot.

4.5.18.6. Managed forest program lands

The Managed Forest Law (MFL) program and the Forest Crop Law (FCL) program work to encourage sustainable forestry on private woodlands in exchange for reduced property taxes. The FCL program was enacted in 1927 and enrollment was closed in 1986. The MFL program was enacted in 1985 and is the only forest tax law program that is now open to enrollment. Both programs encourage healthy and productive management of forest properties through a written management plan which incorporates landowner objectives, timber management, wildlife management, water quality, and the environment as a whole.

When a transmission line is constructed through woodland, all trees within a ROW are removed. Eligibility for the MFL program requires that no more than 20 percent of the land be in a non-productive state (not growing trees). If the amount of productive woodland falls below 80 percent, the property might be dropped from the program when the contract expires, and the property owner may suffer a monetary loss. Participants in these forest programs along a transmission route would therefore be permanently affected by the line. Loss of MFL eligibility could also have a long-term adverse effect on recreation, since landowners that receive the largest property taxes deferrals must open their land for hunting, fishing, hiking and cross-country skiing.

CHAPTER

5

5. Environmental Analysis: Proposed Substation Modifications and Off-Site Construction Areas

5.1. SUBSTATION MODIFICATIONS

The applicants propose to construct a new 345 kV transmission line from the Briggs Road Substation (La Crosse County) to the North Madison Substation (Dane County), and ending at the Cardinal Substation (Dane County). Modifications would be required at all three substations. A small expansion outside of the existing fenced area would be required at the Briggs Road Substation; however, all work at the North Madison and Cardinal Substations would be within the existing substation fenced boundaries. No new property would be acquired for the work proposed at any of the substations. In the vicinity of the Briggs Road Substation and to a lesser extent at the other two, users of nearby local roads and neighboring properties may experience some temporary construction impacts such as noise and dust. The applicants anticipate beginning construction on the substations in April 2017. Construction of the full project would be completed in December 2018.

5.1.1. Briggs Road Substation

The Briggs Road Substation was approved for construction as part of the CapX project (docket 5-CE-136) on May 30, 2012. It is located along Briggs Road in the town of Onalaska, La Crosse County. NSPW, one of the applicants in this docket, is currently constructing this substation and anticipates construction to be completed and the substation operational by January 2015. If the Badger-Coulee project is approved, a new 345 kV terminal would be installed at the Briggs Road Substation.

The substation is located on 36.2 acres with a fenced-in area of 10.8 acres. There are two transmission route alternatives for exiting the Briggs Road Substation. The Segment P-west option would exit the Briggs Road Substation to the north along Subsegment P0 (Figure 5.1-1). The Segment P-east route option and the Segment O option would exit the Briggs Road Substation to the south along Subsegment O0a (Figure 5.1-2).

Figure 5.1-1 Briggs Road Substation layout – Segment Option P-west

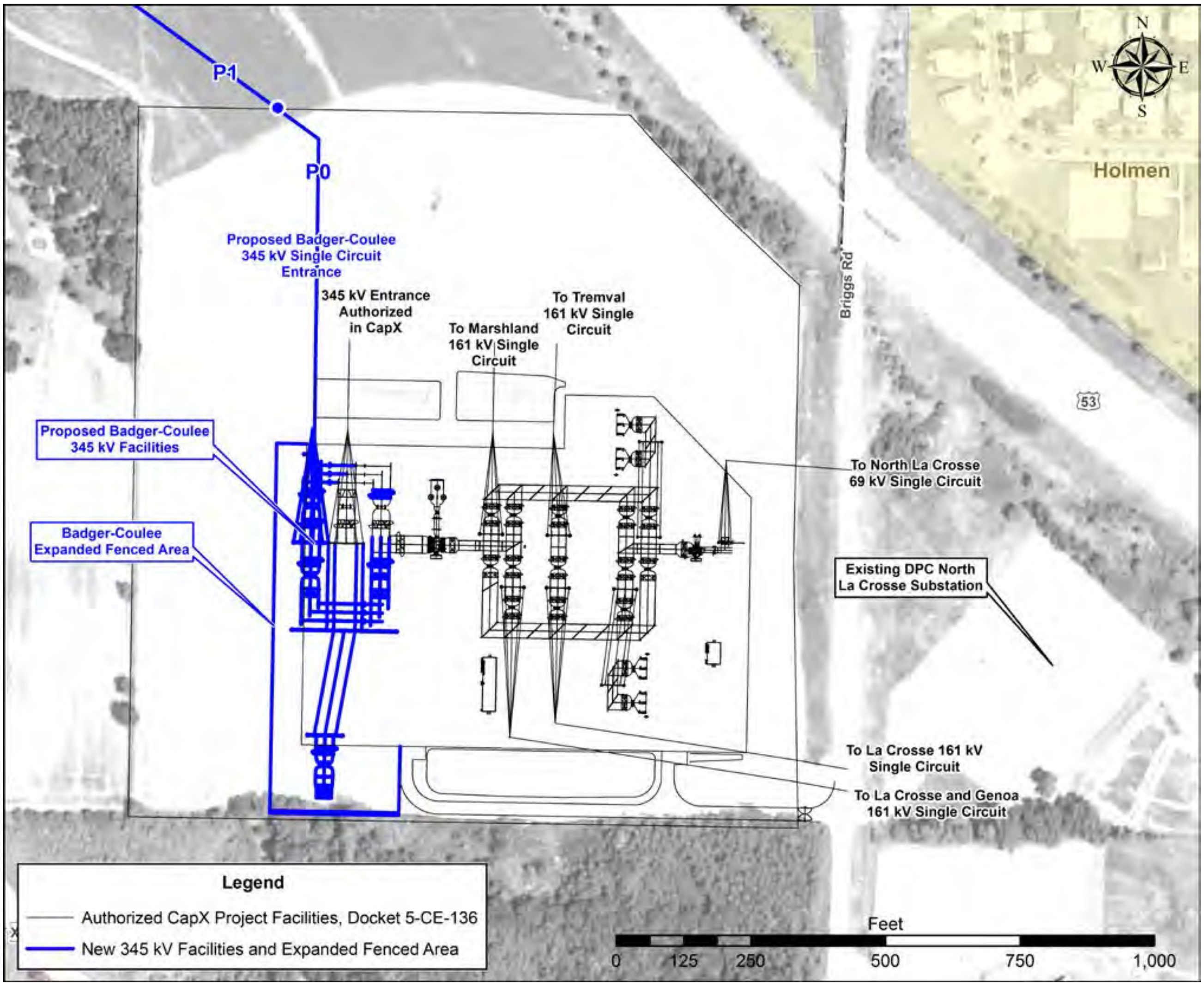
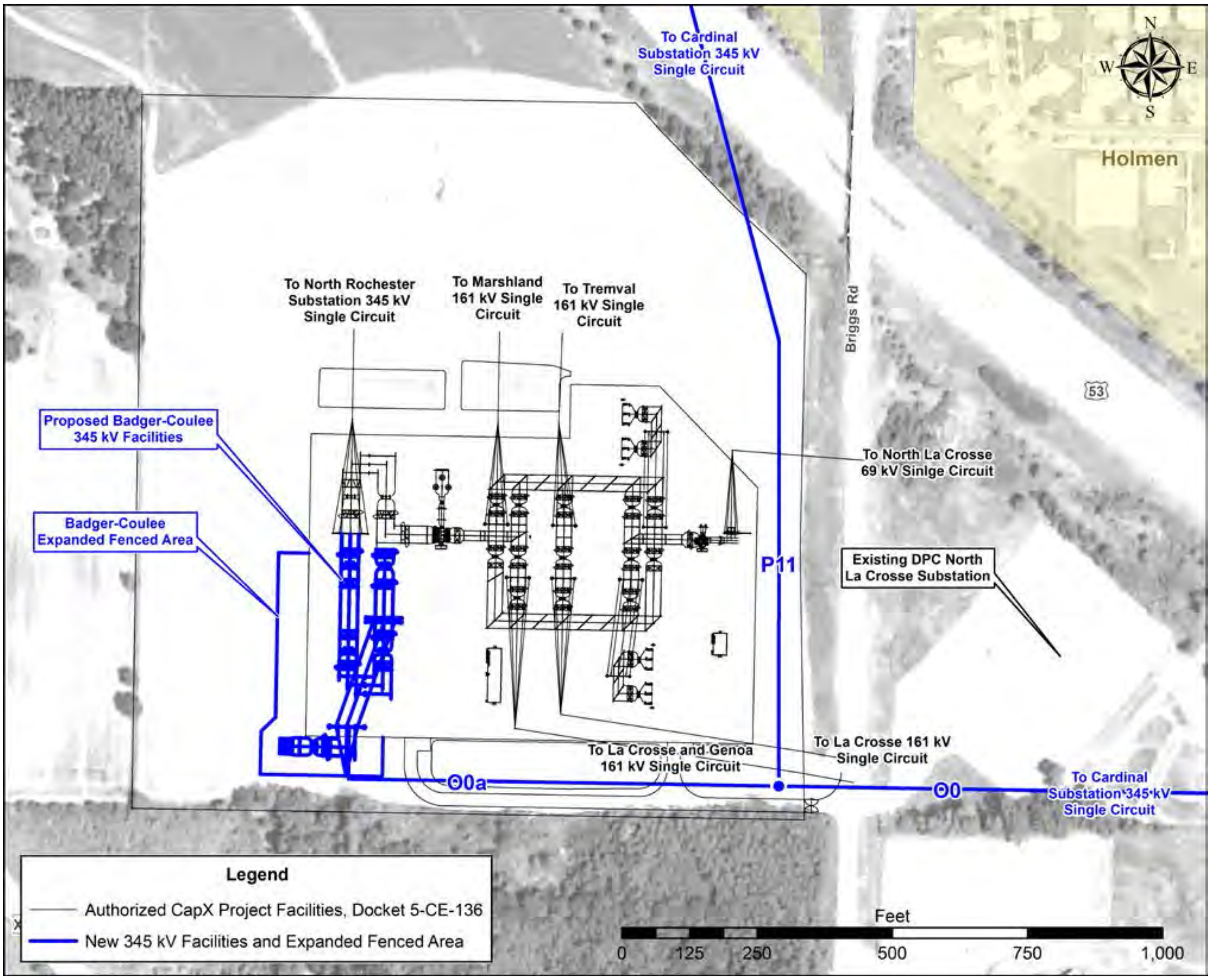


Figure 5.1-2 Briggs Road Substation layout – Segment Option P-east and Segment O



The construction for the Segment P-west option would require a 1.5 acres expansion of the existing fenced area. Segment P-east or Segment O would require a 0.9-acre expansion of the fenced area. Both layouts would expand the substation to the south and west of the current fenced area. Minor changes to the topography in the immediate vicinity of the fence expansion would be needed.

Construction at the site would entail minor amounts of excavation and replacement of the excavated materials with on-site sand. Typical construction machinery would be used including a dozer, a backhoe, an off-road truck, and a smooth drum compactor. All construction vehicles would access the substation via the existing substation driveway. Spoil materials would be handled on-site.

Environmental impacts from the expansion of the Briggs Road Substation would be minimal, due to the recent substation construction activities that have occurred. No additional farmland would be taken out of production. No change in zoning would be required. The archaeological consultant has found no potential impact on archaeological or historic resources in the vicinity of the substation or the two route options that would connect directly to it.[138] The substation is bordered by farm fields, USH 53, a distribution substation, and a riding club. Due to the lack of residential properties near the substation, impacts to adjacent property owners is anticipated to be minimal.

The following equipment would be installed at the Briggs Road Substation:

- Two 345 kV breakers, foundations and control cables to convert the existing 2-position straight bus to a 3-position ring bus;
- A 345 kV line steel dead-end structure with foundations to terminate the Briggs Road to North Madison line;
- A 345 kV 80 MVAR oil filled shunt reactor with foundation, secondary oil containment and control cables connected to the Briggs Road to North Madison line;
- A 345 kV breaker, foundation, and control cables for shunt reactor switching;
- Two additional static masts for lighting shielding;
- Disconnect switches, bus work, instrument transformers, surge arresters and all appurtenances for a complete substation installation. All ring bus components will have a minimum capacity of 3000 amps continuous;
- Protection and control panels for the new circuit breakers, shunt reactor, and transmission line;
- Fiber-optic communications and supervisory control and data acquisition (SCADA) equipment for system protection, remote control, and monitoring of the substation.

5.1.2. North Madison Substation

While both transmission line alternatives, Segments E and F travel south to the North Madison Substation, Segment E enters along the east side of the facility (Figure 5.1-3) and Segment F enters on the west side (Figure 5.1-4). Segments C and D would both leave the substation westward along a common Subsegment C0/D0.

[138] Commonwealth Cultural Resources Group, Inc. A Cultural Resources Assessment of the Proposed Routes of the Badger Coulee Transmission Line Project. August 2013.

Figure 5.1-3 North Madison Substation Layout – Segment E

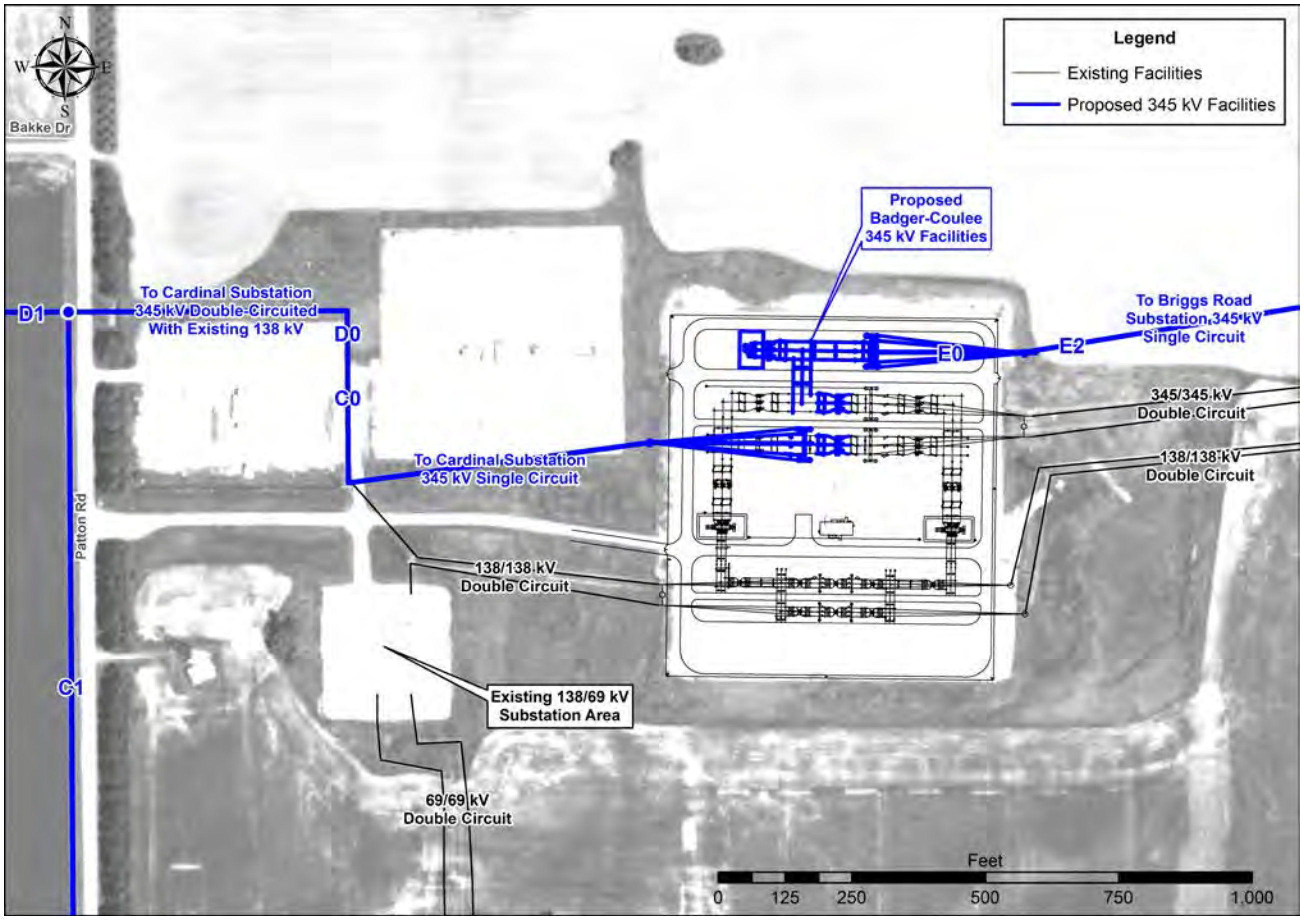
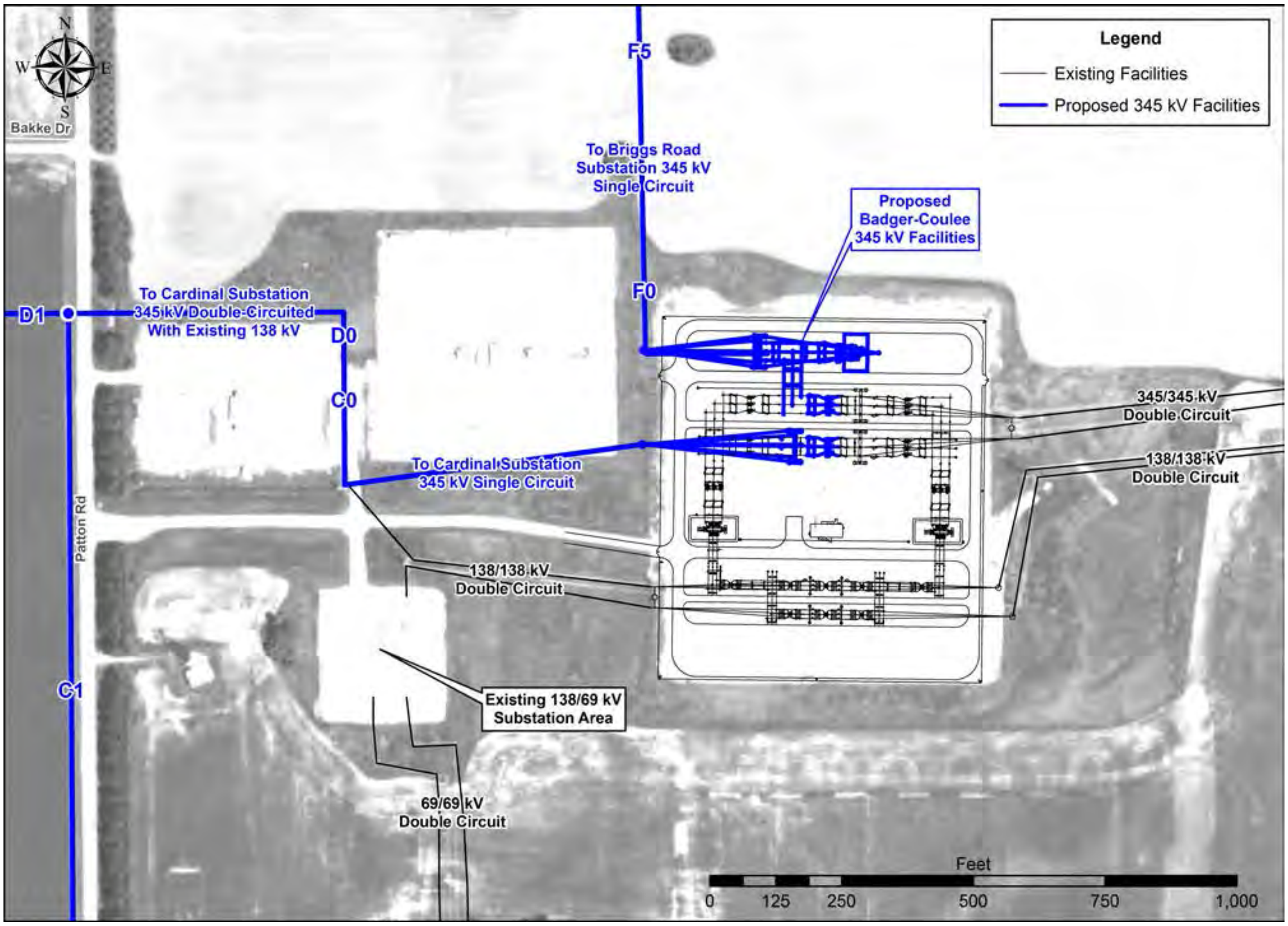


Figure 5.1-4 North Madison Substation Layout – Segment F



The North Madison Substation, which is owned by ATC, is located on Patton Road in the town of Vienna, Dane County, approximately 1.5 miles west of I-39. It is surrounded by agricultural fields. The applicants propose constructing two new 345 kV terminals within the existing North Madison Substation. No additional property or fence expansion would be required. Additionally, no grading would be required. No agricultural or natural resource impacts are anticipated at this substation. The archaeological consultant has found no potential impact on archaeological or historic resources at the substation site.

Regardless of the segments chosen, the scope of work for the North Madison Substation would include the installation of the following equipment.

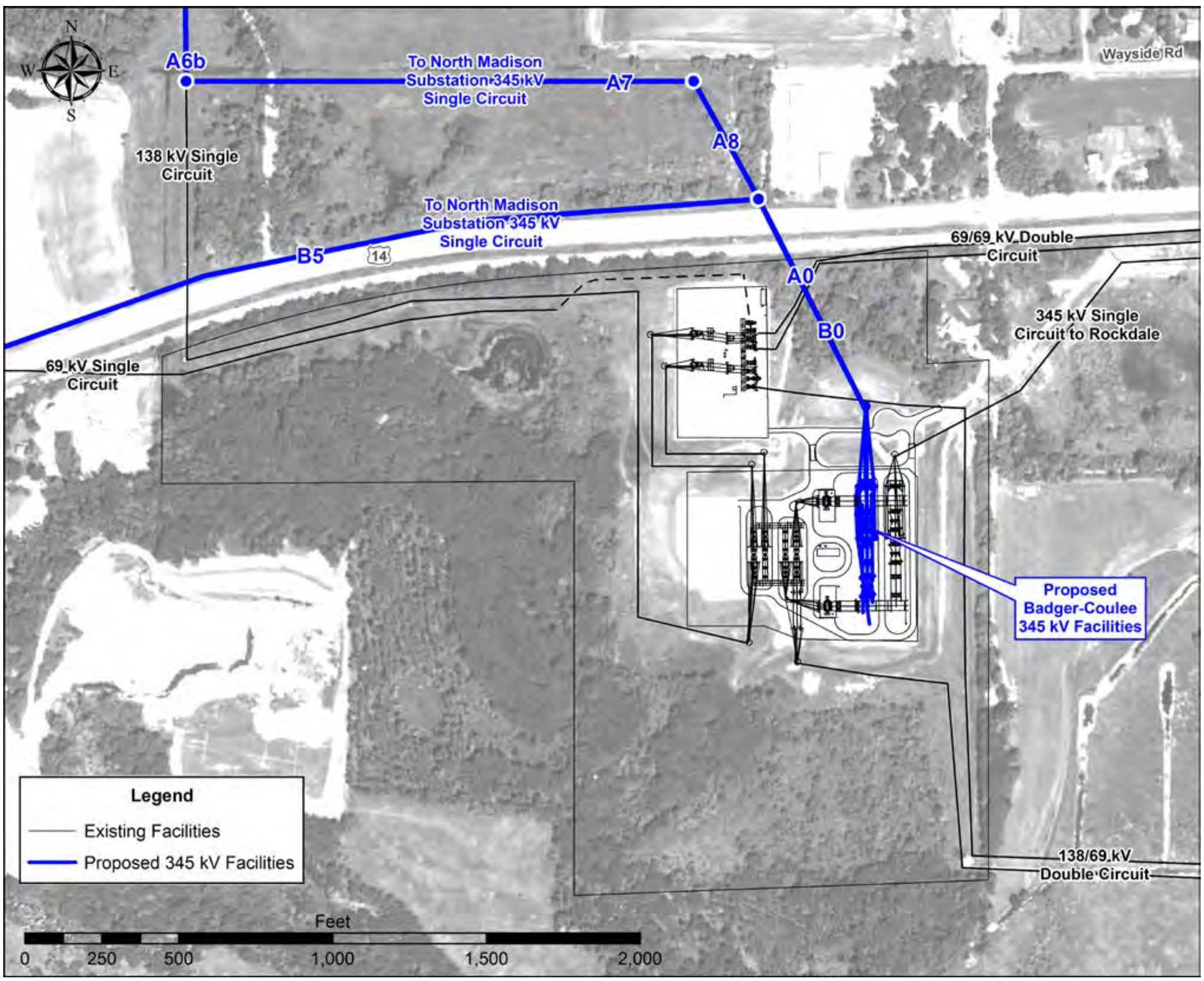
- Two 345 kV breakers, foundations, and control cables to expand the existing 4-position ring bus to a 6-position ring bus;
- A 345 kV line steel dead-end structure with foundations to terminate the Briggs Road to North Madison line;
- A 345 kV line steel dead-end structure with foundations to terminate the North Madison to Cardinal line;
- A 345 kV 80 MVAR oil filled shunt reactor with foundation, secondary oil containment and control cables connected to the Briggs Road to North Madison line;
- A 345 kV breaker, foundation and control cables for shunt reactor switching;

- Disconnect switches, bus work, instrument transformers, surge arresters and all appurtenances for a complete substation installation. All ring bus components will have a minimum capacity of 3000 amps continuous;
- Protection and control panels for the new circuit breakers, shunt reactor, and transmission lines;
- Fiber-optic communications and SCADA equipment for system protection, remote control, and monitoring of the substation.

5.1.3. Cardinal Substation

Common Subsegment A0/B0 is the only route proposed into Cardinal Substation (Figure 5.1-5). The substation, which is owned by ATC, is located on Willow Lane in the town of Middleton, Dane County. Constructed in 2011 as part of the Rockdale-West Middleton Transmission Project (Docket 137-CE-147), it is mostly surrounded by woods and open fields. It is bordered by the West Middleton Substation, owned by MGE, on the northwest and by a narrow line of trees and a residential property on the east.

Figure 5.1-5 Cardinal Substation Layout



The applicants propose installing a new 345 kV terminal within the existing Cardinal Substation. No additional property or fenced-in area expansion would be needed for this project. Additionally, no grading would be required. All proposed work would occur within the existing fenced-in area of the substation and no change to the access road or detention pond would be needed. The transmission line route into the substation would require clearing less than 1.0 acre of forest. Two small wetlands and one unnamed tributary to Black Earth Creek would be within the proposed ROW. One pole may be constructed within a wetland. The archaeological consultant has found no potential impact on archaeological or historic resources at the substation site.

The proposed scope of work at the substation includes the installation of the following equipment:

- Two 345 kV breakers, foundations, and control cables to expand the existing 3-position bus to a 4-position ring bus;
- Two 345 kV line steel dead-end structures with foundations to terminate the North Madison to Cardinal line;
- Disconnect switches, bus work, instrument transformers, surge arresters and all appurtenances for a complete substation installation. All ring bus components will have a minimum capacity of 3000 amps continuous;
- Protection and control panels for the new circuit breakers and transmission line;
- Fiber-optic communications and SCADA equipment for system protection, remote control, and monitoring of the substation.

5.2. OFF-SITE LAYDOWN YARDS AND STAGING AREAS

Construction staging areas (laydown yards) would be required during the entire construction period for the storage of construction materials, transmission line poles, cables, equipment, vehicles, job trailers, and related materials. The applicants identified potential staging areas on the basis of their location, access, security, and suitability for the efficient and safe warehousing of supplies. Environmental and landowner impacts were also considered. The applicants state that preferred sites require minimal site preparation and include areas such as parking lots and old gravel pits.

Laydown yards/staging areas outside the proposed transmission line ROW would be obtained from private landowners through leases that would last until the end of construction. Table 5.2-1 lists 25 potential laydown yards for the project.

Table 5.2-1 Potential laydown yards

Site #	Parcel Owner	Legal Description	Municipality	County	Size (Acres)
1	Mathy Construction Co./Croell Redi-Mix Inc.	T18M, R8W, Sec 19	Town of Caledonia	Trempealeau	45
2	Nationwide Limited Partnership	T18N, R8W, Sec 19	Town of Caledonia	Trempealeau	29
3	Lofgren	T21N, R6W, Sec 8	Town of Springfield	Jackson	3
4	Badger Mining Corp./Earthland Resources LP	T22N, R6W, Sec 29	Town of Curran	Jackson	16
5	Chippewa Valley Bank	T21N, R4W, Sec 11	Town of Adams	Jackson	5
6	Fort McCoy – U.S. Army	T18N, R3W, Sec 25	Town of Lafayette	Monroe	14
7	Mathy Construction Co.	T18N, R1W, Sec 34	Town of La Grange	Monroe	6
8	M&O Aggregate Inc.	T17N, R1W, Sec 3	City of Tomah	Monroe	8
9	City of New Lisbon	T16N, R3E, Sec 9	City of New Lisbon	Juneau	5

10	JCC Realty LLC, BCP Realty LLC	T16N, R3E, Sec 9	City of New Lisbon	Juneau	3
11	Woodside Ranch LLC	T15N, R4E, Sec 2 & Sec 1	Town of Lemonweir	Juneau	52
12	Kolba Pit	T15N, R4E, Sec 3	Town of Lemonweir	Juneau	9
13	TKC Real Estate Holdings LLC	T12N, R6E, Sec 3	Town of Delton	Sauk	4
14	Mathy Construction/Goerks	T12N, R6E, Sec 22 & Sec 23	Town of Baraboo	Sauk	28
15	Lake Morganne Group LLC	T12N, R8E, Sec 14	Town of Caledonia	Columbia	3
16	Lycon Inc.	T11N, R8E, Sec 2	Town of Caledonia	Columbia	7
17	ATC North Madison Substation	T9N, R9E, Sec 15	Town of Vienna	Dane	7
18	A&L Buchner LLC	T9N, R10E, Sec 14	Town of Windsor	Dane	6
19	McHugh Family Trust	T17N, R7W, Sec 19	Town of Onalaska	La Crosse	9
20	Monroe County Highway Department	T17N, R4W, Sec 25	Town of Sparta	Monroe	14
21	Arthur Overgaard, a Division of Mathy Construction Co.	T15N, R3W, Sec 19	Town of Jefferson	Monroe	6
22	Leis/Menn	T15N, R2W, Sec 2	Town of Sheldon	Monroe	13
23	Kraemer Quarry	T14N, R1E, Sec 8 & Sec 17	Town of Hillsboro	Vernon	15
24	City of Elroy	T14N, R2E, Sec 4	City of Elroy	Juneau	1
25	Nelson Joint Rev. Tr./Leage Joint Rev. Tr.	T13N, R6E, Sec 12	Town of Newport	Columbia	43

In general, 10.0 acres would be used at each site, and an access path at least 30-feet wide would be required. Staging areas would not be located within wetlands. If a selected site is located near or upslope from a wetland or waterway, appropriate erosion control measures would be implemented to prevent impacts. In addition, access points for these work sites and the haul routes to and from them would be selected, located and designed to minimize disturbance to soils and sensitive natural resources to the greatest degree practicable, as well as to minimize off-site tracking of soil. The applicants intend to have an appropriate Spill Prevention Control and Countermeasure Plan for all construction activities that would occur at the staging areas.

The proposed staging areas/laydown yards primarily consist of areas made up of active sand and gravel mining operations. Any nearby homes or businesses could experience noise, dust and visual impacts. Screening vegetation may mitigate these impacts in some cases. Roads between the various staging areas and worksites would be impacted by construction traffic. There are a number of sites, listed below, that contain other land cover features, including grassland or agriculture. Soil compaction should be expected on these types of lands, although measures could be taken to alleviate this compaction once construction is completed.

- Site 1 is primarily a sand mining site, with the eastern part of the sites composed of some areas of grassland and some scrub/tree areas.
- Site 3 is a small sand/gravel mining area, with some type of agricultural land use located along the eastern edge of the site.
- Site 4 is adjacent to several large mining areas and appears to be grassland. There is an area of open water visible on the DNR hydro layer. The placement of this hydro feature does not correspond to recent aerial images, but there appears to be small wetland areas at the northeast and southeast corners of the proposed staging area.
- Site 6 is primarily open grassland that is between a railway and several roads, with vehicle tracks crossing through the area.

- Site 11 is adjacent to the Woodside Sports Complex, a site that was previously forest/grassland, but has been partially developed (on west side) to consist of baseball/softball fields. The eastern part of this site appears to be open, with many vehicle tracks throughout.
- Site 24 is a gravel parking lot adjacent to STH 80 in the city of Elroy.
- Site 25 is primarily an active sand/gravel mining operation with a small area of agricultural land use along the site's western edge.

In addition to these laydown yards, there may be helicopter landing zones/pads that would be required along the selected project corridor. Both heavy-lift and light-duty helicopters may be utilized to assist with foundation installation, wire work, and moving staff/materials. Typically, heavy-lift helicopters require temporary laydown yards of 1.0 to 2.0 acres to provide enough space for the landing pad, tower assembly and equipment and material storage. Light-duty helicopters require a 50 foot by 50 foot landing pad, in close proximity to the ROW. Distances between landing pads is typically five to seven miles for heavy-lift landing pads and three to four miles for light-duty helicopters.

The applicants have not selected landing pad sites but would base these locations on the Commission's approved route. The preferred helicopter landing pad sites would be near the ROW, relatively flat (1-2 percent slope), and free of obstructions for safe equipment movement. Sites that require minimal site preparation are also preferred, such as vacant parking lots, quarries, gravel pits or fallow fields. The landing pads are typically made of compacted gravel or matting, and water is applied to surrounding soil/gravel to control dust during helicopter operation. Refueling is generally provided by fuel trucks; however, a fuel tank may be placed at landing zones used for longer durations. Secondary containment would be provided if a fuel tank is utilized at a landing zone.

If helicopter pads are located in areas of agricultural fields, soil compaction should be expected, although measures could be taken to alleviate this compaction when construction is completed.

During construction, temporary wire pulling/handling areas would be required approximately every 10,000 feet along the approved route. The staging area for this process would be approximately 40 feet by 300 feet. The applicants have not identified these areas, but would base these decisions on the Commission's approved route and final engineering considerations.

If the Commission approves this project, should any additional staging areas, laydown yards, or access routes not specified in the application become necessary, the applicants are required under Wis. Admin. Code § PSC 111.71 to notify the Commission prior to the use of any new additional work areas. The Commission notification must include the locations of the sites and sufficient information to demonstrate that threatened or endangered species, historic resources, wetlands, waterways, or other sensitive resources would not be affected. Site information and environmental analysis of the additional sites should also be submitted to DNR for review of grading requirements and potential impacts to waterways and wetlands, and protected species.

CHAPTER

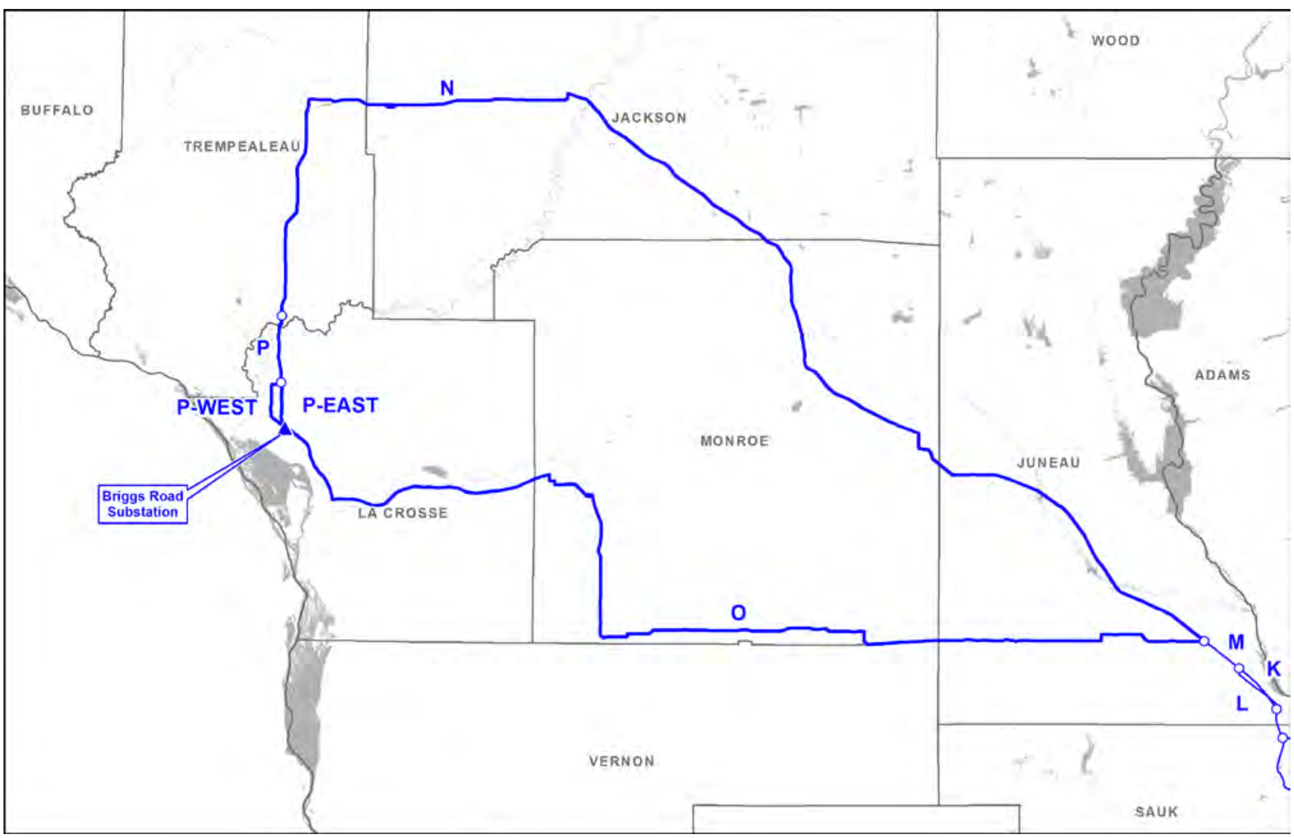
6

6. Environmental Analysis: Briggs Road Substation to Lyndon Station (Segments P, N, and O)

6.1. SEGMENT COMPARISONS

This section provides a detailed description of the proposed Segments of P, N, and O, including their subsegment components.

Figure 6.1-1 Badger-Coulee Segments P, N, and O



6.1.1. Detailed route description of Segments P and N

Segment P originates at the Briggs Road Substation and extends north through the town of Onalaska, the village of Holmen, the town of Holland, across the Black River and into the town of Gale, terminating just north of the Black River, south of STH 54. Segment P includes Option P-east or P-west, two route variations beginning at the Briggs Road Substation; each requires a different substation layout. P-east parallels P-west northward but takes a more eastern course, staying close to the USH 53 ROW and joining Segment P just north of the intersection of USH 53 and CTH HD. The lengths of the various subsegments are as follows:

Table 6.1-1 Lengths of segments

Segment	Length (miles)
Segment P with P-west	9.6
Segment P with P-east	8.9
Segment N	103.1

6.1.1.1. Option P-west (Subsegments P0 through P8)

Option P-west starts with Subsegment P0 exiting the north fenced boundary of Briggs Road Substation. Beyond the fenced boundary, Subsegment P1 would consist of a 345 kV line double-circuited with the existing DPC 161 kV (Q-1) transmission line, requiring an expansion of the existing ROW approximately 20 feet on both sides (40 feet in total). It crosses through agricultural crop lands and extends northwest into the town of Holland for approximately 0.8 miles before Subsegment P2 becomes single-circuit and briefly shares ROW with CTH XX. It continues north on new cross-country ROW for 0.3 miles, ending immediately south of CTH MH. The new ROW would be 120-feet wide. Subsegments P3, P4, and P5 continue northward for about 2.1 miles through the town of Holland into the village of Holmen, crossing CTH MH and ending at STH 35. This route requires new transmission ROW through and near residential subdivisions. It initially parallels the west side of Pedretti Street and then crosses to the east side to avoid newly constructed homes. It continues north crossing Country Avenue and passing through a farmstead on Old CTH NA and then across and along the edge of the Mississippi Valley Conservancy's New Amsterdam Grasslands. The new 345 kV transmission line on Subsegment P5, from CTH Old NA to the north side of STH 35, would be double-circuited with an existing DPC 69 kV transmission line (N-226), requiring expansion of the existing ROW by taking approximately 20 feet from residential properties and agricultural fields on the west side and agricultural fields on the east side.

From there, Subsegments P6 and P7 turn east, paralleling the north side of STH 35 for approximately 0.4 miles before turning north to follow the east side of USH 53 (Subsegment P8). The transmission line on Subsegments P6, P7 and P8 would consist of a single-circuit delta configuration and partially share ROW with the highway for a short distance before intersecting with Option P-east and continuing north on Segment P (Subsegments P9 and P10).

6.1.1.2. Option P-east (Subsegments O0a, P11 through P14)

Option P-east leaves the southern fenced boundary of the Briggs Road Substation and wraps around the substation on the southern and eastern property edges (Subsegments O0a and P11). Subsegment P11 extends north for 0.2 miles, adjacent to Briggs Road, crossing over an existing transmission line (DPC's Q1) and USH 53. The proposed 345 kV line would be single-circuit and require new 120-foot wide ROW.

Subsegments P12, P13, and P14 parallel and continue north along the east side of USH 53 for approximately 8.4 miles. The route extends along the western border of the village of Holmen and through the town of Holland before ending north of USH 53, at the start of the common portion of

Segment P. This route shares ROW with the highway, requiring varying amounts of new ROW width, ranging from 0 to 91 feet, from private properties that abut the highway. These segments parallel but do not overlap the approved CapX route, which is located primarily along the west side of USH 53. The CapX 345 kV line would be double-circuited with an existing NSPW 161 kV transmission line (W3203). At one location, the two transmission lines would be constructed side by side on the east side of USH 53 requiring a combined ROW easement of approximately 255 feet from the edge of the WisDOT ROW. This configuration would last for a distance of about 0.5 mile (Subsegment P13) through an agricultural field. While crossing CTH MH, CTH Old NA, CTH HD, and USH 53, these segments pass near a group of apartments, agricultural fields, small residential lots, a school, and a daycare.

6.1.1.3. Segment P (Subsegments P9 and P10)

Segment P (Subsegment P9 and P10) extends north while paralleling USH 53 for a total length of 4.4 miles. Subsegment P9 starts in the village of Holmen, crosses the town of Holland and the Black River, and terminates just south of Pow Wow Lane in the town of Gale, Trempealeau County. This subsegment partially shares WisDOT ROW on the west side of the highway for approximately 3.7 miles before crossing to the east side. The new 345 kV line would be a single-circuited line in a delta configuration. Subsegment P9 crosses a mixture of agricultural fields, wooded tracts and nearly 20 residential properties.

Subsegment P10 extends east for a short distance adjacent to Pow Wow Lane before turning north for 0.5 mile where it connects with Segment N. This portion of Segment P requires new 120-foot wide cross-country ROW. Pow Wow Lane is a small local road through a wooded setting. When the segment turns north, it parallels the approved double-circuit 345/161 kV CapX route for approximately 0.5 mile. The centerline of the new Badger-Coulee 345 kV transmission line would be located approximately 200 feet west of the CapX structures. This subsegment crosses blocks of woodland and agricultural fields, as well as several residential properties.

6.1.1.4. Segment N – town of Holland, La Crosse County to Blair, Trempealeau County

The total length of Subsegments N1, N2, and N3a, which extend from the town of Gale in Trempealeau County to the south edge of the city of Blair in Trempealeau County, is approximately 16 miles. It extends north over the Black River, around the northern edge of the village of Ettrick, to just south of the city of Blair, Trempealeau County.

Subsegments N1 and N2 would be double-circuited with the existing NSPW 161 kV transmission line (W3203) that is double-circuited with the CapX transmission line farther south in the town of Holland. The new double-circuit line would require expanding the existing transmission line ROW by approximately 20 feet on both side of the line. Due to the hilly terrain, two spans on Subsegment N2, require the existing ROW to be expanded to between 225 and 320 feet in width. These subsegments cross a number of local roads as well as several small tributaries of the Black River and Beaver Creek. The topography is very hilly and the landscape here supports irregularly-shaped agricultural fields interspersed with narrow wooded valleys.

Subsegment N3a is 11 miles in length and begins southwest of the village of Ettrick. The transmission line would continue as a double-circuit with the existing NSPW 161 kV line (W3203), briefly jogging east twice and continuing north, before ending near the NSPW Tremval Substation. The expansion of the existing 100-foot wide transmission ROW would be primarily 20 feet (10 feet on both side of the centerline) but in some locations, hilly terrain would require the existing ROW to be expanded as much as 150 additional feet for a total width of 250 feet. Originally a cross-country alignment, the route crosses USH 53, briefly paralleling West Road, then CTH D, Amoth Lane, Mitchell Road, Hagestad Lane, Kittelson Road, Larson

Coulee Road, and Skorstad Road. In the town of Preston, Segment N3a crosses CTH I, and Chenoweth Lane. A number of tributaries to Beaver Creek are also crossed by this segment. The landscape is similar to Subsegments N1 and N2, hilly terrain with wooded hillsides, rivers, and creeks in the sometimes broad valleys, and irregularly-shaped agricultural fields on the hilltops.

As the north end of Segment N3a approaches the Tremval Substation, it departs from the 161 kV line, crosses USH 53 and wraps around the east side of the substation. It crosses through neighboring farm fields before rejoining another 161 kV line heading northeast out of the Tremval Substation and merging into Subsegment N3b.

6.1.1.5. Segment N – town of Preston, Trempealeau County to Black River Falls, Jackson County

Altogether, Subsegments N3b, N4, and N5 total approximately 20.4 miles in length. It is the second portion of Segment N and begins near the city of Blair, Trempealeau County and continues east until intersecting with I-94, just north of the city of Black River Falls in Jackson County. For nearly all of this distance, these subsegments follow an existing NSPW161 kV transmission line ROW (W3204) and the new 345 kV line would be double-circuited with this transmission line.

Subsegment N3b starts by crossing the Trempealeau River and Schansberg Road before turning east and continuing along the north side of the city of Blair. As it proceeds eastward for approximately 1.6 miles, Subsegment N3b crosses Larken Valley Road and Skunk Hollow Road. For the next 2.1 miles, it briefly jogs south, crossing STH 95 and the meandering wooded banks of the Trempealeau River several times. Using the existing cross-country transmission line route, Subsegment N3b jogs southward and proceeds into Jackson County. For the remaining 13.6 miles of Subsegment N3b, the route stays within the existing transmission ROW and crosses the towns of Springfield and Albion, ending in the town of Adams. It crosses Hamilton Road, CTH N, Skutley Road, Wilson Road, French Creek Road, CTH X, CTH P, and a number of other local roads.

In some locations along this subsegment, in particular at the corner where it turns east (Subsegment N3b), the existing lower-voltage transmission line is poorly sited. At these locations, the applicants propose to move the existing 161 kV line to a new ROW that would likely have fewer impacts on private properties and/or a more reasonable alignment. Thus for most of its length, the new double-circuit line would be constructed within the existing 120-foot wide transmission line ROW, requiring no new ROW, except for five spans near Pine Creek Road, where the ROW would be widened between 15 and 55 additional feet.

Also, in some areas, the full width of the existing ROW may not been kept clear of trees and therefore some tree clearing could be necessary. The landscape along this subsegment is similar to the earlier sections to the west with few local roads and hilly terrain with woodlands and interspersed agricultural fields. However as the route moves east, the land becomes more rolling to level and agricultural fields begin to dominate the landscape.

Subsegment N4 is about 0.7 miles long and continues east crossing Shankey Road and Kenyon Road. It partially overlaps the existing ROW of a natural gas pipeline.

Subsegment N5 is approximately 1.7 miles long. It continues east along the edge of the city of Black River Falls, turns north and crosses CTH A and I-94, in the town of Adams. The outskirts of the city of Black River Falls are more suburban and some new roads have been built for new homes on larger lots surrounded by woodlands and the Skyline Golf Course. At the corner where the route turns northward, it departs from the existing transmission ROW to avoid major impact on the Skyline Golf Course. The existing 161 kV line would be relocated to the new ROW with the new 345 kV transmission line. On most of Subsegment N5, the new double-circuit line would be constructed within the existing 120-foot wide transmission ROW, with the likelihood that there would be some additional tree clearing within the full width of the ROW.

6.1.1.6. Segment N – Black River Falls, Jackson County to Lyndon Station, Juneau County

Subsegments N6 through N23 are approximately 67 miles long. They are sited along the interstate (I-94 and I90/94) from the city of Black River Falls in Jackson County to just north of the village of Lyndon Station in Juneau County. This portion of the Badger-Coulee transmission line would be constructed as a new single-circuit 345 kV line in either a vertical or delta configuration. It starts by traveling across the north and east side of Black River Falls, crossing the Black River, then continuing southeast along I-94 toward the village of Warrens in Monroe County.

In Monroe County, the transmission line would travel through the village of Warrens, the city of Tomah and the village of Oakdale. Continuing southeast along the interstate, it would enter Juneau County and divert to the south and east around the village of Camp Douglas to avoid Volk Field. Segment N crosses the Lemonweir River, the city of New Lisbon, the city of Mauston, and then crosses the Lemonweir River a second time before terminating north of Lyndon Station in the town of Kildare, Juneau County.

Subsegment N6 is 21.3 miles long and overlaps the WisDOT ROW on the north/east side of I-94. It starts approximately 1,300 feet north of the McNulty Road underpass and spans the Black River, passing very near some residential and commercial properties that abut the interstate. It crosses through the USH 12, STH 54, and CTH O interchanges and ends in the village of Warrens. On average, an additional 20 feet of new ROW width would be required from private landowners; however, private property easement widths could range from zero to 100 feet.

Within Jackson County, the towns of Brockway, Manchester, and Millston are dominated by both upland and wetland forests owned by the county and the state of Wisconsin. Though Subsegment N6 would be partially if not mostly within WisDOT ROW, significant natural resources would be crossed by the route, including the Jackson County Forest, the Black River State Forest, other state managed lands, and a number of creeks and tributaries of the Black River.

Segment N7 is 7.4 miles long and continues along the east side of I-94 in Monroe County. It begins in the village of Warrens and ends in the town of La Grange, just north of the city of Tomah. Similar to Subsegment N6, the proposed ROW overlap the WisDOT ROW along I-94. The proposed line would require, on average, an additional 91 feet of new ROW width from private landowners. The landscape is dominated by agricultural fields with some woodlands abutting the interstate. This subsegment crosses through the interchange on/off ramps of CTH EW, across the overpass of CTH OO, past the Lincoln Town Cemetery, and over USH 12.

Subsegments N8 and N9 total approximately 10 miles in length and continues to parallel I-94 south to a location approximately 1.8 miles south of the village of Oakdale. In Tomah, Subsegment N8 has a narrower ROW of 100 feet. It continues to overlap the I-94 ROW and requires, on average, 19 feet of new ROW width from private property owners. This subsegment passes near commercial and residential buildings. ROW requirements for Subsegment N9 are similar to most of Segment N, requiring a ROW width of 120 feet. Partially overlapping the WisDOT ROW, an average of 41 feet of new ROW would be required from private property owners, though in some places private property easements could be as wide as 120 feet. This subsegment starts within the interchange of STH 21 and continues south crossing a railroad, the CTH ET overpass, the on/off ramps of Industrial Avenue/Forbes Road, the overpass of CTH N, and then around the outside of the CTH PP on-ramps ending just outside of Oakdale. The land use/cover along Subsegment N9 is dominated by farmland, cranberry bogs, frac sand mines, wetlands and creeks, and some forested land.

Subsegments N10 through N14 start in the town of Oakdale, Monroe County and end in the town of Orange, Juneau County. These subsegments depart from the I-90/94 ROW near the intersection of Grover Road, cross to the south side of the interstate, and then travel south and east and northeast, reconnecting with the west side of the interstate, after a 7.8 mile loop. This loop would be new cross-country ROW which the applicants determined is necessary to avoid airspace restrictions associated with Volk Field Air National Guard Base and natural resource impacts to Mill Bluff State Park and the Mill Bluff State Natural Area.

Subsegment N10 turns sharply south, crossing the I-90/94 and travels along the western boundary of Mill Bluff State Park for 1.1 miles before turning east (Subsegment N11). Here, the route follows the narrow, winding Horizon Avenue, first on the north side, then crossing to the west side, before leaving the local road entirely. The route skirts around the western side of Sorenson Cemetery, then briefly parallels the west side of CTH W. Subsegment N12 is a straight cross-country, 2.0-mile segment that travels southeast, crossing farm fields and forested hillsides. Subsegments N13 and N14 head east back towards the interstate corridor over a distance of 3.2 miles, with a slight deviation at CTH H to avoid a farmstead. For a portion of this diversion off of the interstate corridor, the subsegments avoid the hilly terrain and wooded landscapes; however, much of Subsegment P12 and all of Subsegment P13 are on a straight line irrespective of the topography, crossing steep hillsides and small irregular hilltop farm fields.

The remainder of Segment N (Subsegments N15-N23), continues along I-90/94 over a distance of approximately 20.5 miles, until reaching a point just north of Lyndon Station. The new transmission line would require a ROW width of either 100, 120, or 150 feet. This easement would partially overlap the WisDOT ROW and the remaining ROW width would come from private properties that abut the interstate. In most cases the additional private property ROW easement would, on average, range from a few feet to 62 feet; however, in some cases substantially more private property easement would be required. These subsegments are all within Juneau County, starting in town of Orange, and crossing through towns of Clearfield and Lisbon, the cities of New Lisbon and Mauston, and the town of Lemonweir, before finally ending in the town of Kildare.

Subsegment N15 begins approximately 0.2 miles east of Belchure Road, paralleling the west side of the interstate. At Subsegment N16, the route crosses the CTH M overpass and a floodplain forest of the Lemonweir River. While monopole transmission structures have been proposed for much of Segment N, H-frames are proposed for the 1.2 miles of Subsegment N16 that cross the Lemonweir River. The use of H-frames would require a wider ROW of 150 feet. For Subsegment N17, the transmission structures would return to the standard delta configuration, proceeding approximately 1.2 miles through the STH 80 interchange and then crossing back to the east side of I-90/94. From there, the line would continue on the west side of the interstate to Subsegment N20 in the city of Mauston where it again returns to the east side. Subsegments N17, N18, and N20 cross large areas of forested wetland interspersed with agricultural fields. In the city of Mauston, the final structure for Subsegment N20 would have an existing ATC 69 kV transmission line (Y-74) underbuilt on the new structures.

Subsegments N21, N22, and N23 continue on the west side of the I-90/94 corridor. Subsegment N21 would consist of a new 345 kV single-circuit delta configuration. However, on Subsegment N22, an existing ATC 69 kV transmission line (Y-101) angles south and east around the perimeter of a WisDOT wayside; the new 345 kV line is proposed to cross directly in front of the wayside adjacent to the interstate. The applicants propose to underbuild the lower-voltage line on the new transmission structures on the new ROW.

Subsegment N23 continues, similar to Subsegment N22, with the 69 kV line underbuild on the new structures. The line would be routed on the existing 69kV ROW. The double-circuited structures would require the existing ROW to be expanded from 60 to 120 feet wide. Because the original alignment of the lower-voltage line does not overlap the WisDOT ROW, the expanded new ROW would all come from private property owners. Subsegments N21 through N23 cross STH 82, the meandering floodplain forest of the Lemonweir River, and CTH N twice. The landscape is primarily agricultural, except in areas too wet to farm. These are the floodplains and wooded wetlands, mostly associated with the Lemonweir River and its tributaries.

6.1.2. Detailed route description of Segment O

Segment O is 85.4 miles long. It originates at the Briggs Road Substation in the town of Onalaska and extends south through portions of the village of Holmen, before crossing into the city of Onalaska. Continuing east, the segment follows I-90 east through the villages of West Salem, Bangor, and Rockland, before leaving the interstate and crossing into Monroe County. Segment O turns south towards the village of Cashton, crossing through the towns of Sparta, Leon, and Portland. Skirting the western and southern edge of Cashton, this segment turns east and heads cross-country through the towns of Jefferson, Sheldon, Wellington, and Glendale. Continuing into Juneau County, it passes through the southern edge of the city of Elroy, the towns of Lindina and Lemonweir and ends in the town of Kildare where Segment O intersects I-90/94 and common Segment M.

6.1.2.1. La Crosse County

Subsegments O0a and O0 leave the southwest corner of the Briggs Road Substation and continue along the southern property boundary, across Briggs Road and past a DPC substation before ending on the west side of USH 53. These subsegments would be a 345 kV single-circuited line requiring a new 120-foot wide ROW.

Subsegments O1 through O5 constitute the portion of Segment O (5.8 miles) that is located along the USH 53 corridor. They begin in the town of Onalaska and end in the city of Onalaska. Subsegment O1 heads south as a single-circuit delta configuration for approximately 0.4 miles on the west side of USH 53. It would require no new ROW and be fully located within the WisDOT ROW. Subsegment O2 continues along the east side of USH 53, crossing through the STH 35 interchange. This subsegment begins as a single-circuit configuration, paralleling a DPC 161 kV line (Q-1D) for a distance of several hundred feet, before changing to a double-circuit configuration with an existing NSPW 161 kV (W3203) transmission line. This double-circuit configuration would continue for approximately 0.75 mile. South of the USH 53/STH 35 interchange, the proposed line would revert back to a single-circuit configuration. The proposed ROW required for Subsegment O2 is 120 feet wide and straddles the WisDOT ROW and private properties, partially sharing the existing transmission line ROW. The private properties affected are primarily agricultural fields.

Subsegment O3 is 1.2 miles long and would, similarly to the previous subsegments, require a 120-foot wide ROW. As a single-circuit transmission line, its ROW would partially overlap WisDOT's ROW and require, on average, 18 feet of additional ROW width from private properties. After crossing approximately 1,800 feet of agricultural land, this subsegment enters the village of Holmen where the landscape becomes urban with numerous small residential lots abutting the highway.

Subsegments O4 and O5 total 3.2 miles in length and cross through the CTH OT overpass, shift to the east side of USH 53, then cross CTH S, and end north of STH 157. The required ROW width is 120 feet and it overlaps WisDOT's ROW, with some additional ROW width required from private properties. Even though multiple transmission corridors would be located adjacent to the proposed line, the new line would not be double-circuited with any of the existing transmission lines but remain single-circuited in a vertical or delta configuration. For approximately 0.8 mile, between East Avenue North and Riders Club Road, and for all of Subsegment O5, the proposed line would parallel one or two existing transmission lines currently located mostly on private properties. In Subsegment O4, the paralleling existing transmission lines are two DPC lines, an H-frame 161 kV (Q-1D) and a vertical 69 kV line (N222). On Subsegment O5, the paralleling existing transmission lines are DPC's 161 kV (Q-1D) and an NSPW 161 kV (W3203) line. The portion of Subsegment O4 located on the west side of the USH 53 passes close to a number of small residential properties. After crossing to the east side of the highway, the adjacent properties are largely commercial or undeveloped.

Subsegment O6 begins on the east side of USH 53 in the city of Onalaska and turns east following the north side of I-90. Subsegment O6 is 17.6 miles long. It crosses through the villages West Salem and Bangor, and terminates approximately 1.0 mile east of the village of Rockland. The proposed line would be single-circuited in a delta configuration and require a 120-foot wide ROW mostly overlapping the WisDOT ROW. The remainder of the ROW width, averaging 28 feet, would be on private properties. This subsegment crosses STH 16, the La Crosse River, the La Crosse River State Trail, and CTH M. At this location, it crosses to the south side of I-90 and continues across CTH C, STH 162, CTH B, and CTH J into Monroe County for a short distance before turning south and leaving the interstate near Iceman Road.

Within the city of Onalaska, the route passes through areas of dense residential development, city parks, and larger commercial properties. As the segment continues east along the I-90, the surrounding area is dominated by agricultural fields and natural areas, within and near the broad and level La Crosse River floodplain. Where the route passes near the state trail, the subsegment briefly parallels an NSPW existing 69 kV transmission line (W3411) that is routed along the trail.

6.1.2.2. Monroe County

Subsegments O7a through O7d total 5.1 miles in length and start in the town of Sparta, Monroe County, approximately 1.0 mile east of the village of Rockland. These subsegments repeatedly jog south, east, and southeast, winding through primarily agricultural bottomlands with tree covered hilltops and the Little La Crosse River, ending at Kansas Avenue. These subsegments require primarily new 120-foot wide cross-country ROW, which at times parallels local roads. The new 345 kV line would be mostly single-circuited except for the short distance along Subsegment O7b that would be double-circuited with an existing NSPW 69 kV transmission line (W3411) that is currently located on the north side of Jackpot Avenue. The new double-circuit line would be located on the south side of the road. For Subsegment O7b, approximately 86 feet of new ROW width would be on private properties on the south side of the road.

Subsegments O8 through O10b run due south and cross-country, through the towns of Leon and Portland, towards the village of Cashton. These subsegments total 8.2 miles in length and the new line would be double-circuited in a vertical configuration with an existing NSPW 69 kV transmission line (W3414). The existing transmission ROW would be expanded, on average, between 20 and 70 feet. The ROW expansion would be divided evenly and required from both sides of the existing ROW. In two locations, the subsegments are routed adjacent to local roads. Subsegment O9 is routed for approximately

1.0 mile along the east side of CTH X and Subsegment O10b parallels the east side of STH 33 for about 0.4 mile.

At the southern end of Subsegment O10a, the new double-circuited line would bend westward slightly to avoid directly impacting a farmstead. Although these subsegments follow an existing transmission corridor, once leaving Cannon Valley (an unnamed tributary of the Little La Crosse River), the route follows a relatively straight line over hilly terrain with narrow valleys and bottomland creeks. The subsegments cross agricultural fields irrespective of field boundaries or natural habitat areas. The hillsides are forested and the level land in this region is restricted to the broad floodplains of larger rivers and some hill tops. Construction access may be difficult.

Subsegments O11a through O16 total 19.3 miles in length and run primarily east on a cross-country path around the southern edge of the village of Cashton and through the towns of Portland, Jefferson, Sheldon, and Wellington. Subsegment 11a require 0.6 miles of new ROW that crosses the southern edge of the city of Cashton and loops around the Organic Valley wind turbines. New 120-foot wide ROW would be required here. Subsegments O11b and O12 total 1.6 miles in length and pass through the towns of Portland and Jefferson along field boundaries. The new 345 kV line would be double-circuited with an existing DPC 69 kV (N-93) transmission line. On Subsegment O11b, the proposed centerline does not coincide with the centerline of the existing transmission line but instead is 60 feet to the north. The proposed ROW would overlap 40 feet of the existing transmission ROW and require an additional 80 feet of new ROW in farm fields. At the intersection of Oklahoma and Oclinton Roads, Subsegment O12 turns north briefly and then east again. It is on the same alignment as the lower-voltage line but requires additional ROW width of 40 feet from farm fields. Subsegment O13 runs mostly east for 2.8 miles in the town of Jefferson on new 120-foot ROW. It crosses primarily crop land with some upland woodlands and pasture and also CTH D, STH 33 and several creeks bordered by woodlands.

At the eastern end of Subsegment O13, the landscape becomes hilly with many ravines cut by small creeks. The steep hill sides are wooded with small agricultural fields located on hilltops. Subsegments O14 and O15 begin near Olympic Avenue and run mostly east for approximately 13 miles on all new ROW through the towns of Jefferson, Sheldon, and Wellington. These subsegments cross STH 131, CTH P, and CTH Z. Due to the hilly terrain, the new ROW width would average about 200 feet for Subsegment O14 and 150 feet for Subsegment O15. However, in some locations, construction issues may require the ROW width to be over 300 feet. H-frame construction is proposed for this portion of the project. Construction access may be difficult due to the topography and the limited number of roads that cross the proposed route. Subsegment O16 is a short segment of 1.3 miles that continues east and ends at the township border of Wellington and Glendale. It briefly crosses to the south side of CTH V and parallels the road east. This subsegment would, otherwise, be similar to Subsegments O13 to O15, constructed on H-frames and requiring a ROW width of 150 feet.

6.1.2.3. Juneau County

Subsegments O17 through O27 total 27.3 miles and run primarily east. This portion of Segment O is almost entirely cross-country and requires new ROW. These subsegments start in the town of Glendale, Monroe County, cross into Juneau County and continue east on the township borders of Plymouth/Wonewoc and Lindina/Summit. They jog north and cross the town of Lemonweir, jog south and continues along the borders of the towns of Lemonweir and Seven Mile Creek before ending in the town of Kildare.

The landscape on this portion of Segment O is similar to the subsegments to the east, hilly terrain with narrow wooded valleys and small creeks in the lowlands. Agricultural land, while a significant portion of the land cover, is limited to areas where the land is level enough to farm, primarily along the hilltops. Construction access in this portion of the route may be very difficult due to the terrain and the lack of roads that cross these subsegments. From about Subsegment O23 to O27, the landscape becomes flatter and agriculture becomes the truly dominant land cover. Segment O ends at its intersection with I-90/94.

Subsegment O17 is 0.5 mile long and would be double-circuited with an existing DPC 69 kV transmission line (N-322) in a monopole configuration. The existing transmission ROW is 80 feet wide and the new line would require an average ROW expansion of 49 feet. Subsegment O18 turns south for approximately 0.8 miles on new ROW; this portion of the new line would be constructed on H-frames and require a new ROW width ranging from 340 to 305 feet.

Subsegment O19 cuts diagonally southeast for approximately 0.3 miles before turning east again for about 19 miles following the border of the towns of Glendale in Monroe County and Hillsboro in Vernon County. After approximately 5.0 miles, it crosses into Juneau County and continues along the border of the towns of Plymouth and Wonewoc before crossing the southern edge of the city of Elroy. This subsegment crosses CTH W, CTH WW, and STH 80. The line would be constructed on H-frames and require a new 120-foot wide ROW. Land cover present in the area includes primarily upland woods and crop land, with lesser quantities of prairie/grassland, non-forested wetlands, and pasture.

Subsegment O20 continues east for approximately 0.8 miles, single-circuited in a delta monopole configuration. This subsegment overlaps a natural gas corridor and requires a total ROW width of 158 feet. Subsegment O21 is 0.5 miles long and requires new 120-foot wide ROW. The line would be constructed on H-frames. Subsegments O22 through O24 total 7.3 miles in length and would be double-circuited with a DPC 69 kV transmission line (N-101). The existing 69 kV line ROW is 80 feet wide. The proposed double-circuit line requires 20 feet of additional ROW on both sides (40 feet total). These subsegments cross CTH G and STH 58. At the end of Subsegment 024, the route turns north for approximately 0.5 mile along Townline Road, the boundary between the towns of Lindina and Lemonweir.

On Subsegment O25 the route turns east again for 1.3 miles along the south side of CTH O. Similar to Subsegments O22-O24, it would be double-circuited with the existing DPC 69 kV transmission line (N-101); however, its alignment would be offset from the existing centerline by 60 feet to the south. The new line would require a ROW width of 120 feet and would share ROW with the highway and the existing transmission line. On average, approximately 69 feet of additional ROW would be required from private properties. Land cover present in the area is primarily crop land and non-forested wetlands. Just before ending, Subsegment O25 crosses to the north side of CTH O.

Subsegment O26 starts on the north side of CTH O and continues first east and then south paralleling USH 12. This subsegment is 1.3 miles long and requires a 120-foot wide ROW. The subsegment terminates at the border between the towns of Lemonweir and Seven Mile Creek. The proposed line would continue to be double-circuited with the existing DPC 69 kV line until the junction with Caring Road; it would then be single circuited in a delta configuration for the remainder of the subsegment. The proposed line would share ROW with the highways and the existing transmission line. The existing ROW would be expanded, on average, 83 feet. Land cover present in the area is primarily crop land.

Subsegment O27 starts near the intersection of Morrisey Road and USH 12. This last subsegment of Segment O extends straight east for 4.2 miles and ends at I-90/94. The proposed line would be constructed on single-circuit delta-configured structures. A new 120-foot wide ROW is required. Land cover present in the area includes primarily crop land and non-forested wetland. The initial 2.4 miles of this subsegment is in the town of Lemonweir, with the remainder in the town of Kildare. It crosses CTH N and a railroad corridor.

6.1.3. Comparison of Segments P-N and O

Table 6.1-2 Comparison of ROW characteristics for the routes from Briggs Road Substation to Lyndon Station

Segment Combination	Length (miles)	Total ROW Required (acres)	Existing ROW Shared (acres)	New ROW (acres)	Percentage of Shared ROW
P-west, P, and N	112.7	1,601.5	1,139.8	461.7	71.2
P-east, P, and N	112.0	1,587.2	1,142.4	444.8	71.9
O	85.4	1,354.1	474.9	879.3	35.1

6.1.4. CapX-related issues

6.1.4.1. Badger-Coulee impacts contrasted with CapX route adjustments

In determining the route for the CapX 345 kV transmission line, the Commission found that some route segments through the village of Holmen would unreasonably interfere with local land use and development plans and would have unreasonable impacts on the village, as described in the project EIS and testimony provided by citizens and municipal officials at the project hearing.[139,140] The Commission determined that the CapX 345 kV transmission line would run along the west side of USH 53 from the Briggs Road Substation northward to the interchange of USH 53 and STH 35 and then run east to the existing ROW of the NSPW Tremval-Mayfair 161 kV line along the bluffs east of the village. Moving the CapX project to the west side of USH 53 enabled the project to avoid impacts on the existing western campus of the village high school, some residential neighborhoods, the proposed middle school, and the Gundersen medical clinic, all south of the interchange. At one point, the transmission line crossed to the east side of USH 53 to avoid a housing development west of the highway. There, the transmission line was routed along the west side of the Waldenberger farm.

The Badger-Coulee 345 kV transmission line on Segment P-east would run along the east side of USH 53, opposite the CapX line on the west side, which would place it along the edge of a multi-family housing development just north of the Briggs Road Substation and the western edge of the Prairie View Elementary School campus (which is west of the proposed middle school site) and the Gundersen clinic. (See Figures 6.1-2 and 6.1-3). Also, as shown in Figure 6.1-4, where the CapX line crosses USH 53 to parallel the Waldenberger farm, Segment P-east is located about 200 feet into the Waldenberger farm fields to maintain an adequate distance from the CapX line.

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[139] Final Decision, PSC docket 5-CE-136, PSC REF#: 165332, p. 33.
[140] Final EIS, PSC docket 5-CE-136, PSC REF#: 158964, p. 187.

Figure 6.1-2 Impacts of the Badger-Coulee project on housing developments in the village of Holmen

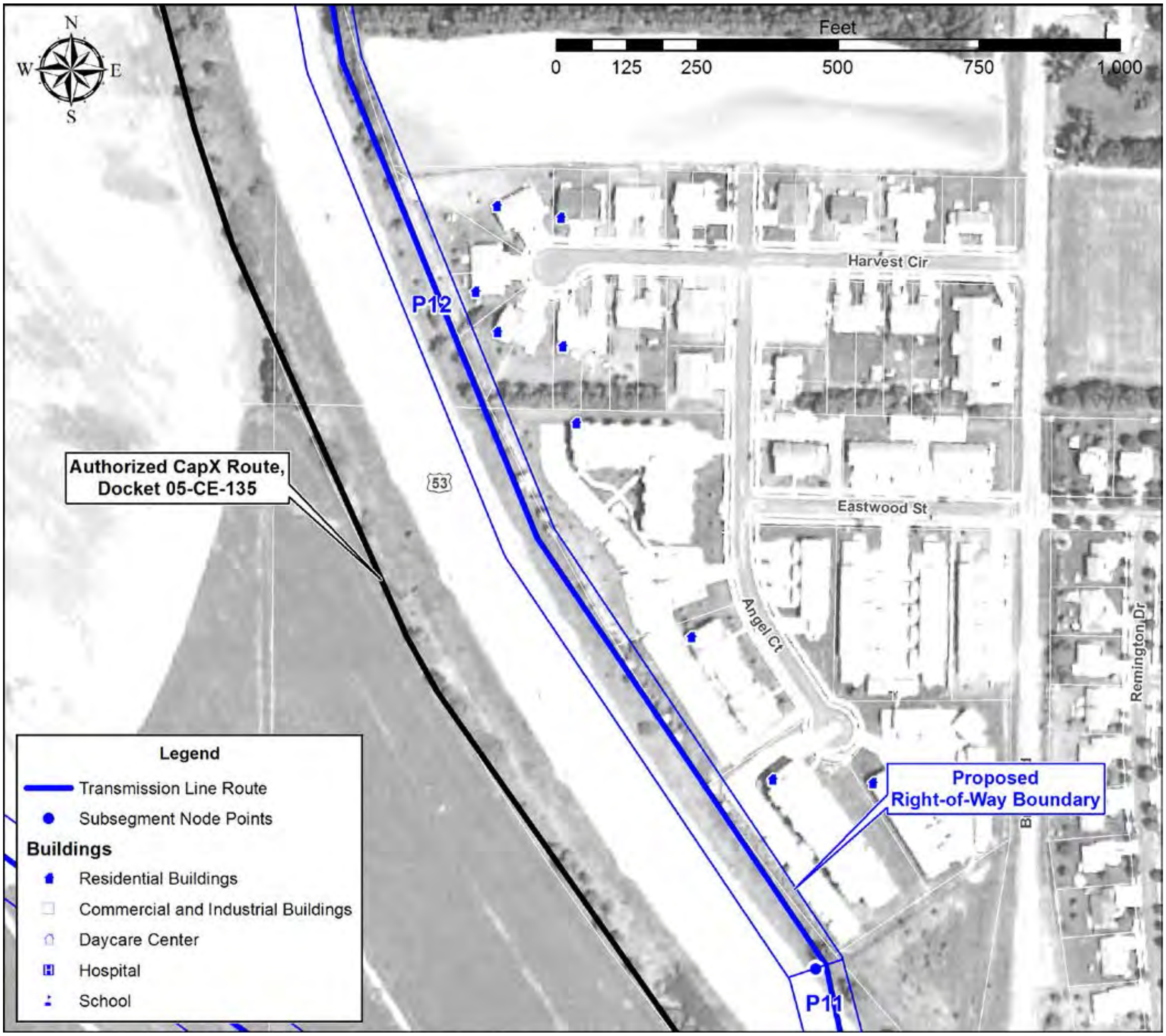


Figure 6.1-3 Impacts of the Badger-Coulee project on Prairie View Elementary School in the village of Holmen

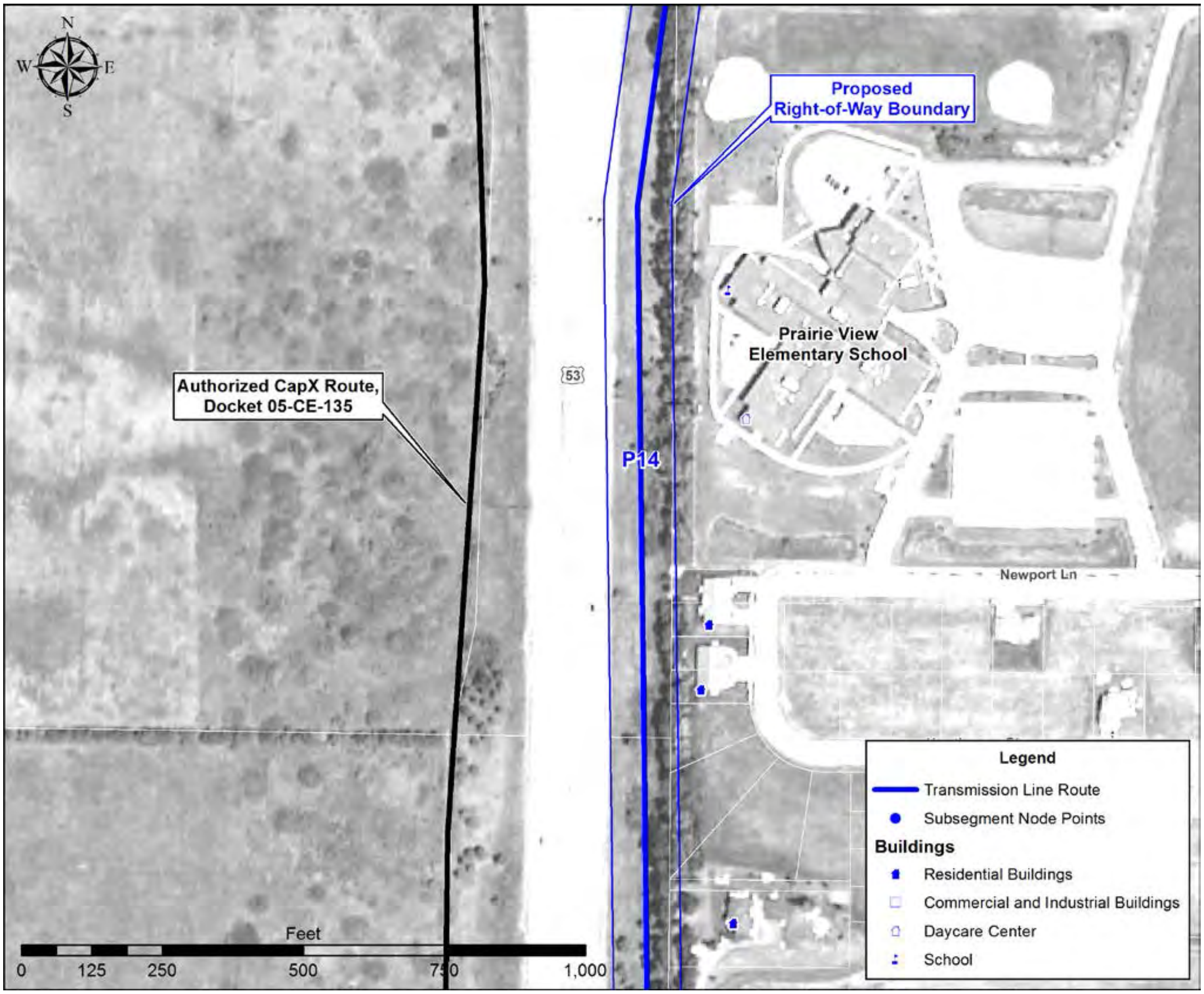
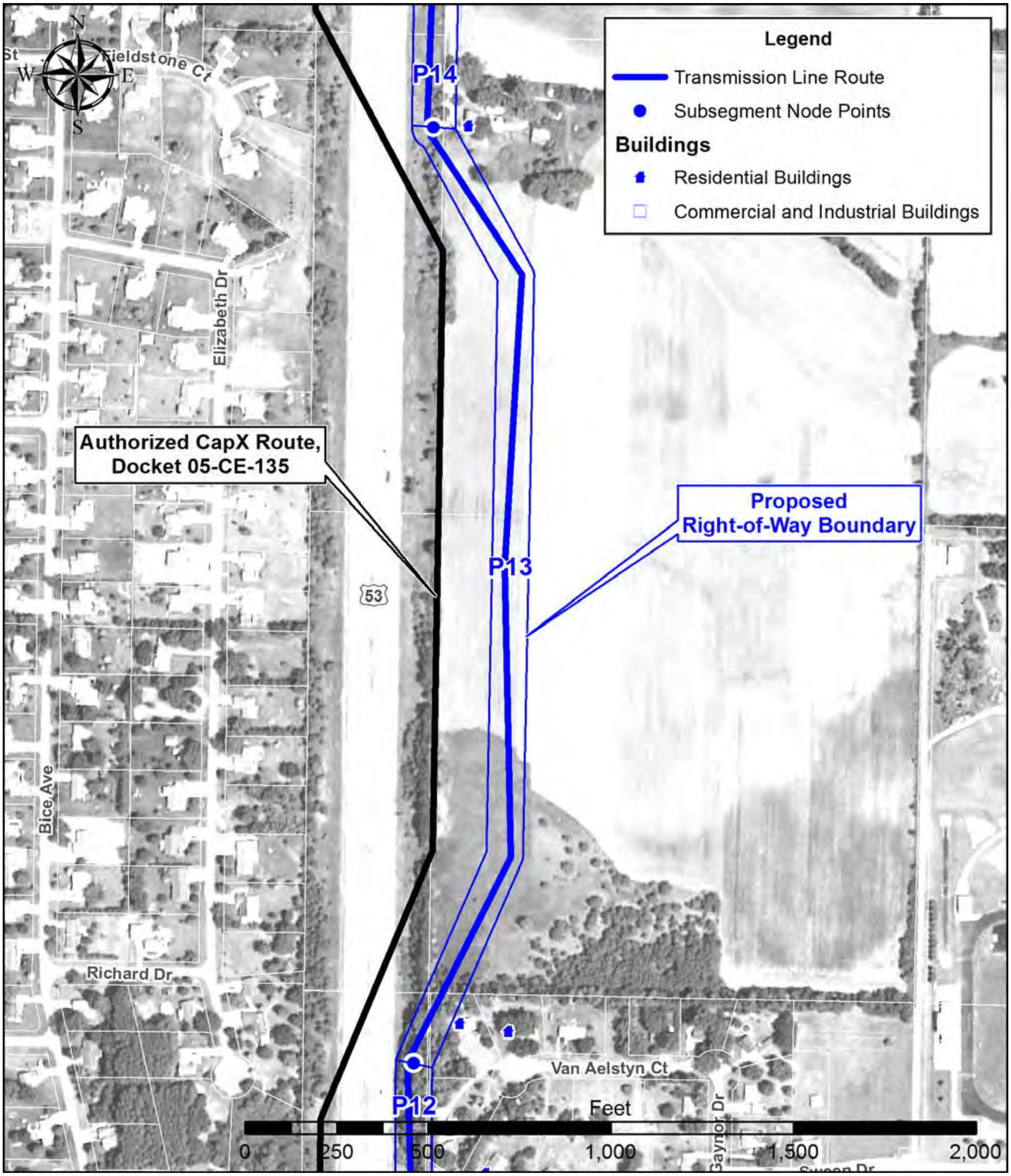


Figure 6.1-4 Impacts of the Badger-Coulee project on the Waldenberger farmland and adjacent residences in the town of Holland



6.1.4.2. Badger-Coulee and CapX potential exchange of conductors

If either Segment Option P-west or P-east are approved for construction, the approved CapX and the proposed Badger-Coulee lines would cross, once on P-west and twice on P-east. The applicants request the option of eliminating the crossings by swapping the circuits of the two approved transmission projects. The CapX line is scheduled to be in service in 2015, prior to final design of the Badger-Coulee project. To accommodate this swap, the two transmission projects would be constructed with the same type of structures and conductors. The applicants state that by eliminating the crossings of the lines, it would eliminate reliability risks and avoid atypically tall tower structures and their associated wider ROW. Additionally, the applicants' state that the cost implications associated with eliminating the crossings would be negligible.

Segment Option P-west modification

If the Badger-Coulee 345 kV transmission line project was approved using Segments P-west, P, and N, the proposed line would cross the approved CapX 345 kV transmission line in one location. The lines would cross at Subsegment P10, in the town of Gale.

As currently proposed, P-west terminates in the Briggs Road Substation, west of the approved CapX line. The requested modification would swap the circuits of the two approved transmission projects from Subsegment P0 at the substation terminus to Subsegment P10, where they cross. Some additional work would be required in the Briggs Road Substation to move the termination for the CapX circuit to a more westerly bus position. The Badger-Coulee line would then, instead travel north along USH 53 on the alignment approved for Cap X, and north of STH 35, it would turn east to be double-circuited with the existing NSPW 161 kV transmission line (W3203). At the point where the lines would have crossed, the Badger-Coulee line would continue north on Segment N, already double-circuited. Additionally, CapX would travel north on the approved P-west Badger-Coulee alignment as a single-circuit 345 kV line. At the point of intersection, the CapX line would turn and continue west on its originally approved CapX alignment. In essence, the Badger-Coulee conductors would be placed on the CapX structures and visa-versa.

Segment Option P-east modification

If the Badger-Coulee 345 kV transmission line project was approved using Segments P-east, P, and N, the proposed line would cross the approved CapX 345 kV transmission line in two locations. First, the lines would cross on Subsegment P14, north of the intersection of USH 53 and STH 35 and then again on Subsegment P10, north of the Black River.

As currently proposed, Subsegment P-east leaves the Briggs Road Substation parallel to and east of the approved CapX transmission line, sometimes separated by USH 53. For much of Subsegments P11 through P14 (Option P-east), the Badger-Coulee line would be located on the east side of USH 53 and the approved CapX on the west side of the highway. Shortly after crossing STH 35, the CapX line turns east, crossing USH 53 and the proposed Badger-Coulee route. It continues east until reaching the existing NSPW 161 kV transmission line (W3203). At that point, the CapX line will be double-circuited with the lower-voltage transmission line and continue north until crossing the Black River into Trempealeau County. Near the northern end of Subsegment P10, the CapX centerline is located approximately 200 feet east of the proposed Badger-Coulee centerline. At this location, the CapX line turns west and crosses the Badger-Coulee line for the second time. The Badger-Coulee line would continue north (Subsegment N1) double-circuited with the NSPW 161 kV line that was formerly double-circuited with the CapX line.

The requested modification would swap the circuits of the two approved transmission projects between the areas where they cross. At the first point of intersection (Subsegment P14), the Badger-Coulee line would leave its proposed alignment and turn east until intersecting with the existing NSPW 161kV line. From there it would turn north to be double-circuited with the lower-voltage transmission line. The CapX line would be single-circuited and travel north along Badger-Coulee Subsegments P8, P9, and P10, on the west side of USH 53. At the second crossing, the CapX line would turn west to continue on its approved alignment and Badger-Coulee would continue north along Subsegment N1, already proposed as double-circuited with the existing lower-voltage NSPW line. The swapping of these circuits would make it unnecessary to adjust the CapX terminal position at the Briggs Road Substation.

6.1.4.3. Multi-circuit options for CapX and Badger-Coulee 345 kV transmission lines

The applicants evaluated whether the proposed Badger-Coulee project could be co-located on the same structures as those authorized for the CapX 345 kV transmission line project in the Holmen area. This would require that the lines be constructed in a 345/345/161 kV triple-circuit configuration for approximately 8.0 miles in the area directly north of the Briggs Road Substation.

The CapX project is currently authorized to be constructed in a double-circuit configuration (345 and 161 kV) in this area. The primary purpose of the CapX project is to satisfy reliability needs of the La Crosse, Wisconsin and Winona, Minnesota area by providing a new 345 kV transmission source to support the existing 161 kV transmission network that serves the area

As discussed in Chapter 3, the applicants state that the proposed Badger-Coulee project is being proposed primarily for its economic benefits, but that it would also provide additional transfer capability and reliability benefits. Specifically, the project would serve the longer term reliability needs in the La Crosse/Winona area by providing a second 345 kV source into the Briggs Road Substation. The applicants state that this second 345 kV source would help ensure reliable service to load that will be served from the Briggs Road Substation.

Transmission owners are required to plan the transmission system in a manner that complies with mandatory NERC planning and operating standards.[141] These criteria require that the transmission system reliably meet customer demands under a variety of conditions, including contingency conditions. Contingency conditions are those where elements of the system, such as transmission lines, are out-of-service because of planned maintenance or catastrophic events, such as storm damage. NERC planning criteria requires that when two or more lines are co-located, all lines must be considered out-of-service when planning for certain categories of contingencies. To comply with NERC planning criteria if the line were co-located in a triple-circuit configuration, the applicants state that under such contingencies NSPW would be required to have a plan to interrupt service to customers in order to maintain acceptable operating voltages and system loads.

The applicants state that NSPW evaluated the La Crosse/Winona area system under applicable contingencies including loss of a 345/345/161 triple-circuit line north of the Briggs Road Substation and concluded that, given the existing and expected future load in the area, the risks associated with loss of the triple-circuit line are unacceptable. NSPW concluded that constructing the proposed project on separate rights-of-way results in a significantly more robust transmission system serving the area, and eliminates any NERC requirement to have a plan to interrupt service to customers.[142]

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141 http://www.nerc.com/pa/Stand/Reliability%20Standards%20Complete%20Set/RSCompleteSet.pdf
142 See applicants' response to Data Request Item 04.04, PSC REF#: 213034, pp. 5-6 of 8.

6.1.5. WisDOT issues

6.1.5.1. WisDOT rest areas

On Segment N, Subsegment N6 crosses WisDOT Rest Area #54 on the northeast side of I-94 between Millston and Black River Falls and farther south Subsegment N22 crosses WisDOT Rest Area #9 on the southwest side of I-90/94 north of Lyndon Station. The proposed transmission line would be adjacent to the freeway and span both the entry and exit ramps at these rest areas. If Segment N is approved, there likely would be some impact on the use of these rest areas during the construction phase of this project. Construction activities at this location would need to be carefully planned and managed to avoid disruption and maintain safe entry and exit ramps.

Similarly, Subsegment O6 crosses WisDOT Rest Area #15 adjacent to the south side of I-90 in the town of Burns. Again, the proposed transmission line would be adjacent to the freeway and span both the entry and exit ramps at the rest area. In order to minimize disruptions and maintain safe conditions for users of this facility, construction activities would need to be planned in consultation with WisDOT and carefully managed.

6.1.5.2. WisDOT scenic easements

WisDOT holds several scenic easements along I-94 in Jackson County. The proposed ROW along Subsegment N6 crosses WisDOT-owned scenic easements at the following locations and for the approximate distances provided below:

- North of Black River Falls in the town of Adams, for approximately 500 feet
- Town of Brockway, for approximately 1,360 feet
- Town of Brockway, for approximately two miles
- Town of Manchester, for approximately 1,360 feet
- Town of Millston, for approximately 730 feet
- Town of Millston, for approximately 1,510 feet

These scenic easements exist because WisDOT sold the adjoining remnant parcels but retained scenic easement rights to prevent the placement of structures, billboards, junkyards and other potentially unsightly facilities. Three of these easements restrict the applicants' ability to use the land for this project within specified distances from the highway corridor. The applicants have worked directly with WisDOT to determine how to route the transmission line through these areas.

To address the problem, the applicants provided WisDOT with information, maps, and construction data for three plausible alternative centerline approaches:

- Locate the project on WisDOT ROW and where necessary overlap the scenic areas.
- Locate the project entirely on WisDOT ROW to keep it out of the scenic easements.
- Locate the project entirely outside of WisDOT ROW and entirely outside the scenic easements.

The applicants and WisDOT agreed that, given the impacts of the second and third options on safety, trees and vistas, the first option would be preferable while recognizing that there would be a need for WisDOT to modify or release its rights in the scenic easements.[143] If Segment N is part of a route

[143] December 18, 2013, Letter from Robert Fasick of WisDOT to Pete Holtz of ATC

approved by the Commission, WisDOT and the applicants would work together to determine the appropriate process for modifying or releasing the scenic easements and identifying any compensation that may be due to WisDOT.

6.2. CONSTRUCTION SPECIFICS

6.2.1. Construction issues

Off-ROW access roads become necessary where there are natural constraints such as steep hills, large high-quality natural resources, or other limitations where direct access from public roads is not possible. A brief discussion of the role of off-ROW access roads for this project is included in Section 2.1.4. If the proposed transmission line is built, all necessary access roads will be 16 feet wide and constructed with the ability to support the movement of heavy construction equipment. If the project is approved, the applicants will re-evaluate the proposed access routes. After construction is completed, off-ROW access roads may be restored to pre-construction conditions or, depending on negotiations with the property owner, access roads constructed in upland areas may be left in place.

Additionally, there are locations where alternate foundations or construction techniques would be useful or necessary to avoid significant impacts on natural resources. More information about these construction techniques can be found in Chapter 2, Section 2.1.2. In addition, Chapter 4, Section 4.4 discusses the phases of construction in detail.

Table 6.2-1 Off-ROW access roads impacts by segment and segment combination*

Segment Combinations	Number of Roads	Length (miles)	Wetlands (acres)	Upland Forest (acres)
P-west, P, and N	53	13.4	3.6	8.2
P-east, P, and N	53	13.4	3.6	8.2
O	39	11.4	0.7	3.2

* Data compiled from Application, Appendix B, Table 10.

6.2.1.1. Segment P

No off-ROW access roads are proposed for Segment P.

6.2.1.2. Segment N

Much of Segment N traverses areas of the Western Coulees and Ridges Ecological Landscape (see Figure Vol. 2-3), an area characterized by unglaciated ridge and valley topography that can prove challenging to access along the entire length of the ROW. Many of the hillsides are heavily forested, and due to these landscape considerations, off-ROW access roads can reduce impacts on steeper slopes that would require massive grading to be useable for construction equipment. Throughout the western part of this segment, the applicants state that the use of alternative construction methods would be considered, particularly the use of micro-piles in remote and rocky locations. See Chapter 2, Section 2.1.2. for more detailed information on foundation construction, both conventional and alternate. Areas that would lend themselves to the use of heavy helicopters for transporting materials would also be a likely location for the installation of micro-piles. The shallow depth of top soil, rocky conditions, and remote locations of the transmission line route on the western part of Segment N make this a good candidate for considering these techniques. See Figures Vol. 2-5.01 and 2-5.02 for maps of the depth to bedrock in the project area.

The applicants have proposed seven off-ROW access roads along Subsegments N1 and N2, totaling 3.2 miles in length, and requiring the clearing of 2.1 acres of woodland. These subsegments are located in an area of shallow soils (70 percent of the area has bedrock within 5 feet of the ground surface) and erosion here could impact water quality in the streams that drain the area. Strict erosion control measures should be implemented, particularly when clearing forested land on slopes. The off-ROW access roads cross 3.8 acres of agricultural land, most appearing to follow informal farm lanes.

Subsegment N3a also passes through an area of very steep and narrow hills and valleys. Overall, eleven off-ROW access roads are proposed on Subsegment N3a, totaling 2.9 miles in length. A temporary construction bridge (TCSB) would be needed to cross a tributary to Beaver Creek. Towards the northern part of this subsegment, a tributary to Bear Creek is crossed by the transmission line route in a steep-sided valley. The off-ROW access in this area would impact less than 0.1 acres of wetland, but is primarily located on existing farm roads.

Subsegment N3b also has some areas where off-ROW access is necessary due to steep slopes. Additionally, the off-ROW access roads are used in the vicinity of the meandering the Trempealeau River, east of Blair, to reduce impacts to wetlands and floodplain forests. In one area on this subsegment, an in-stream support structure for a temporary bridge would be required in a Trempealeau River side channel crossing for off-ROW access. This support structure would be a reinforced culvert, cement block or similar material.

In total, Subsegment N3b requires 15 off-ROW access roads totaling 5.0 miles in length; five of these are in the Trempealeau River floodplain. No permanent wetland fill is proposed by the applicants. In areas where these roads cross agricultural land (2.4 acres on this subsegment), compression of soil should be expected. A total of 3.6 acres of upland forest would be cleared to construct all of the access routes as described.

Southeast of Black River Falls, Segment N moves into the Central Sand Plains Ecological Landscape (see Figure Vol. 2-3); the area becomes far less hilly and the number of wetlands increases. In this area the proposed transmission line also follows interstate ROW. For that reason, most of the off-ROW access roads proposed for Subsegments N6, N7, N9, N14, N15, N16, N18, and N21 are needed due to restrictions on equipment access, as well as steep embankments at ramps and overpasses along the interstate that restrict direct access to the ROW. Utilizing off-ROW access routes in these areas provides a safer means of accessing the areas for construction. In total, there are 17 off-ROW access roads proposed, totaling 1.7 miles in length.

A grouping of three off-ROW access roads are identified along Subsegment N13, totaling 0.6 miles in length in an area southwest of Camp Douglas. This area has some very steep forested slopes with shallow soils, and the risk of erosion would be extremely high if vehicles traveled along the proposed transmission ROW. The proposed off-ROW access roads approach the transmission line ROW from valleys that are currently used for agriculture, as well as along existing forest roads that follow the ridges of these landforms. Upland forest totaling 0.5 acre would be cleared for access and compaction of soil in the agricultural areas should be expected.

For large sections of Segment N, the transmission line is proposed to be installed in areas of wetlands, floodplain forests, and lands adjacent to waterways, including the Lemonweir River. To reduce impacts on these waterways and associated habitats, alternative construction methods such as the use of helicopters or marsh buggies and helical pier foundations (See Section 2.1.2) should be considered. Where use of mats or platforms may be necessary to access these wetland areas, the appropriate permits would be required from DNR.

6.2.1.3. Segment O

Segment O travels through the Western Coulee and Ridges Ecological Landscape (see Figure Vol. 2-3) and has a number of subsegments that traverse areas of wooded hills and bluffs, in addition to wetland and stream complexes in the associated valleys. Steep slopes can prevent direct access along the ROW path to pole locations. Off-ROW access routes can also help reduce wetland and stream crossings by construction and maintenance equipment. Due to the challenging topography and amounts of woodland cover, the use of Off ROW access in this segment and consideration of alternative construction techniques, such as the use of helicopters for transporting equipment or line stringing is warranted (see Chapter 2, Section 2.1.2 and Chapter 4, Section 4.4.5).

Subsegment O10a requires the construction of 13 off-ROW access roads, totaling 2.9 miles in length. These roads would allow access to the ROW by using existing farm access roads, field edges, and forest trails to avoid areas of wetlands, as well as avoid the steeper sections of woodland bluffs and hills. A temporary construction bridge would be needed to cross a stream located at the north end of Subsegment 010a. Five of the access roads (0.86 mile) cross agricultural land off of an existing access path. As such, the construction of these new access routes would result in deep compaction of soil that would have to be mitigated following construction. Decompaction could be completed to restore the soil structure and tilth or the landowner should be compensated to leave the access road in place.

The very eastern edge of Subsegment O13 contains the end of a proposed off- ROW access road that leads to Subsegment O14. Subsegment O14 require the construction of nine off- ROW access roads totaling 3.8 miles in length. In this location, the transmission line would traverse the tops of wooded hills that are north of STH 33. Access from the road and along the ROW would be difficult due to the very steep slopes and forested conditions. The off-ROW access roads are proposed to pass through and require the clearing of 1.6 acres of upland forest. In these areas, strict erosion control measures must be implemented to prevent runoff and erosion on the steep slopes that would enter small streams and waterways that lead into Brush Creek, south of STH 33.

Subsegment O15 passes along the tops of hills and ridges that are part of the drainage basin leading to the Kickapoo River and include Billings and Brey Valley Creeks. Due to these sensitive waterways and the extremely steep and wooded slopes that follow the length of the transmission route, the use of off-ROW access roads, particularly near CTH P, would be beneficial. Consideration of alternate construction methods such as helicopters may also be useful. In total, there are 10 off ROW access proposed for Subsegment O15, totaling 3.2 miles in length. Environmental impacts to agricultural soils and forests from the construction and use of the access roads is anticipated.

Subsegment O19 is similar to those mentioned above in that it crosses over very steep and wooded hills and valleys that drain into the Baraboo River, an important natural resource for the state. This subsegment passes to the south of the City of Elroy, and five of the eight off-ROW access roads needed for this subsegment would use relatively level routes across agricultural land along the hilltops. The access roads would be off of CTH O and connect to the proposed transmission line ROW to the south. In total, 1.8 miles of off-ROW access roads are proposed for Subsegment O19 with similar potential impacts occurring and mitigation required for traversing agricultural land.

Subsegment O22 is the easternmost subsegment that the applicants have determined may need off-ROW access roads for the purposes of constructing the transmission line. Three off-ROW access roads, totaling 0.8 mile in length would cross agricultural land to avoid several steep slopes.

Throughout Segment O, the applicants state that the use of alternative construction methods would be considered, particularly the use of micro-piles in remote and rocky locations. Areas that would lend themselves to the use of heavy helicopters would also be likely locations for the installation of micro-piles. The shallow depth of top soil, rocky conditions, and remote locations of the transmission line route on Segment O make it a good candidate for considering these techniques. The shallow depth of top soil, rocky conditions, and remote locations of the transmission line route in the western part of Segment N make this a good candidate for considering these techniques. See Figure Vol. 2-5.01 and 2-5.02 for maps of the depth to bedrock in the project area.

6.2.2. Electric distribution lines

Along Segments P, N, and O, there are distribution lines owned by multiple entities that would require relocation if the proposed project is approved along these potential segments. The existing distribution lines may be located in areas that pose physical conflicts with the proposed 345 kV line or their proximity to the transmission line might result in stray voltage concerns, also known as NEV. No distribution lines are proposed to be underbuilt on the new 345 kV structures.

There is a general consensus that distribution lines located less than 150 feet from and parallel to a transmission line for a continuous distance greater than 1,000 feet can cause impacts on farms with confined animals. In Chapter 4, Section 4.5.15, the cause, impact, and mitigation of NEV issues are discussed in detail. In addition, the Commission may require the applicant to conduct pre-construction and post-construction testing of potentially impacted farms and lines.

All distribution modifications required as a result of this project would be made by the distribution owners including distribution line design, relocation, and associated permitting. For cost estimation purposes (see Section 2.4), all modified distribution lines were assumed to be relocated underground and the related costs are factored into the total costs presented.

Table 6.2-2 Distribution lines that would be relocated

Segment Combinations	Number of Locations	Miles of Distribution Line
P-west, P, and N	12	3.1
P-east, P, and N	8	1.6
O	15	7.5

6.2.2.1. Segment P

P-east
No relocations of distribution lines are proposed for Segment P-east.

P-west
A total of approximately 1.5 miles of distribution lines have been identified by the applicants as potentially interfering with proposed Segment P-west. If the proposed 345 kV line would be constructed along P-west, the following Riverland Electric distribution lines would be relocated:

- On Subsegment P2 along the east side of CTH XX, 1,100 feet of the three-phase overhead primary distribution line would be relocated.
- On Subsegment P3 along the east side of Pedretti Street, 800 feet of the underground primary distribution line presents a physical conflict and would be relocated underground elsewhere.
- On Subsegment P5 between Old CTH NA and STH 35, a Riverland Electric distribution line is currently underbuilt on the DPC 69 kV transmission line (N-226) structures. If the project is

approved using P-west, the new 345 kV line would be double-circuited with the existing lower-voltage transmission line. Approximately 5,400 feet of the three-phase primary distribution line would be relocated.

- On Subsegment P6 along the north side of USH 35, 600 feet of the single-phase underground primary distribution line presents a physical conflict and would be relocated underground elsewhere.

Segment P

On Subsegment P9 along the west side of USH 53, the applicants indicate there are two locations totaling 2,500 feet where Riverland Electric distribution lines would be relocated. However, between Amsterdam Prairie Road and just north of CTH T where the segment crosses to the east side of the highway, there are 1.8 miles of three-phase underground distribution line that appear to be within the proposed ROW and may need to be relocated. At the printing of this draft EIS, it is unknown which portion or portions of the distribution line would require relocation along this subsegment.

6.2.2.2. Segment N

A total of approximately 1.1 miles of distribution lines would be relocated if the proposed line is constructed along Segment N. The applicants have listed distribution lines owned by Jackson Electric, Oakdale Electric, and Wisconsin Power and Light Company (WP&L) that would be relocated. Unfortunately, at the printing of this draft EIS, the applicants have supplied insufficient information to determine the exact locations of the distribution lines on Subsegments N6 and N9 that would be relocated. The information that is known or could be gleaned from maps is listed below:

- On Subsegment N6, in two locations (1,000 feet and 1,600 feet lengths) along the east side of I-94 present, Jackson Electric distribution lines would be relocated.
- On Subsegment N9 along the east side of 1-94, approximately 1,600 feet of Oakdale Electric distribution line would be relocated.
- On Subsegment N11, along the north side of Horizon Avenue, 200 feet of a single-phase underground distribution lines would be relocated.
- On Subsegment N11, along the west side of CTH W, 1,000 feet of Oakdale Electric single-phase overhead distribution line would be relocated.
- On Subsegment N17, along the east side of I-90/94 and the west side of Welch Prairie Road, approximately 300 feet of WP&L single-phase overhead distribution line would be relocated.

6.2.2.3. Segment O

A total of approximately 7.5 miles of distribution lines would be relocated if the proposed line is constructed along Segment O. The applicants have listed distribution lines owned by NSPW, Vernon Electric, and Oakdale Electric that would be relocated. Unfortunately, at the printing of this draft EIS, the applicants have supplied insufficient information to determine the exact location of distribution lines on Subsegments O5 and O6 that would be relocated. The information that is known or could be gleaned from maps is listed below:

- On Subsegment O5 along the east side of USH 53, 700 feet of NSPW distribution line would be relocated.
- On Subsegment O6, seven different locations of NSPW distribution lines would be relocated:
  - 1,900 feet along the east side of USH 53
  - 1,000 feet and 400 feet along the north side of I-90 and the south side of Kinney Coulee Road

  - 2,100 feet along the north side of I-90
  - Two locations, each requiring 200 feet of underground cable to be relocated away from the proposed route between the south side of I-90 and north side of Buol Road
  - 500 feet along the south side of I-90
- For the full length of Subsegment O7b (approximately 2,100 feet) adjacent to Jackpot Avenue, an NSPW distribution line is currently underbuilt on the NSPW 69kV transmission line (W3411) structures. If the project is approved using Segment O, the new 345 kV line would be double-circuited with the existing lower-voltage transmission line. Approximately 2,100 feet of the NSPW three-phase distribution line would be relocated elsewhere.
- On Subsegment O10a and O10b, from Nebraska Avenue to the Cashton Substation, these subsegments would be double-circuited with the existing NSPW 69 kV transmission line (W3414). Currently there is a distribution line underbuilt on the lower-voltage transmission line structures. If the project is approved using Segment O, approximately 13,800 feet of the distribution lines would be relocated.
- On Subsegment O12, a Vernon Electric distribution line is underbuilt on the DPC 69 kV transmission line (N-93). If the project is approved using Segment O, the new 345 kV line would be double-circuited with the existing lower-voltage transmission line. The approximately 1,300-foot Vernon Electric distribution line would be relocated.
- On Subsegment O13 along the north side of Olympic Avenue, approximately 500 feet of Vernon Electric overhead distribution line would be relocated.
- On Subsegment O19 along the south side of a private driveway east of Outboard Road, approximately 600 feet of Vernon Electric overhead distribution line would be relocated.
- The full length of Subsegment O23 (approximately 4,300 feet), the new 345 kV line would be double-circuited with an existing DPC 69 kV transmission line (N-101). Currently an Oakdale Electric distribution line is underbuilt on the lower-voltage transmission line structures. If the project is approved using Segment O, approximately 4,300 feet of the distribution line would be relocated.
- On Subsegment 26 where the segment is adjacent to the north side of CTH O, 1.86 miles of Oakdale Electric three-phase overhead distribution line would be relocated.

6.3. NATURAL RESOURCES

6.3.1. Agriculture

The continuing presence of a high-voltage transmission can adversely affect farm operations and field productivity. Refer to Chapter 4, Section 4.5.2, for a discussion of potential impacts associated with transmission line construction and operation in agricultural fields. DATCP will present its analyses of the potential impacts of the proposed project to farmed fields in the AIS it is preparing. See Chapter 1, Section 1.4.2 for a discussion of the role of DATCP in this project. The table of contents of the AIS is included in Appendix D. The acreage figures used below were obtained from DATCP, and may differ from those supplied by the applicants due to the possible exclusion in the application of cropped wetlands from the cropland totals.

Segments P, N, and O pass through a mix of forested and agricultural lands. Agricultural land is more prevalent on Segment O than Segment N, although it is not the predominant land cover in the ROW on either route. There are concentrations of prime farmland on Segment O near Cashton and on Segment N near Blair and north of the Black River in Trempealeau County. South of Mauston on Segment O is an extensive area of farmland that is designated as prime if drained or not frequently flooded during the growing season.

Most of the agricultural land is in active cropland. The majority of the crops are corn and soybeans; however, wheat and alfalfa/hay fields also occur. A relatively small area is devoted to pasture and the remainder is in old (fallow) fields and tree farms. No other specialty crops, such as ginseng, orchards, or cranberry bogs are grown within the proposed ROW along these segments.

According to the application, no clear evidence of drain tile lines along the segments was apparent from either aerial photography interpretation or field investigation. However, there are areas of farmland along each segment that contain hydric soils and are in close proximity to ditches, which suggests that drain tiles may exist in these locations. During the final design process, the applicants would work with landowners to place structures so that impacts to drain tiles are minimized, to the extent practicable.

Farms that practice organic farming would require specific protection measures during construction to avoid the spread of farm pests and diseases or to protect organic certifications. Additional issues for organic farms might be caused by the removal of tree buffers for new ROWs or the enlargement of existing ROWs. The removal of buffers might threaten a crop's organic status by increasing the potential for herbicide drift from adjacent fields. Biosecurity and organic farm impacts can be minimized by the applicants working with agricultural landowners well in advance of construction, giving advance notice of construction activities, and following through with agreed to protective measures. See Section 4.5.2 in Chapter 4 for discussions about potential impacts and mitigation.

The full width of the ROW would be cleared for construction of the proposed line, including properties currently planted with trees as part of plantations or tree farms. Under state statute (see Section 4.3), landowners must be compensated for any crop damage caused by construction or maintenance of a high voltage transmission line. The applicants should work with tree farm and plantation landowners to minimize construction impacts and determine allowable post-construction use of the land within the easement.

The part of Segment O east of Cashton, in southern Monroe County, passes through an area that has many Amish farmers. Their sensitivity to project impacts may be different than farmers using more conventional farming methods. See Section 6.4.2.3 for additional discussion regarding the Amish community.

6.3.1.1. Segment P

Segment Option P-west (Subsegments P0-P10)

Along this segment a total of 49.3 acres of agricultural land lie within the proposed ROW, about 99.5 percent of which is active cropland; the remainder is pasture. Agricultural land represents 35.4 percent of the total required ROW, with new ROW (not overlapping any existing utility or road ROW) encompassing 36.7 acres of farm land.

No dairy operations (ten or more animals confined in a facility) are located within 0.5 mile of the proposed centerline, but there are 18 non-residential agricultural buildings within 300 feet of the centerline. Concerns associated with the presence of dairy operations and nearby agricultural buildings include the potential for stray voltage and induced currents. For a detailed discussion of this issue see Sections 4.5.14 and 4.5.15 in Chapter 4. Additional types of confined animal operations are located along this segment.

On Subsegment P4, the Spangler farmstead would be significantly impacted by the proposed line. The centerline passes between the farmstead buildings, located on the south side of Old CTH NA. The owners are concerned about a safety hazard from their use of tall farm equipment in this area. Three buildings housing beef cattle are located within 100 feet of the centerline; one is within 50 feet. Two other metal buildings are within 50 feet. Numerous metal grain bins and fuel tanks are also nearby. Additionally, electric fences are used in close proximity to the proposed centerline. Special measures may be necessary to deal with induced voltages form the line.

The applicants propose to locate transmission structures, to the extent practicable, outside of cultivated fields and offset from field edges. However, the proposed segment centerline does cross some fields at mid-field, potentially resulting in poles being placed in cropland away from field edges, thereby creating obstacles for farm machinery working in the fields. In three locations on this segment, these mid-field crossings exceed 1,000 feet and would most likely require construction of a transmission structure within a field.

A center pivot irrigation system is located on Subsegment P1, but because this subsegment follows an existing electric transmission line, interference with the system should be minimal. Two center pivot irrigation systems are located along Subsegment P9, where it closely parallels USH 53. The poles would be located in the highway ROW near these systems, so interference with the systems should be negligible. Impacts on these systems could be minimized by working with agricultural landowners prior to the start of construction and providing appropriate compensation for damage or required modifications to the system.

Limited aerial applications of herbicides, fungicides, and pesticides may occur along the route, though no specific information is known. The applicants should work with landowners whose aerial spraying would be affected by transmission line placement to minimize potential impacts.

Windbreaks or tree lines would be cleared along 0.7 mile of the route increasing the potential for wind erosion in neighboring fields or drift of agricultural chemicals.

No known organic farm operations are located along this segment. DATCP surveys may provide additional information about the location of organic farms or organic farming practices.

Segment Option P east (Subsegments O0a, P11, P12, P13, P14, P9, and P10)
A total of 23.9 acres of agricultural land lie within the proposed ROW, about 99.0 percent of which is active cropland; the remainder is pasture. Agricultural land represents 19.2 percent of the total required ROW. Of the total ROW on agricultural land, 22.5 acres would be new ROW, not overlapping any existing utility or road ROW.

No dairy operations (ten or more animals confined in a facility) are located within 0.5 mile of the proposed centerline. Three non-residential agricultural buildings are within 300 feet of the centerline. Concerns associated with the presence of dairy operations and nearby agricultural buildings include the potential for stray voltage and induced currents. For a detailed discussion of this issue see Sections 4.5.14 and 4.5.15 in Chapter 4. Additional types of confined animal operations are located along this segment.

The applicants propose to locate transmission structures, to the extent practicable, outside of cultivated fields and offset from the field edge. However, the proposed segment centerline does cross some fields at mid-field, potentially resulting in poles being placed in cropland away from field edges, creating obstacles for farm machinery working in the fields. At two locations these mid-field crossings exceed 1,000 feet.

Two center pivot irrigation systems are located along Subsegment P9, where it closely parallels USH 53. The poles would be located in highway ROW near these systems, so the proposed line should not interfere with the systems. Impacts to these systems could be minimized by working with agricultural landowners prior to the start of construction and providing appropriate compensation for damage or required modifications to the system.

Limited aerial applications of herbicides, fungicides, and pesticides may occur along the route, though no specific information is known. The applicants should work with landowners whose aerial spraying would be affected by transmission line placement to minimize potential impacts.

Windbreaks or tree lines would be cleared along 0.8 mile of this route increasing the potential for wind erosion in neighboring fields or drift of agricultural chemicals.

No known organic farm operations are located along this route, but others may be present.

6.3.1.2. Segment N

A total of 315.2 acres of agricultural land lies within the proposed ROW, about 87.7 percent of which is active cropland and 9.3 percent is pasture—the remainder is tree farm or old field. Agricultural land represents 21.6 percent of the total required ROW, with new ROW encompassing 115.9 acres of farmland. An additional 9.4 acres of agricultural land would be affected by temporary, off-ROW access routes.

Approximately 9.0 acres of land managed as tree farms would be impacted by the segment, primarily on Subsegment N3b (3.6 acres) in Trempealeau County, Subsegment N9 (1.4 acres) in Monroe County, and Subsegments N22 (0.1 acre) and N23 (3.9 acres) in Juneau County.

A total of 21 dairy operations (ten or more animals confined in a facility) are within 0.5 mile of the proposed centerline; one is within 300 feet. There are also 66 non-residential agricultural buildings within 300 feet of the centerline. Concerns associated with the presence of dairy operations and nearby agricultural buildings include the potential for stray voltage and induced currents. For a detailed discussion of this issue see Sections 4.5.14 and 4.5.15 in Chapter 4. There are numerous additional types of confined animal operations along this segment.

The applicants propose to locate transmission structures, to the extent practicable, outside of cultivated fields and offset from field edges. However, the proposed segment centerline does cross some fields at mid-field, potentially resulting in poles being placed in cropland away from field edges, thereby creating obstacles for farm machinery working in the fields. At 17 locations on this segment, these mid-field crossings exceed 1,000 feet. Where the new line would be double-circuited with existing transmission lines currently on H-frame structures, the impacts on field operations would be reduced due to replacing the two-pole structures with new single-pole structures.

Limited aerial applications of herbicides, fungicides, and pesticides may occur along the route, though no specific information is known. The applicants should work with landowners whose aerial spraying would be affected by transmission line placement to minimize potential impacts.

Windbreaks or tree lines would be cleared along 1.6 miles of Segment N, increasing the potential for wind erosion in neighboring fields and drift of agricultural chemicals.

Four known organic farms are located along the western part of Subsegment N3b, near Blair and Taylor. Another is located on Subsegment N6 at Black River Falls. DATCP surveys may provide additional information about the location of organic farms or organic farming practices and surveys conducted by the applicants prior to construction could determine where special measures may be needed to protect the operation's organic status.

Segment N crosses 18 parcels enrolled in the Farmland Preservation Program (FPP), with 13 in Trempealeau County and five in Juneau County. Electric transmission lines are permitted on FPP lands and are considered compatible with agricultural use.

6.3.1.3. Segment O

A total of 503.7 acres of agricultural land is within the proposed ROW on Segment O, about 87.3 percent of which is active cropland and 12.2 percent is pasture—the remainder is tree farm or old field. Agricultural land represents 37.2 percent of the total required ROW. New ROW (not overlapping any existing utility or road ROW) affects 437.8 acres of farm land. An additional 12.6 acres would be crossed by temporary, off-ROW access routes.

Approximately 1.3 acres of land managed as tree farms would be impacted by the proposed transmission line. These tree farms are in two general locations along Segment O. Approximately 1.0 acre is on Subsegment O27 northwest of Lyndon Station and a few small areas (totaling 0.3 acre) are on Subsegment O19 near the Monroe County line in Juneau County.

A total of 58 dairy operations (ten or more animals confined in a facility) are within 0.5 mile of the proposed centerline; seven are within 300 feet. There are also 91 non-residential agricultural buildings within 300 feet of the centerline. Concerns associated with the presence of dairy operations and nearby agricultural buildings include the potential for stray voltage and induced currents. For a detailed discussion of this issue see Sections 4.5.14 and 4.5.15 in Chapter 4. There are numerous additional types of confined animal operations along this segment.

The applicants propose to locate transmission structures, to the extent practicable, outside of cultivated fields and offset from field edges. However, the proposed segment centerline does cross some fields at mid-field, potentially resulting in poles being placed in cropland away from field edges, thereby creating obstacles for farm machinery working in the fields. At eight locations on this segment, these mid-field crossings exceed 1,000 feet.

Limited aerial applications of herbicides, fungicides, and pesticides may occur along the route, though no specific information is known. The applicants should work with landowners whose aerial spraying would be affected by transmission line placement to minimize potential impacts.

Windbreaks or tree lines would be cleared along 5.0 miles of the segment, increasing the potential for wind erosion in neighboring fields and drift of agricultural chemicals.

Organic farming is a more common practice along Segment O, with two farms reported along Subsegment O7d, south of Sparta; three west and south of Cashton on Subsegments O10, O11, and O13; five in the Ontario area along Subsegment O14 and between Ontario and Elroy on Subsegment O15. Others may be present along the segment. DATCP surveys may provide additional information about the location of organic farms or organic farming practices and surveys conducted by the applicants prior to construction could determine where special measures may be needed to protect the operation's organic status.

Segment O crosses 18 parcels enrolled in the Farmland Preservation Program (FPP), with 17 in Juneau County and one in Vernon County. Electric transmission lines are permitted on FPP lands and are considered compatible with agricultural use.

6.3.1.4. Summary of agricultural impacts on Segments P, N, and O

Segment O crosses more acres of agricultural crop land than Segments P and N (either P-west or P-east). Additionally, agriculture represents a larger percentage of total ROW as well.

Table 6.3-1 Potential agricultural impacts on Segments P, N, and O

Segment Combinations	Total ROW (acres)	Agricultural Land (acres)	Percentage of ROW in Agriculture	Dairy Operations within 0.5 Mile
P-west and N	1,601.5	364.5	22.8	21
P-east and N	1,587.2	339.1	21.4	21
O	1,354.1	503.7	37.2	58

6.3.2. Natural resource properties

This section discusses the properties in this part of the project area that are managed primarily for protecting natural resource habitat. These properties may include publicly-owned lands and also private lands covered by a conservation easement or agreement. There may be some overlap in this section with properties discussed in Section 6.4.4 Public lands and Recreation because some properties serve multiple functions or have multiple designated uses.

6.3.2.1. Segment P

Segment P-west

Subsegment P2 passes approximately 530 feet west of the Holland Sand Prairie State Natural Area (SNA), a parcel owned by the town of Holland and managed by the Mississippi Valley Conservancy (MVC). The proposed transmission line would have no direct physical impact on this property.

Subsegment P5 crosses approximately 4,000 feet of the New Amsterdam Grasslands, a property purchased with Wisconsin Knowles-Nelson Stewardship Funds and owned and managed by the MVC. This 310-acre parcel supports the largest remaining grassland bird habitat in this region. While the transmission line would be located primarily along the edges of this property, it would cross directly over approximately 500 feet of the southern portion of the grasslands. Two state threatened bird species nest here in addition to a number of species of greatest conservation need. Construction of the transmission line could disrupt nesting activities if performed during spring and summer months. The long-term presence of the tall double-circuit transmission structures and conductors would likely not have an adverse effect on the grassland habitat, but the line would be a visual intrusion on the western and northern viewsheds (towards the Mississippi River and bluffs) from some areas in the interior of the property and the potential for introduction of invasive plant species would exist.

Segment P-east

No private or publicly-owned parcels on this segment have been identified as being specifically managed for natural resource conservation or protection. The approved CapX 345 kV transmission line will be constructed on the west side of USH 53 along the eastern boundary of the New Amsterdam Grasslands. Subsegment P14 is across USH 53, approximately 260 feet or more from this property edge.

Segment P (Subsegments P9 and P10)

Subsegment P9 crosses to the east side of USH 53 to avoid direct impacts on the Van Loon Floodplain Savanna SNA; however, Subsegment P9 and P10 pass through a large area that is part of the Van Loon Bottoms IBA. The Wisconsin Bird Conservation Initiative has identified IBAs as key sites critical to the protection of bird populations in Wisconsin (see Section 2.4.3 and 2.4.4 for additional information about IBAs and potential impacts to birds). Much of the proposed transmission line ROW and surrounding land along these segments is heavily forested. Construction of the transmission line along these two subsegments would require the removal of nearly 20 acres of trees. Because approximately 75 percent of this acreage would be cleared adjacent to a busy four-lane roadway (USH 53), the potential habitat impacts are not as significant, although clearing forested wetlands adjacent to the Black River would alter the riparian habitat and potentially result in adverse impacts on birds and other terrestrial and aquatic species, as well as water quality, at this location.

6.3.2.2. Segment N

Approximately 1,350 feet of Subsegment N1 is within the Van Loon Bottoms IBA. The area of this segment within the IBA appears to be open field. See the Segment P discussion above for a description of this IBA and potential impacts.

Subsegments N1, N2, and a short portion of N3a are within the western end of a large designated Conservation Opportunity Area associated with the Black River and the Driftless Area. This portion of Segment N traverses very hilly topography with steep-sided wooded slopes and deeply incised valleys. The valley bottoms often contain narrow streams and relatively small irregularly-shaped agricultural fields. This COA, recognized as having continental significance, is being managed to emphasize a matrix of older oak-central hardwood forest with smaller patches of oak woodland, oak opening, regenerating younger forest, native prairies and relict forests.[144] Approximately 30 acres of forest would be removed to accommodate the wider ROW necessary to construct the proposed transmission line in this terrain. This forest loss would incrementally add to the edge effects caused by the existing NSPW 138 kV transmission line, further fragment larger wooded tracts and generally degrade habitat for birds and other species that require forest interior and prefer mature woodlands.

Segment N3b passes through two parcels of land owned and managed by DNR as scattered wildlife habitat areas. The parcels support a mixture of grassland, forest and wetland habitat. An existing NSPW transmission line ROW has already been cleared through these parcels and the new double-circuit line would create incremental impacts on this habitat.

Also, in the town of Springfield Subsegment N3b crosses private land encumbered by a USFWS habitat conservation easement. The purpose of the easement is the protection and restoration of wetland areas associated with Skutley Creek. The easement contract does not allow the construction of any structures or the cutting of any vegetation in the easement area. There are currently two single-circuit H-frame structures located within the area covered by the conservation easement. The applicants may propose to locate structures on the property, but outside of the USFWS easement. It appears from project GIS data, the proposed ROW crosses approximately 0.5 mile of USFWS easement; three temporary clear span bridges would be needed to work within and adjacent to the easement. At the time of printing of this draft EIS, the disposition of potential conflicts and issues related to constructing the new transmission line across this USFWS easement is unknown. However, if this segment is part of an approved route, environmental impacts to the wetlands and creek may be further minimized by using off-ROW access to construct and install the transmission structures at several pole locations in order to avoid construction equipment crossing the easement.

South of the city of Black River Falls, Subsegment N6 crosses approximately five miles of Jackson County Forest land adjacent to the northeast side of I-94. Where this subsegment enters the Jackson County Forest northwest of the intersection of Castle Mound Road and I-94, the proposed transmission line

[144] Wisconsin's Wildlife Action Plan (2005-2015). IMPLEMENTATION: Priority Conservation Actions and Conservation Opportunity Areas. Prepared by: Wisconsin Department of Natural Resources with Assistance from Conservation Partners, June 30, 2008.

ROW would cross about 2,000 feet of wetland, of which a portion is forested wetland. Continuing south for about 4,500 feet, many upland trees on county forest land adjacent to the interstate corridor would have to be cleared. Continuing south, the proposed ROW again traverses primarily wetlands for the next 1.2 miles, including shrub-scrub wetland, forested wetlands, sedge meadows, and marsh. Near the southern end of the Jackson County Forest, the proposed transmission line would again impact mostly upland forest. It passes in close proximity to the Millston Sand Barrens SNA, but should not adversely affect this uncommon plant community.

Shortly after exiting the Jackson County Forest, Subsegment N6 enters the Black River State Forest and continues south across state forest lands for approximately seven miles. The state forests are managed sustainably for multiple uses, which include, among others, recreation, timber production and sales, and natural resource habitat protection. The Master Plan for the Black River State Forest includes at least two goals aimed at natural resource protection: 1) identifying and protecting endangered and threatened resources; and 2) protecting diverse terrestrial and aquatic communities by providing a range of forest types, age classes and communities. Although the proposed high-voltage transmission line would be located adjacent to I-94 and partially overlap ROW with the interstate, a substantial number of trees would have to be cleared to accommodate the new transmission line. In addition, LAWCON funds have been used to purchase property in the state forest and thus, a separate review process involving DNR and NPS would have to occur in order to construct the transmission line on this forest land. The application indicates that that the applicants have begun this consultation process.

North of the village of Warrens, Subsegment N6 passes very near two sections of Monroe County forest land. The outer edge of the transmission line ROW would overlap about 35 feet of county land; however, this area is already devoid of trees.

Subsegments N6 and N7 cross two narrow extensions of a larger COA area located southwest of USH 12 and encompassing the Fort McCoy Barrens Area and portions of the Jackson County Forest and the Black River State Forest. Due to the substantial disturbance related to the interstate corridor itself and some industrial development in the areas crossed by Subsegments N6 and N7, no adverse impacts on this COA would be expected at this location.

Subsegments N10, N11, N12 and N13 deviate from the interstate corridor to avoid potential interference with Volk Field and impacts on Mill Bluff State Park and SNA. In doing so, they cross an identified COA that includes the hilly, wooded topography southwest of the interstate. Because the majority of the proposed ROW on Subsegments N10 and N11 is adjacent to a local road that is mostly open, few trees would have to be removed and little, if any, adverse impacts on habitat in this area would be expected. However, the proposed transmission line and ROW on Subsegments N12 and N13 would be cross-country through very steep and wooded terrain, resulting in the loss of 23 acres of forest over a distance of 2.4 miles. This forest loss would fragment several large wooded blocks by creating new edge effects and generally degrade habitat degrade habitat for birds and other species that require forest interior and prefer mature woodlands.

Subsegment N16 crosses the Lemonweir River adjacent to I-90/94 at a location where the river is highly braided. Although no specified natural resource protection areas are identified here, the vegetation adjacent to the stream that would be cleared for the new ROW is primarily forested wetland. Use of BMPs and strict erosion control measures would be needed during to avoid adverse impacts on water quality if Segment N is part of an approved route.

Near Mauston, the Lemonweir River is crossed again, south of the STH 82 and I-90/94 interchange. Similarly, the stream is very braided at this location and the dominant vegetation type is forested wetlands. ROW clearing and construction activities could have permanent adverse effects on the riparian habitat at this location. Again, the implementation of strict erosion control measures and BMPs would be necessary to avoid impacts on water quality.

6.3.2.3. Segment O

Along Subsegment O3, south of the Walden Acres residential neighborhood, the village of Holmen owns a linear corridor of land that abuts USH 53. This parcel contains a developed park (West Cedar Meadows Park), adjacent to the highway. However, the remainder of this municipal parcel continues west from the end of the park for approximately 1,500 feet following the path of an unnamed stream that eventually drains into the Upper Mississippi National Wildlife and Fish Refuge. This parcel and virtually all of the land west to the Refuge boundary is wooded and undeveloped and is clearly being managed as an environmental corridor. Nearly all of the proposed transmission line ROW is within the USH 53 ROW at this location. While there would be aesthetic impacts on the developed park land on the east end of this parcel, the environmental corridor should not be adversely affected.

The DNR owns and manages a narrow 2,000-foot long parcel of land, adjacent to the La Crosse River along Subsegment O6, bordering North Kinney Coulee Road. This parcel is developed and managed as a fisheries management area. It includes a small gravel parking area and access to the La Crosse River. The riparian vegetation along the river and transmission line ROW includes floodplain forest, sedge meadow and sections of mowed grass. (Use of this parcel for recreation is described in Section 6.4.4 of this chapter). If Segment O is approved, construction of the line could temporarily disrupt use of this property as the parking area is within the transmission line ROW. In addition, the loss of some mature trees adjacent to the river would alter the riparian habitat. Implementation of appropriate erosion control and BMPs would be necessary to avoid adverse impacts on water quality.

The ROW along Subsegments O7d and O8 crosses two private properties abutting the Little La Crosse River that are covered by USFWS Fishery Area easements. These easements are overseen and managed by DNR. On Subsegment O7d, as well as Subsegment O8, some shrubs and trees adjacent to the river would be removed during construction. Low-growing woody vegetation may be allowed to re-establish following construction. Loss of woody vegetation would alter the riparian habitat at these locations. Implementation of appropriate erosion control and BMPs would be necessary to avoid adverse effects on water quality during construction. The applicants have consulted with DNR and USFWS regarding constructing across these easements. Neither agency has indicated whether constructing the proposed transmission line across these easements would be allowed.

The eastern portion of Subsegment O14 and the western half of Subsegment O15 cross a large expanse of private lands that comprise the Kickapoo-Wildcat Important Bird Area (IBA) and are designated as a Conservation Opportunity Area (COA). The Wisconsin Bird Conservation Initiative has identified IBAs as key sites critical to the protection of bird populations in Wisconsin. Although no legal status or regulatory authority is conferred, the importance of managing and maintaining these lands to protect birds is acknowledged. This Driftless area COA is recognized as having continental significance and is being managed to emphasize a matrix of older oak-central hardwood forest with smaller patches of oak woodland, oak opening, regenerating younger forest, native prairies and relict forests.[145] The proposed

[145] Wisconsin's Wildlife Action Plan (2005-2015). IMPLEMENTATION: Priority Conservation Actions and Conservation Opportunity Areas. Prepared by: Wisconsin Department of Natural Resources with Assistance from Conservation Partners, June 30th, 2008.

transmission line would require clearing a significant amount of forest through this area to accommodate a ROW width of 150 to 330 feet on Subsegment O14 and a width of 170 to 230 feet on Subsegment O15. This forest loss would reduce nest sites, create more edge effects, further fragment larger wooded tracts and generally degrade habitat for birds that require forest interior and prefer mature woodlands.

For a distance of 8.0 miles, Subsegments O20 through O24 cross another Driftless area COA. Also, on Subsegment O24, the proposed transmission line ROW crosses a private property covered by an NRCS Wetland Reserve Program (WRP) easement. If Segment O is part of an approved route, the NRCS may need to make a compatibility determination before ROW acquisition for the transmission could occur.

6.3.3. Forested lands

6.3.3.1. Existing environment

Segments P-west, P-east, P, and N

Segments P-west, P-east, P, and Subsegments N1 through N5 are located in the Western Coulee and Ridges Ecological Landscape, as described in Chapter 2, Section 2.3. Subsegments N10-14 that deviate from the interstate corridor to avoid impact on Volk Field are also in this ecological landscape which coincides with a portion of the Driftless Area of Wisconsin. While all Segment P options lie on rolling to level terrain that likely supported prairie in the past, the larger region is characterized by large stands of mixed deciduous forests dominated by oaks, hickory and red maple. Sugar maple, basswood and a variety of other species are of secondary importance. Current vegetation of the region consists of extensive forests on the steep slopes and relatively small irregularly-shaped agricultural fields in the valleys. Forests are typically pole and saw-sized timber, frequently deciduous and occasionally mixed deciduous-coniferous. Mixed forests are typically dominated by red and white pine and oak. Forested wetlands occur occasionally on these segments and are typically hardwood swamps in riparian areas. Dominant species include box-elder and silver maple.

Segments P-west and P-east are flat and almost completely converted to agriculture and urban development. Forested areas along Segment P (consisting of Subsegments P9 and P10) are limited to the northern part, primarily near the riparian habitat along the Black River. This area is primarily dominated by oak and pine. Forested lands along this portion of the segment are almost entirely privately-owned. These lands are used for recreation and riparian habitat.

The remaining portion of Segment N (Subsegments N6 throughN9 and N15 through N23) runs along the western edge of the Central Sand Plains Ecological Landscape. This region is characterized as a flat, sandy area of outwash, lacustrine deposits, sand buttes, and stream bottoms. The potential natural vegetation is jack pine and scrub oak forests, barrens, sedge meadow, and conifer swamp wetlands.

Woodlands in this area tend to be larger, more contiguous blocks of forest (over 10 acres on average) than in the agricultural areas farther south in the project area. The deciduous forests along these segments are dominated by pole and saw timber-sized oaks, hickory, and maples, while the mixed deciduous-coniferous forests are dominated by pole and saw timber-sized oaks, pines, and quaking aspen. Minor species include black locust, ash, and black cherry. Coniferous stands include white and red pines, and a substantial quantity of jack pine. The understory commonly includes sumac, buckthorn, and honeysuckle. Traveling from north to south along this segment, white, red, and jack pines become less dominant in the overstory, while shagbark hickory becomes more prevalent.

On the portion of Segment N in the Central Sand Plains, wooded wetlands include primarily hardwood swamps and white pine-red maple wet-mesic forest. Dominant species include red maple, American elm, green and black ash, and river birch. White pine, tamarack, and alder are more prevalent near the vegetation tension zone. Floodplain forests are found along both crossings of the Lemonweir River.

Both public and privately-owned forests are present along Segment N. A substantial length of Subsegment N6 crosses the Black River State Forest and Jackson County Forest land and touches the edge of the Monroe County Forest. The forests in this area are large, contiguous stands of pole-sized white and jack pine, and red oak, with beaked hazelnut common in the understory. Additional publicly-owned forest exists where woodlands occur within the WisDOT ROW. Private forest lands along Segment N are primarily used for recreation. A combination of uses including recreation, timber management, and habitat management exist in the Black River State Forest, Jackson County Forest, and adjoining areas next to the interstate. Forested wetlands along waterways are considered to be riparian habitat.

Segment O

Segment O traverses the Coulee Region of the Driftless Area ecoregion. This region is characterized by unglaciated topography, dissected slopes with steep-sided valleys and narrow bottomlands. The potential natural vegetation of the ecoregion is prairie and large stands of mixed deciduous forests of oaks, sugar maple, and basswood. Current vegetation in the region consists of extensive forests on steep hillsides and irregularly-shaped agricultural fields in narrow valleys.

Forests within this region are typically pole and saw-sized timber, usually deciduous, and occasionally mixed deciduous-coniferous. The deciduous forests are dominated by oaks, shagbark hickory, sugar and red maples, basswood, and ashes, with a variety of species of secondary importance. Mixed forests are dominated by red and white pine and oaks.

Forested wetlands include floodplain forests, riparian forests, and hardwood swamps. Dominant species include box-elder, silver maple, cottonwood, American elm, ashes, and willows. A large floodplain forest complex is located adjacent to the La Crosse River and its backwaters. A large wetland complex along Seven Mile Creek on Subsegment O27 includes both a hardwood and coniferous swamp.

Forests along Segment O are predominantly privately-owned, with occasional parcels owned by municipalities or the state of Wisconsin. These forested lands are primarily used for recreation and riparian habitat.

6.3.3.2. Potential impacts

Segments P-west and P

A total of 21.6 acres of upland woods and 1.4 acres of wooded wetland would be cleared, for a total permanent loss of 23.0 acres of woodland. Most of the clearing would result from widening existing road ROWs and removing landscape trees from residential properties. No clearing would be required for off-ROW access routes.

Segments P-west and P have three pine plantations or forests along the proposed ROW. Removing pine trees creates the potential to introduce annosum root rot.

Segments P-east and P

A total of 26.1acres of upland woods and 1.4 acres of wooded wetland would be cleared, for a total permanent forest loss of 27.5 acres. The clearing would result from widening existing corridors. No clearing would be required for off-ROW access routes.

Segments P-west and P have three pine plantations or forests along the proposed ROW. Removing pine trees creates the potential to introduce annosum root rot.

Segment N

A total of 207.2 acres of upland woods and 68.5 acres of wooded wetland would be cleared, for a total permanent forest loss of 275.7 acres. Most clearing would result from widening existing transmission line ROWs and road corridors. Off-ROW access routes would require an additional 8.23 acres of upland woodland clearing and 0.16 acres of wooded wetland clearing. Off-ROW routes requiring the most clearing are needed to access Subsegments N1 and N3b.

Segment N has 21 pine plantations or forests along its ROW. This is more than on any other proposed route segment. Of these, 18 are located along the interstate corridor. Removing pine trees creates the potential to introduce annosum root rot.

Segment N crosses parts of the Black River State Forest that are designated in the property Master Plan as "Forest Production Units," which are not compatible with a transmission line ROW. If Segment N is part of the route authorized by the Commission, the applicants would coordinate with Black River State Forest management staff to amend the property Master Plan.

Subsegments N1 and N2 south of Ettrick, N3a and N3b between Blair and Black River Falls, and N22 and N23 between Mauston and Lyndon Station pass through lands enrolled in the Managed Forest Law (MFL) program. The proposed clearing would likely impact lands enrolled in the program. Subsegments N3a and N3b, in particular, follow an existing transmission line that passes through the southern edge of an expansive, largely unfragmented forest. These subsegments include areas where the ROW would be 135 to 150 feet in width.

In many areas, the proposed ROW for the new line is typically 120 feet wide; however, on Segment N, there are many locations where the proposed ROW exceeds this width in order to span a steep forested hillside and narrow valley. On Subsegment N1, again, there are locations where the ROW is proposed to be 225 or 320 feet wide, and on Subsegment N2 part of the ROW would be cleared to a width of 270, 165, or 160 feet to allow for longer spans in the hilly wooded terrain. Near Camp Douglas, Segment N leaves the interstate corridor requiring significant forest clearing along an entirely new ROW. These subsegment also encounters blocks of land enrolled in the MFL program in this area. Again, on Subsegments N13 and N16, part of the ROW would be cleared to a width of 150 feet to accommodate a long span of a forested hillside.

Segment O

A total of 314.0 acres of upland woods and 19.9 acres of wooded wetland would be cleared, for a total permanent forest loss of 333.9 acres. Extensive clearing of new transmission line ROW would be required. Off-ROW access routes would require an additional 3.16 acres of upland woodland clearing and 0.02 acres of wooded wetland clearing.

Segment O has two pine plantations or forests along its ROW. Removing pine trees creates the potential to introduce annosum root rot.

Some of the most seriously impacted forests in the entire project are located on Subsegments O14 and O15 in the towns of Jefferson, Sheldon, and Wellington in Monroe County. The proposed line would cut a new corridor through large blocks of mature, closed canopy forest that is common in this area. Fragmenting these large blocks of woodlands would reduce forest interior habitat and break up uninterrupted forested corridors that extend for miles, linking many of the large forest blocks. Edge effects, such as changes in vegetation structure, light conditions, and moisture conditions would encroach farther into the interior of these forests. Large cleared corridors through a forest block generally provide conduits for the introduction of invasive plant and animal species and result in barriers to the movement of some local wildlife, including increased exposure of native wildlife to predators.

Due to the steep slopes in this region, soil erosion would also be a concern on the newly denuded hillsides. Some of the longest off-ROW construction access routes required for the proposed project are needed in this area because of the steep terrain. Additionally, the average ROW width is also greater, due to some longer spans necessitated by the steep slopes. This would result in some of the most extensive clearing for new corridors of any segment proposed for this project.

There appears to be no "typical" ROW width on Segment O. The ROW width is rarely less than 150 feet wide and frequently increases to 165, 195, 270, or even 330 feet wide to accommodate the steep forested terrain. Subsegment O20 would expand a natural gas pipeline ROW that crosses a large forest block. The gas pipeline ROW is currently cleared for a width of approximately 20 to 60 feet. The proposed transmission line would expand this to an average cleared width of158 feet with some sections cleared to 210 feet wide.

Subsegment 010a, west of the village of Melvina and Subsegments O14 and O15, north of Ontario pass through forested blocks enrolled in the MFL program. It is highly likely that ROW clearing would impact forest land enrolled in the program in these areas, thus potentially affecting landowner participation. These areas also require the most and longest off-ROW access routes due to the steep wooded slopes.

Table 6.3-2 Summary of woodland loss on Segments P-west, P-east, P, N, and O

Segment Combinations	Upland Woods Cleared (acres)	Forested Wetland Cleared (acres)	Total Forest Area Cleared (acres)
P-west, P and N	228.8	69.9	298.7
P-east, P and N	233.3	69.9	303.2
O	314.0	19.9	333.9

6.3.4. Wetlands

Construction in wetlands could alter wetland hydrology, vegetative character, and function. More specifically, forested wetlands would be permanently lost and converted to shrub wetlands or sedge meadow and the likelihood of invasive species being introduced to the site would be greater. Furthermore, minimizing impacts is necessary and might be achieved by restricting construction to winter or periods of low flow, implementing requirements of Wis. Admin. Code ch. NR 40 for invasive species, and using matting or other low ground pressure equipment. After completing construction of the transmission line, the applicants would conduct site restoration and compensatory mitigation activities as required. General information about wetland resources and the potential short- and long-term potential impacts of constructing transmission line through and across wetlands can be found in Section 4.5.17.

Segments P, N, and O cross a number of wetlands and wetland types. The applicants conducted field analyses of the wetlands crossed by project routes where the wetlands were accessible along existing electric transmission and public ROWs. Thus, a substantial portion of the segments were not evaluated or surveyed in the field. The applicants evaluated wetlands on private properties using available desktop resources, such as the Wisconsin Wetland Inventory (WWI), soil maps, and recent aerial photographs.

The applicants intend to compensate for permanent and conversion wetland impacts by using either existing mitigation banks, Wisconsin's In-Lieu Fee Program and, if no other option exists, permittee-responsible mitigation. As part of the permitting process, DNR and USACE will review any mitigation proposal for this project prior to the start of construction.

6.3.4.1. Segment P

Neither Segment Options P-west nor P-east cross wetlands.

Subsegments P9 and 10 cross five forested wetlands, of which some have been partially cleared. One wetland is a small isolated drainage swale located between STH Old 93 and Amsterdam Prairie Road. The remaining wetlands are related to tributaries of the Black River (between Amsterdam Prairie Road and A Johnson Road) and on both sides of the Black River itself. A pole would be constructed within a small wetland associated with a tributary of the Black River. Adjacent to the Black River, Segment P crosses 504 feet of floodplain forest, identified as significant, high-quality wetlands. The Black River is considered a Priority Navigable Waterway (PNW) and an ASNRI waterway because sturgeon are present in the river as well as state-listed threatened/endangered species. One transmission structure would be located in the wetland on the southern bank of the river. Approximately 1.4 acres of wetland forest would be cleared, resulting in conversion of high-quality floodplain forest to a shrub-carr or herbaceous wetland community. This would potentially impact wildlife habitat and other wetland functional values.

6.3.4.2. Segment N

Segment N crosses 208 wetlands, potentially impacting 272 acres of wetlands (81 acres of forested wetlands and 191 acres of non-forested wetland). Forested wetland clearing results in permanent conversion of forested ecosystems to more open communities, potentially impacting wildlife habitat, impairing wetland functional values, and increasing the occurrence of woody invasive species. In total, 196 structures would be built in wetlands along Segment N. In addition, 50 wetlands are identified as significant, high-quality wetlands. A majority of this segment was accessed in the field, approximately 92 percent of the route.

Subsegment N1-N3a

There are fewer wetlands crossed by this portion of Segment N due to the hilly topography. At its northern end, it crosses the Trempealeau River and its associated wetlands. Most of the wetlands along these subsegments are riparian, located next to small streams or rivers that can be spanned by the proposed transmission line. Additionally, some of the route crosses forested wetlands along an existing transmission corridor where 0.75 acre of forested wetland would be cleared for the wider ROW required. Three transmission structures would be constructed in wetlands; two in narrow riparian wetlands and a third in a wetlands associated with the Trempealeau River. Because all three potentially impacted wetlands are narrow, the applicants might be able to find suitable locations outside of the delineated wetlands. Of the wetlands crossed by these subsegments, four are associated with rivers designated as ASNRI waterways.

Subsegments N3b-N5

Construction of the proposed transmission line along this stretch would result in approximately 50 acres of potential wetland impacts. The applicants propose to construct 24 transmission poles in these wetlands. Approximately 10 acres are forested wetlands. However, because almost all of these subsegments follow an existing transmission line ROW, the incremental ROW clearing would require only 2.9 acres of tree clearing. Ten of the wetlands crossed by the subsegments are associated with streams designated as ASNRI waters.

The most significant wetlands on this stretch are associated with the Trempealeau River, west of Blair. The proposed route intersects the Trempealeau River and its associated side channels at seven locations, over a distance of four miles. Four of these crossings would impact almost a mile of floodplain forest and wet meadow in which five transmission structures would be constructed. Another riparian sedge-meadow wetland complex is associated with Skutley Creek, which is a designated trout stream; two structures would be constructed within these wetlands. Finally, along Subsegment N3b is a third riparian wetland complex which is associated with French Creek, a trout stream. This subsegment crosses many river tributaries and associated shrub-carr and sedge meadow wetlands for a distance of approximately two miles. Five structures are proposed to be constructed within this complex.

Subsegments N6-N23

The remainder of Segment N would be a new transmission corridor along the interstate ROW. Though the interstate ROW consists of primarily herbaceous wetlands, in several places along this route large areas of forested wetlands and non-forested wetland lie just outside of the interstate ROW. Construction of the high-voltage line would potentially cause impacts to these large wetland complexes and would require the removal of trees within the forested wetlands. Additionally, construction access for some of these segments would be through private properties and would result in additional wetland impacts.

These subsegments would potentially impact approximately 210 acres of wetlands. Approximately 170 transmission structures are proposed to be constructed within wetlands on these subsegments. Additionally, 36 of the wetlands are associated with creeks or streams that are designated as ASNRI waterways.

Along Subsegment N6 from just south of Black River Falls to the county border, the wetlands in Jackson County are associated with numerous tributaries of the Black River. Additionally, the interstate and the route crosses large blocks of wetlands and forested land within the county- and state-owned forests. These large wetland complexes stretch for an initial distance of one mile and then another 1.5 miles, consisting of sedge meadow interspersed with shrub-carr and hardwood swamp components. In total, twelve structures are proposed to be constructed in these two complexes that contain significant high-quality wetlands.

From the Monroe County border to the southern end of Segment N, the wetlands crossed by the subsegments are associated with the numerous tributaries of the Lemonweir River. East of Tomah on Subsegment N9, the route crosses approximately 2.3 miles of a large wetland complex. Fourteen structures are proposed to be constructed in these wetlands. Though much of the complex is dominated by invasive species, it still has wetland functional values due to its size. Construction impacts on this wetland complex should be minimized. Along Subsegments N9 through N16, the proposed route continues southeast from Tomah to New Lisbon where agriculture becomes more common and the wetlands are more fragmented and dominated by invasive species, such as reed-canary grass.

Subsegments N10-N14 are located away from the interstate ROW and travel cross-country on new ROW. The subsegments would cross 1.5 miles of a wetland complex that includes hardwood swamp, wet meadow, sedge meadow, and shallow marsh, though some of the wetland is farmed. Fragmentation of this wetland by the proposed transmission line could increase the likelihood of the spread of invasive species. To minimize the introduction of new invasive species populations, equipment and matting should be cleaned before entering this site.

Along Subsegments N17-N20, from New Lisbon to Mauston, the meandering Lemonweir River somewhat parallels much of the route. These subsegments cross the large riparian wetland complex associated with the river and its extensive floodplain. This portion of the route crosses approximately 0.7 miles of this complex, including several wetland types, such as sedge meadow, shallow marsh with open water, and floodplain forest. Six structures are proposed to be constructed in this complex. The applicants anticipate constructing at least some of these structures with helicopters and alternative foundation types. These construction methods might minimize the need for access roads through wetlands for heavy equipment and thereby, reduce wetland impacts.

For the remaining portion of Segment N (Subsegments N21-N23), from Mauston to just north of Lyndon Station, the route crosses more of the Lemonweir River floodplain. It also crosses 0.8 miles of a large wetland complex. Here, structures could be located below the OHWM of the river and construction via helicopter could be utilized. If possible, these structures should be located above the OHWM to reduce impacts caused by the difficulty of access and constructing the structures in standing water.

6.3.4.3. Segment O

Most of Segment O is located on private property and thus, was not accessed in the field for wetland field surveys. The portion of the route between Subsegments O1 to O6 where it is along freeways was accessible; however, very little of the route that is not along highway corridors (Subsegments O7-O27) was field surveyed by the applicants.

Segment O crosses 11.9 miles of wetlands, and would result in approximately 119 acres of existing and new ROW wetland impacts (20.8 acres of forested wetland and 98.6 acres of non-forested wetland). A total of 118 wetlands would be crossed, with 74 structures constructed in these wetlands.

Between Briggs Road Substation and where Subsegment O6 intersects with I-90, the landscape is extremely urban and there are only three narrow wetlands that parallel the roadways. One wetland is a wet meadow/ riparian forest that contains reed canary grass. It would have two transmission structures constructed within its boundaries. The rest of Subsegment O6 is adjacent to I-90 and shares WisDOT ROW. The majority of the wetland impacts on this stretch are between STH 16 and CTH B, where the route crosses wetland complexes associated with the La Crosse River. The La Crosse River Marsh is associated with a designated ASNRI river and is considered a high-quality floodplain wetland. In total, 1.1 miles of wet meadow, shallow marsh, and floodplain forest wetland would be crossed by this section of the Segment O. Five structures would be constructed in this wetland complex. Further to the east, the route would impact the edge of several larger wetland complexes located along the I-90 ROW. If off-ROW construction access is necessary, additional wetlands could be impacted.

Just east of the La Crosse/Monroe County line, the proposed route turns south away from the interstate and proceeds along new ROW, mostly cross-country. The wetlands in this area are associated with creeks in the valleys due to the hilly topography of the region. Because most of the remaining portion of Segment O is on private lands, wetland delineations and habitat assessments have not been completed by the applicants.

Along CTH X, Subsegment O9 crosses a large significant high-quality herbaceous floodplain wetland complex associated with a tributary to the Little La Crosse River (an ASNRI waterway). This portion of the route crosses 1.2 miles of this complex, which is primarily composed of sedge meadow, shallow marsh, and shrub-carr. Up to ten structures are proposed to be constructed in this wetland complex.

For Subsegment O11a through O19 (Cashton to Elroy), rolling hills with irregularly-shaped fields planted in ROW crops and forested tracts dominate the landscape. The route crosses 404 feet of a floodplain wetland complex located along Brush Creek, an ASNRI-designated waterway. Two structures are proposed to be constructed within these wetlands. Subsegment O15 crosses approximately 1,280 feet of another floodplain wetland associated with Bluff Creek. Two structures are proposed to be constructed within this wetland, as well. Near the city of Elroy, Subsegment O19 crosses approximately 1,313 feet of a third floodplain wetland complex associated with the Baraboo River. This complex consists of wet meadow and floodplain forest.

For the remainder of Segment O, from the city of Elroy to the junction of I-90/94, the proposed route partially follows an existing 69 kV transmission line but would be mostly cross-country on new ROW. Subsegment O27 crosses 1.5 miles of a wetland complex, composed of wet meadow, shrub-carr, and hardwood swamp that is associated with Sevenmile Creek. The location of the proposed ROW would fragment this wetland complex, increasing the potential for the introduction and establishment of invasive species. Disturbances to this wetland could be significant as six structures are proposed to be constructed in the complex.

6.3.4.4. Summary of wetland impacts of Segments P-N and O

Segments P and N cross 213 wetlands and would have approximately 200 structures constructed within wetlands, causing more temporary and permanent wetland impacts and requiring more forested wetland clearing than Segment O. Additionally, these segments would cross several large floodplain wetlands along the Trempealeau and Lemonweir Rivers. However, there are unknowns regarding the quality and number of wetlands that would be impacted on the cross-country portions of Segment O due to lack of field analyses by the applicants.

Table 6.3-3 Summary of wetland impacts of Segments P-N and O

Segment Combinations	Forested Wetland				Non-Forested Wetland			Total Wetland Impact (acres)	Significant/ High-quality Wetlands
	Existing Shared ROW Not Cleared* (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Forested Wetland Impact (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Non-Forested Wetland Impact (acres)		
P and N	18.6	31.2	51.3	82.5	108.0	83.0	191.0	273.5	52
O	2.2	3.1	17.7	20.8	24.0	74.6	98.6	119.4	14

* This column is a subset of the Existing Shared ROW.

6.3.5. Lakes, rivers, and streams

Some of the waterways crossed by the proposed project have significant scientific value, and are identified by DNR as Areas of Special Natural Resource Interest (ASNRI) for their protection under Wis. Admin. Code § NR 1.05. ASNRI designations are given to water bodies that meet one of a number of criteria representing high ecological value such as outstanding resource waters (ORW), exceptional resource waters (ERW), and trout streams (Class I, II, and III). See Figure Vol. 2-4.01 for a map depicting the region's waterways.

Some waterways crossed during construction would require a temporary clear span bridge (TCSB) or a bridge requiring support below the ordinary high water mark (OHWM). These waterways could be adversely affected by removal of stream bank vegetation, excavation, potential soil erosion and sedimentation, and temporary closure to users of the river. Impacts may be minimized by implementing requirements of Wis. Admin. Code ch. NR 40 for invasive species, completing site restoration and re-vegetation activities as required, as well as following BMPs and Erosion Control Plan specifications. General information about lakes, rivers, and streams, and the potential impacts to this resource from transmission line construction can be found in this EIS in Section 4.5.16.

The applicants identified navigable waterways intersected by the proposed routes based on a review of desktop information, DNR-supplied data, and aerial photographs; field observations were made along accessible routes. DNR has final jurisdictional authority over navigability determinations. Some non-navigable and intermittent streams may also be present along the routes. These resources would be identified during a pre-construction engineering survey if the proposed project is approved.

6.3.5.1. Segment P

The applicants identified no anticipated waterway impacts associated with either Segment Option P-west or P-east. Though, Subsegment P5 (Option P-west) appears to cross an unnamed tributary to the Black River for which the application contains no information.

The common subsegments of Segment P (Subsegment P9 and P10) follows a valley along STH 53 from the village of Holmen north to the town of Holland. The proposed route crosses four waterways associated with the Black River, including the main channel of the Black River. The Black River is designated as a priority navigable waterway (PNW) because sturgeon are present in the river, and an ASNRI waterway because state-listed threatened/endangered species use the river.

On Subsegment P9, two unnamed tributaries to the Black River would be crossed by TCSBs. No poles, structures, or TCSBs are proposed below the OHWM of any waterways. Impacts on these resources should be avoided and minimized to the extent possible to protect this unique ecological area.

Segment P also parallels the east side of the Van Loon Floodplain Savanna SNA/Van Loon Wildlife Area, where a unique habitat situated on sand and gravel deposits is located in the Black River. Segment P runs adjacent to this special natural resource area, which is home to many rare and uncommon plant and wildlife species, for approximately four miles.

6.3.5.2. Segment N

The majority of Segment N was field surveyed. In total, Segment N crosses 129 waterways, of which 42 are designated as ASNRIs and 22 are listed as either ORW, ERW, and/or trout streams. Specific waterways with high ecological value along Segment N include larger river systems such as the Trempealeau River, Black River, and Lemonweir River as well as smaller river systems such as French Creek, Coffee Creek, and Robinson Creek. These waterways provide habitat for a variety of aquatic species, improve water quality, and provide flood attenuation for surrounding landscapes. Along Segment N, 84 TCSBs would be required (10 over ASNRI waterways). Impacts on these resources should be minimized to the extent possible to protect these ecosystem functions.

In addition to TCSBs, five miscellaneous structures are proposed to be placed below the OHWM of the Lemonweir River; two near New Lisbon and three near Mauston. These temporary structures could consist of additional bridges requiring in-stream support or other structures to facilitate access. It is essential to minimize the need for these structures. Their placement and removal could increase the suspension of sediments, disturb habitat, and disrupt flow.

Subsegments N1-N3a

Proposed route Segment N starts near the town of Gale (Subsegment N1) and travels north, cross-country, to the city of Blair (Subsegment N3a). Here the terrain becomes quite hilly and forested. On Subsegment N2 a temporary bridge would be built over an unnamed tributary to Beaver Creek that would require in-stream support (below OHWM) to cross the 35- to 40-foot width. The applicants propose to use a structural mid-stream support such as a reinforced culvert, concrete block, or similar material.

Another waterway, a side channel of Trempealeau River, would be crossed by an off-ROW access road. This section of the Trempealeau River is designated an ASNRI and trout stream. Whenever in-stream support is required, disturbance to the bed of the waterway could occur. Special attention should be given to all crossings of special-designation waterways to ensure that bridge placement and removal does not adversely impact the waterway.

Subsegments N3b-N5
From the city of Blair (Subsegments N3b) east to Black River Falls (Subsegment N5), the proposed route travels cross-country and the topography becomes less hilly and more agricultural. A side channel of the Trempealeau River, where a TCSB is needed, would require in-stream support (below OHWM) to cross the 35- to 40- foot width. The applicants propose to use a structural mid-stream support such as a reinforced culvert, concrete block, or similar material. This section of the Trempealeau River is also designated an ASNRI and trout stream. Whenever in-stream support is required, disturbance to the bed of the waterway could occur. Special attention should be giving to all crossings of special-designation waterways to ensure that bridge placement and removal does not adversely impact the waterway.

Subsegments N6-N23
The remainder of Segment N would be a new transmission corridor along the interstate I-90 ROW. Along this segment grading of more than 10,000 square feet is proposed at five separate locations, all of which are associated with the Lemonweir River. Three areas are located along Subsegment N21, and two are located along Subsegment N16 (also associated with New Lisbon Lake). Similar to miscellaneous structure placement, it is important that grading be minimized. Exposed soil adjacent to waterways can greatly impact waterways and appropriate erosion control must be utilized. In general, all vegetation clearing near the bank should be minimized to limit impacts on waterways.

6.3.5.3. Segment O

Due to the geology and topography of much of Segment O, fewer large river systems are expected to be crossed by the proposed route as compared to Segment N. Segment O begins in the relatively urban areas of the village of Holmen and city of Onalaska where most of the route was field surveyed by the applicants. From there the segment continues cross-country south and east through hilly terrain, mostly crossing private properties and therefore large areas were not field surveyed by the applicants. Near the western end of Segment O, near the town of Lemonweir agriculture begins to dominate the landscape.

In total, Segment O is expected to cross 63 waterways, of which 19 are designated ASNRIs and 12 are listed as trout streams (Class I, II, and III). Larger river systems crossed by Segment O include the La Crosse, Kickapoo, and Baraboo Rivers. Other smaller waterways include Brush Creek, the Little La Crosse River, and Seven Mile Creek. Segment O would require the construction of 44 TCSBs (10 over ASNRI waterways).

Near STH 27 in the town of Leon, Subsegment O7d crosses in two different locations the La Crosse Area Comprehensive Fishery Area along the Little La Crosse River (ASNRI), temporarily impacting the area with wire stringing activities. This area is managed by the DNR for the protection of the cold water fishery (game and non-game) and provide outdoor recreational opportunities.

One proposed temporary bridge requiring in-stream support would be located over the Kickapoo River along Subsegment O15 for off-ROW access. The in-stream support for this bridge would again consist of a reinforced culvert or cement block. Whenever in-stream support is required, disturbance to the bed of the waterway could occur. Special attention should be giving to all crossings of special-designation waterways to ensure that bridge placement and removal does not adversely impact the waterway.

No additional miscellaneous structures are proposed to be constructed in waterways on Segment O. Also, no grading greater than 10,000 square feet on the bank of a waterway is proposed on this segment.

6.3.5.4. Summary of waterway impacts on Segments P- N and O

Overall, combined Segment P-N is expected to impact more than twice the number of waterways impacted for Segment O. On combined Segment P-N, 86 TCSBs are proposed, including ten over ASNRI waterways. Based on information that includes field surveys on less than half of the route, 44 TCSBs are proposed on Segment O, including ten over ASNRIs. Segment O does not have any miscellaneous structures proposed to be placed in waterways or any grading of over 10,000 square feet on the bank of a waterway. Vegetative clearing on the banks of these waterways and the placement of TCSBs could adversely impact these high-quality streams. TCSB standards and conditions must be followed to minimize impacts, as well as implementation of appropriate erosion control measures.

Table 6.3-4 Summary of waterway impacts for Segments P-N, and O

Segment Combinations	Waterway Crossings	ASNRI Waterway Crossings	TCSBs Required	TCSBs Over ASNRIs
P and N	133	43	86	10
O	63	19	44	10

6.3.6. Endangered resources for Segments P, N, and O

This section discusses the potential impacts to endangered resources that might be affected by construction or operation of the proposed project along Segments O, P, and N. A general discussion of rare species is presented earlier in this EIS in Chapter 4, Section 4.5.7.

Endangered resources include rare or declining species, high quality or rare natural communities, and unique or significant natural features. Endangered resources are tracked via the state's NHI database which is maintained by the DNR Bureau of Natural Heritage Conservation. The project area evaluation consists of both the specific route and a buffer of 1.0 mile for terrestrial and wetland species and a 2.0-mile buffer for aquatic species.

The combined presence of natural habitat and man-made disturbances must be taken into consideration to evaluate whether there is a likelihood that rare species are present and the potential for negative impacts on those species. For the purposes of this document, rare species are defined as federal- or state-listed threatened and endangered species, federal candidate and proposed species, and state special concern species. These species are not common which means they are low in numbers or restricted to small geographical areas, *i.e.*, difficult to find. Therefore, while the existing sources of information are important for estimating impacts to rare species, they are incomplete. Additional rare species beyond those identified may actually be present in potentially impacted areas.

Also, the Wisconsin NHI database only has information on rare species for areas that have been previously surveyed for that species or group, during the appropriate season and the observation recorded. Not all areas of the state have been surveyed, especially most privately-owned lands. Therefore, potential endangered resource impacts along segments dominated by private properties may be incomplete.

For specific route segments, an incidental take of state threatened or endangered animal species may occur as defined by Wis. Stat. § 29.604. Further consultation under the DNR incidental take process may be needed and an incidental take permit may be required for construction to proceed on those segments. Instances where existing information indicates that additional assessment or consultation for incidental take would be needed are described in this EIS.

This section identifies the endangered resources that could be present, the project's potential impacts on these resources, and the mitigation measures that should be implemented. Rare species are discussed as taxa groups or individually if there is a high level of concern. This list and information are taken from existing sources within DNR, such as the NHI database, as well as some external sources, including landowners and surveys completed by the applicants.

6.3.6.1. Birds

Almost all bird species are protected by the Migratory Bird Treaty Act (MBTA). Under the MBTA, it is unlawful to take, capture, kill, or possess migratory birds, their nests, eggs, and young. This may apply to birds nesting in or adjacent to the ROW if construction disturbance results in nest abandonment. Avoiding impacts to nesting birds can be achieved if construction activities are scheduled in suitable habitat areas outside the breeding and nesting season, from approximately March through August.

Segments P, N, and O cross two IBA. The northern portion of Segment P (Subsegments P9 and P10) and the southern portion of Segment N (Subsegment N1) cross through the Van Loon Bottoms IBA. Additionally, this IBA encompasses an area just to the west of Segment P-west, as well. The Van Loon Bottoms encompasses the last 15 miles of the Black River before it meets the Mississippi River. It features extensive contiguous floodplain forest, as well as shallow marsh and willow thickets. Native prairie, oak savanna, and upland deciduous forest are found in the surrounding hills. Yellow-crowned night-herons, Acadian flycatchers, cerulean warblers, and prothonotary warblers all breed here. The area also supports red-headed woodpeckers, blue-winged warblers, and field sparrows. Water birds congregate in late summer and thousands of land birds migrate through, particularly in the spring. Figure Vol. 2-6 illustrates the location of the Van Loon Bottoms IBA.

Along Segment O, Subsegments O14 and O15 cross the Kickapoo-Wildcat IBA, just north of the village of Ontario in Monroe County. This IBA contains the most intact upland forested lands in the entire Driftless portion of the state. The area is characterized by steep terrain and rocky slopes covered in oak-hickory forest with scattered cliffs and ravines. This IBA hosts thousands of land birds during both spring and fall migration, and about 25 percent of Wisconsin's over-wintering golden eagle population. Breeding birds found in this IBA include the Acadian flycatcher, wood thrush, cerulean warbler, worm-eating warbler, and Louisiana waterthrush.[146]

Segment P

The NHI database indicates several occurrences for the bald eagle, a special concern species and federally protected through the Bald and Golden Eagle Act within the vicinity of Subsegments P9-P10. While the specific nests are more than 0.5 mile from the project ROW, there is suitable habitat (large trees in proximity to lakes and rivers) along these segments for the species to be present and nesting. Bird surveys were not completed for this area; therefore, it is unknown if this species is currently present within the area. If these subsegments are approved, additional bird surveys may be recommended. Per USFWS guidelines, it is a requirement to maintain a buffer of at least 660 feet between project activities and an active bald eagle nest. Work may be conducted closer if done outside of the nesting season (August through mid-January). If these guidelines cannot be followed, USFWS must be consulted for further assistance, prior to the start of construction.

Two state threatened birds (Bell's vireo and Henslow's sparrow) and one special concern bird (western meadowlark) have been recorded in the NHI database in the vicinity of Subsegment P9 and most

[146] Steele, Y. 2007. Important Bird Areas of Wisconsin: Critical Sites for the Conservation and Management of Wisconsin's Birds. http://www.wisconsinbirds.org/IBA/sites.htm.

segments of P-west and P-east. Suitable habitat for these grassland and shrubland birds include open habitat or brushy habitat near open areas, unmowed road ROWs, power line corridors, and other linear corridors. Suitable habitat appears to be present along this segment, especially along Subsegment P5 where it crosses the New Amsterdam Grasslands. Therefore, if this route is approved, additional bird surveys may be required. Due to the long length of this subsegment, further review would be recommended to determine where habitat and species surveys should be conducted. Should these birds be found, time of year restrictions would be required during the state-listed birds' breeding periods.

The state threatened red-shouldered hawk has been found in the vicinity of Subsegments P9 and P3 of P-west. This species prefers large stands of medium-aged to mature wet-mesic to dry-mesic and mesic forest with small wetland pockets. This type of habitat is present and occurs adjacent to the ROW of Subsegment P9. If this Subsegment is approved, additional bird surveys and time of year restrictions may be required.

Segment N

The applicants completed bird surveys in June 2013 along five portions of Segment N. Survey sites were chosen due to their likelihood to support rare species and where landowners provided access. The surveys focused on three primary groups—forest interior, grassland, and shrubland songbirds. Surveys were conducted in two forest interior areas and one open area along Subsegment N3b, and two forest interior areas along Segment N1. The survey identified one state threatened species (hooded warbler) and ten species of special concern (black-billed cuckoo, red-headed woodpecker, veery, wood thrush, brown thrasher, golden-winged warbler, blue-winged warbler, field sparrow, vesper sparrow, and dickcissel). If Segment N is approved by the Commission, it is likely that additional bird surveys would be required/recommended.

The NHI database indicates several occurrences for the bald eagle, a special concern species and federally-protected through the Bald and Golden Eagle Act within the vicinity of Subsegments N1, N6, N15, and N16. While the specific nest sites are more than 0.5 mile from the project ROW, there is suitable habitat (large trees in proximity to lakes and rivers) on these segments for the species to be present and nesting. Bird surveys were not completed in this area, therefore, it is unknown if this species is currently present in the area. If this segment is approved, additional bird surveys may be recommended.

In addition to those nests documented in the NHI database, bald eagle surveys were conducted by the applicants in 2013 and additional nests were noted that would need to be taken into consideration if this segment is chosen. In particular, Subsegment N3b near the Trempealeau River is known to have nesting bald eagles. Per USFWS guidelines, it is a requirement to maintain a buffer of at least 660 feet between project activities and an active bald eagle nest. Work may be conducted closer if done outside of the nesting season (August through mid-January). If these guidelines cannot be followed, USFWS must be consulted for further assistance, prior to the start of construction.

A special concern bird has been recorded in the NHI database in the vicinity of Segment N9. This species prefers shallow marshes and sedge meadows for breeding and nesting. Suitable habitat may be present along this segment. While it is likely that the proximity of the proposed ROW to I-90 reduces the quality of nesting habitat for this species, if this segment is approved, additional bird surveys may be required.

The state threatened red-shouldered hawk has been found in the vicinity of Segment N6. This species prefers large stands of medium-aged to mature wet-mesic to dry-mesic and mesic forest with small wetland pockets. This type of habitat is present and occurs adjacent to the ROW. Because Segment N6 crosses several townships, further review would be necessary to determine where specifically this species occurs.

In addition, a total of ten broadcast call surveys were conducted in 2013 along portions of Segment N6, N15, N16, and N21 where suitable habitat occurs. None of the survey stations had red-shouldered hawks respond to the broadcast call surveys except for a station on Segment N21. While it is likely that the proximity of the proposed ROW to I-90 reduces the quality of nesting habitat for this species, if this segment is approved, additional bird surveys may be required.

Segment O

The applicants completed bird surveys in June 2013 along five portions of Segment O. Survey sites were chosen due to their likelihood to support rare species and where landowners provided access. The surveys focused on three primary groups—forest interior, grassland, and shrubland songbirds. Surveys were conducted in open areas along Subsegments O0-O2, O9, O10b, and forested areas along Subsegments O14 and O15. The surveys found two state threatened species (Acadian flycatcher and Bell's vireo) and 14 species of special concern (yellow-billed cuckoo, black-billed cuckoo, willow flycatcher, veery, wood thrush, brown thrasher, blue-winged warbler, field sparrow, vesper sparrow, lark sparrow, grasshopper sparrow, bobolink, eastern meadowlark, and dickcissel). If this segment is approved by the Commission, it is likely that additional surveys will be required/recommended.

The NHI database indicates several occurrences for the bald eagle, a special concern species and federally-protected through the Bald and Golden Eagle Act within the vicinity of Segment O. While some of the specific nest sites are more than 0.5 mile from the project ROW, on Subsegments O4 through O6, there is suitable habitat (large trees in proximity to lakes and rivers) for the species to be present and nesting. In particular, Subsegment O6 near the La Crosse River is known to have nesting bald eagles. Even though it is likely that the proximity of the proposed ROW to STH 53 and I-90 reduces the quality of nesting habitat for this species, if this segment is approved, additional bird surveys may be recommended.

Additionally, there are bald eagle nests immediately adjacent to Subsegment O8 and O14, and one reported by a landowner along Subsegment O15. The applicants conducted bald eagle surveys in 2013 and verified occupied nests, including those nests documented by landowners. Per USFWS guidelines, it is a requirement to maintain a buffer of at least 660 feet between project activities and an active bald eagle nest. Work may be performed closer if conducted outside of the nesting season (August through mid-January). If these guidelines cannot be followed, USFWS must be consulted for further assistance, prior to the start of construction.

One state threatened bird, the Bell's vireo, has been recorded in the NHI database in the vicinity of Subsegments O3 through O6. Suitable habitat for this species includes brushy habitat near open areas, power line corridors, and other linear corridors. Suitable habitat appears to be present along these segments. While it is likely that the proximity of the proposed ROW to USH 53 and I-90 reduces the quality of nesting habitat for this species, if this segment is approved, additional bird surveys may be required. Should these birds be found, time of year restrictions would be required during the Bell's vireo's breeding period.

One state threatened bird, the Acadian flycatcher, has been recorded in the NHI database in the vicinity of Subsegment O15. Suitable habitat for this species includes heavily wooded forests with a semi-open understory; it is rarely observed near forest edges. Suitable habitat is present along this segment. If this segment is approved, additional bird surveys may be required. In addition, the new 120-foot wide ROW traversing through these forested natural communities would result in a permanent loss of habitat for the Acadian flycatcher as a result of fragmentation and edge effects.

6.3.6.2. Small mammals

Segment P

One state threatened bat has been documented in the vicinity of Subsegments P4 through P7 on Segment P-west. This species can be found roosting in tree snags, bat houses, and buildings during the summer and hibernates in caves and mines from fall through spring. It forages primarily over open water and along edge habitats. Where suitable habitat occurs, avoidance measures for this species may include presence/absence surveys and/or no tree clearing during the species' maternity period.

Segment N

One state threatened bat has been documented in the vicinity of Subsegment N14-N15. This species can be found roosting in tree snags, bat houses and buildings during the summer and hibernates in caves and mines from fall through spring. It forages primarily over open water and along edge habitats. Where suitable habitat occurs, avoidance measures for this species may include presence/absence surveys and/or no tree clearing during the species' maternity period. Work conducted during the hibernating months would have no impacts on this species or to the known hibernaculum, as it is located far from the project area.

Segment O

No rare small mammals were documented in the NHI database on Segment O, most likely because many of the documented occurrences in the NHI database are from surveys conducted on public lands. Although a substantial number of large natural forest communities that could support rare mammals are present on this segment, the land is mostly in private ownership.

6.3.6.3. Herptiles – amphibians and reptiles

Segment P

The state endangered and federal candidate Eastern massasauga has been documented in the vicinity of Subsegment P9. This species is associated with floodplain habitats along medium to large rivers, where the snakes occupy open-canopy wetlands and adjacent upland prairies and old fields. Overwintering occurs in burrows or channels in wetlands, shrub-carr and lowland forests. Suitable habitat is found along portions of this segment. Further review would be required to determine where along the segment, this species may be found. Possible avoidance measures for this species may include conducting work in the uplands during the species' inactive season and/or installing herp exclusion fencing in the uplands during the species' inactive season. Any work done in wetland habitat may need an Incidental Take Permit.

The NHI database indicated one state threatened herptile in the vicinity of Subsegments P9 and most of Segments P-west and P-east. This species prefers medium to large rivers and streams and adjacent wetland and upland habitat, usually choosing to nest in sand or gravel. It overwinters in streams and rivers in deep holes or undercut banks. This species becomes active in spring and remains active until fall. Segments P-west and P-east do not contain any suitable habitat, and therefore, would not have any required actions. However, Subsegment P9 crosses the Black River which is considered suitable habitat for this species. The associated wetlands and uplands also would be considered suitable foraging and nesting habitat. Where suitable habitat occurs, required avoidance measures for this species may include working in uplands or wetlands during its inactive season and/or installing exclusion fencing in areas of suitable habitat outside of the active period. Impacts to overwintering sites would be unlikely to occur if temporary bridges were used and there was no disturbance below the OHWM. However, any work done below the OHWM may need an Incidental Take Permit since the species can be present there year-round.

One species of special concern, the timber rattlesnake has been documented as occurring in the vicinity of Subsegments P6 through P8 (P-west), P14 (P-east), and P9. This species prefers deciduous forests, open areas, and woodland edges in an agricultural setting. It appears that suitable habitat is present along these segments. Possible recommended avoidance measures for this species may include conducting work in areas where the species does not overwinter during its inactive season and/or installing herp exclusion fencing in areas of suitable habitat and conducting surveys within the fenced area.

Segment N

One state endangered herptile has been known to occur in the vicinity of Subsegment N13-N14. However, this species will not be impacted; therefore, there are no required measures for this species along these segments.

The state endangered slender glass lizard has been documented along Subsegments N15-18 and Subsegment N6. This species prefers sandy oak savannas, prairies, fields, and woodland habitats which do appear to be present throughout Subsegments N6, N15, and N17-N18. Subsegment N16 consists of wetlands and waterbodies that are not suitable habitat for this species. Typically presence/absence surveys would be required before proceeding with minimization/avoidance measures; however, for this species it is important to note that no survey method is considered 100 percent effective for determining presence or absence. Therefore, if Segment N is approved there will be a requirement to conduct habitat surveys and if suitable habitat is present, an Incidental Take Permit will be required.

The state endangered and federal candidate Eastern massasauga has been documented in the vicinity of Subsegment N6. This species is associated with floodplain habitats along medium to large rivers, where they occupy open-canopy wetlands and adjacent upland prairies and old fields. Overwintering occurs in burrows or channels in wetlands, shrub-carr and lowland forests. Suitable habitat is found along portions of the segment. Further review would be required to determine where along this segment, this species may be found. Possible avoidance measures for this species may include conducting work in the uplands during the species' inactive season and/or installing herp exclusion fencing in the uplands during the species' inactive season. Any work done in wetland habitat may need an Incidental Take Permit.

In addition, the NHI database indicates the special concern Blanding's turtle occurring in the vicinity of Subsegments N6-N9 and N14-N17. This species prefers a wide variety of aquatic habitats and their associated uplands. These subsegments cross several waterbodies, wetlands and their associated uplands. Voluntary avoidance/minimization measures would include: staying out of occupied habitat areas workspace during the appropriate times of year; installing exclusion fencing in areas of suitable habitat before the species becomes actives and moves into the workspace; and/or scheduling construction activities outside of hibernation areas during winter. When conditions preclude timely and effective installation of exclusion fencing, monitoring and removal can be effective if the ground surface is visible and the space to be cleared is relatively small.

The NHI database indicates one state threatened herptile in the vicinity of Subsegments N4-N6 and N9. This species prefers medium to large rivers and streams and adjacent wetland and upland habitat, choosing sand or gravel for nesting. It overwinters in streams and rivers in deep holes or undercut banks. This species becomes active in spring and remains active until fall. Subsegment N9 crosses several waterbodies considered to be suitable habitat for this species including Mud Creek, the South Fork of the Lemonweir River, and Kreyer Creek. Suitable waterbodies along Subsegment N6 may include Glenn Creek, Robinson Creek, Black River, and Kenyon/Hoffman Creek. Their associated wetlands and uplands would also be considered suitable foraging and nesting habitat. Where suitable habitat occurs, required avoidance measures for this species may include working in uplands or wetlands during their inactive season and/or installing exclusion fencing in areas of suitable habitat outside of the active period. Impacts to overwintering sites would be unlikely to occur if temporary bridges were used and there was no disturbance below the OHWM. However, any work done below the OHWM may need an Incidental Take Permit since the species can be present there year-round.

One species of special concern, the gopher snake has been documented to occur within the vicinity of Subsegment N6 and prefers sand prairies, bluff prairies, oak savannas, and pine and oak barrens. This species overwinters in sand prairies. It appears that suitable habitat is present along this segment. Possible recommended avoidance measures for this species may include conducting work in areas where the species does not overwinter during its inactive season and/or installing herp exclusion fencing in areas of suitable habitat and conducting surveys within the fenced area.

Segment O

One state endangered herptile has been known to occur in the vicinity of Subsegments O4-O5. However, this species would not be impacted and therefore, there are no required measures for this species along this segment.

In addition, the NHI database identifies the special concern Blanding's turtle occurring in the vicinity of Subsegment O6. This species prefers a wide variety of aquatic habitat and their associated uplands. Voluntary avoidance/minimization measures would include: avoiding habitat areas during the specific times of the year, installing exclusion fencing in areas of suitable habitat before the species becomes actives and could move into the workspace, and/or scheduling construction activities outside of hibernation areas during winter. When conditions preclude timely and effective installation of exclusion fencing, monitoring and removal can be effective if the ground surface is visible and the space to be cleared is relatively small.

The NHI database indicated one state threatened herptile in the vicinity of Subsegments O6-O7. This species prefers medium to large rivers and streams and adjacent wetland and upland habitat. It overwinters in streams and rivers in deep holes or undercut banks and nests in sand or gravel. This species becomes active in spring and remains active until fall. Subsegment O6 crosses several waterbodies that would be considered suitable habitat for this species including the La Crosse River, Fish Creek, and the Little La Crosse River. Their associated wetlands and uplands would also be considered suitable foraging and nesting habitat. Required avoidance measures for this species may include working in uplands or wetlands during their inactive season and/or installing exclusion fencing in areas of suitable habitat outside of the active period. Impacts to overwintering sites would be unlikely to occur if temporary bridges were used and there was no disturbance below the OHWM. However, any work done below the OHWM may need an Incidental Take Permit.

One species of special concern, the timber rattlesnake, has been documented to occur in the vicinity of Subsegments O6 and O8 through O10. This species prefers deciduous forests, open areas, and woodland edges in an agricultural setting. It appears that suitable habitat is present along these segments. Possible recommended avoidance measures for this species may include conducting work in areas where the species does not overwinter during its inactive season and/or installing herp exclusion fencing in areas of suitable habitat and conducting surveys within the fenced area.

One species of special concern, the gopher snake, has been documented to occur in the vicinity of Subsegments O4 through O7. This species prefers sand prairies, bluff prairies, oak savannas, and pine and oak barrens and overwinters in sand prairies. It appears that suitable habitat is present along these segments. Possible recommended avoidance measures for this species may include conducting work in areas where the species does not overwinter during its inactive season and/or installing herp exclusion fencing in areas of suitable habitat and conducting surveys within the fenced area.

6.3.6.4. Terrestrial invertebrates

Segment P

No rare terrestrial invertebrates were documented in the NHI database on Segment P.

Segment N

The Karner blue butterfly, listed as federally endangered and special concern in Wisconsin, has been found near and on Subsegments N6, N7, N11, and N16-N17. This species prefers pine barrens and oak savanna in close association with its larval host plant, lupine. In Wisconsin, this butterfly is also found along utility and road ROWs, abandoned agricultural fields, and managed forests. Portions of this segment (Subsegments N5 through N7, N9 through N11, and N14 through N17) also directly intersect with the Karner blue butterfly federal high potential range (HPR) which was developed through a model to identify areas where there is a probability of this species occurring. Projects within this area are encouraged to become partners in the Karner blue butterfly habitat conservation plan (HCP) which is a legal agreement between USFWS, DNR, and various other partners. These partnerships allow land managers to work together for the conservation of this species while moving forward with their projects. The applicants are a partner in the HCP. Therefore, for the portions of this segment that cross through the HPR, there would be specific requirements to follow as outlined in the HCP protocols. Implementing protection measures for work done outside of the HPR where this species may also be present would be only voluntary.

Two special concern butterfly species have been found in the vicinity of Subsegment N7. Suitable habitat for both of these species includes barrens, savannas, and prairies. Scattered upland grasslands occur throughout the segment. If this segment was approved, host plant surveys would be recommended in suitable habitat locations. If host plants were located, surveys for the species itself would be recommended.

Rare moths and butterflies have been observed in the vicinity of Subsegment N6. They include one endangered species (phlox moth), one threatened species (frosted elfin), and five species of special concern (columbine dusky wing, gorgone checker spot, mottled dusky wing, Persius dusky wing, dusted skipper, and cobweb skipper). Specifically, the phlox moth, gorgone checker spot, and dusted skipper have been found within or immediately adjacent to the ROW. Suitable habitat for all four of these lepidopteran species include woodland edges, barrens, savannas, and prairies. Habitat for these species is present throughout the subsegment. Due to the length of this subsegment, further review would be required to determine where host plant and species surveys should be conducted. If this route was ordered, host plant surveys would be required in suitable habitat locations. If host plants were located, surveys for the species itself would then be required.

Three special concern grasshopper species, the short-winged grasshopper, huckleberry spur-throat grasshopper, and speckled rangeland grasshopper have been found in the vicinity of Subsegment N6. Suitable habitats for these grasshoppers include woodland edges, shrubland/barrens, grasslands, roadsides, and occasionally along lakes and ponds. Habitat for these species is present throughout this subsegment. Due to the length of this subsegment, further review would be recommended to determine where host plant and species surveys should be conducted. If this subsegment was approved, host plant surveys would be recommended in suitable habitat locations. If host plants were located, surveys for the species itself would be recommended.

The honey vertigo, a terrestrial snail listed as a species of special concern, has been found in the vicinity of Subsegment N6. This species is found in low, sunny, herbaceous places which may be present along this subsegment. Minimization measures for this species may include habitat surveys and/or presence/absence surveys. Further minimization measures would need to be determined if the species is found to be present within the ROW.

Construction measures to avoid or minimize impacts may be required or recommended for all terrestrial invertebrate species. This could include avoiding areas in the ROW, hand clearing, timing restrictions, the use of mats in occupied or suitable habitat areas during the winter months, and habitat-specific seed mixes. Appropriate ROW management that facilitates growth of native plants and maintains an open herbaceous habitat can provide long-term benefits to these species.

Segment O

Portions of Subsegment O7 directly intersect with the Karner blue butterfly federal HPR that was developed through a model to identify areas where there is a probability of this species occurring. Projects within this area are encouraged to become partners in the Karner blue butterfly HCP, which is a legal agreement between USFWS, DNR, and various other partners. These partnerships allow land managers to work together for the conservation of this species while moving forward with their projects. The applicants are a partner in the HCP. Therefore for the portions of this segment that cross the HPR, there would be specific requirements to follow as outlined in the HCP protocols. Protection measures implemented for work done outside of the HPR, where this species may also be present, would be voluntary.

One endangered butterfly, the regal fritillary, has been found in the vicinity of Subsegments O22 through O25. Suitable habitat includes large grassland areas, tall grass prairie remnants, and lightly grazed pasture lands with prairie vegetation. Habitat for this species may be present throughout the segment. If these subsegments are approved, host plant surveys would be required in suitable habitat locations. If host plants were located, surveys for this butterfly species would be required.

6.3.6.5. Aquatic invertebrates

Segment P

One state endangered and three special concern mayflies have been documented in the vicinity of Segment P-west. However, this segment does not cross any waterbodies that would be considered suitable habitat for these species, so no further requirements or recommendations are necessary along this segment.

One state endangered mayfly that has been documented in the vicinity of Segment P-east. However, this segment does not cross any waterbodies that would be considered suitable habitat for any of this species, so no further requirements or recommendations are necessary along this segment.

Two state threatened mussels, four special concern mayflies, and one state endangered mayfly have been documented in the vicinity of Subsegment P9. The mussel species are known occurrences in the Black River which is crossed by this subsegment. Impacts may be avoided by using alternative access routes or structure locations that would not cause disturbance below the OHWM. If disturbance below the OHWM cannot be avoided, further assessments would be needed to determine if these species are present. If they are present, avoidance measures may include removing each mussel within the impacted area and relocating it to an upstream location.

If the state endangered mayfly is present, additional avoidance/minimization measures may be necessary. Otherwise, an Incidental Take Permit may be necessary. For all construction activities conducted above the OHWM, the implementation of strict erosion control practices would be required.

Four special concern mayflies, one state endangered mayfly, three state threatened mussels, and one special concern mussel have been documented in the vicinity of Subsegment P10. However, this subsegment does not cross any waterbodies that would be considered suitable habitat for these species. No further requirements or recommendations are necessary for these species along this subsegment.

Segment N
Four special concern mayflies, one state endangered mayfly, and two state threatened mussels that are documented in the vicinity of Subsegment N1. However, this segment does not cross any waterbodies considered to be suitable habitat for these species. No further requirements or recommendations are necessary.

One state threatened and one special concern mussel has been documented in the vicinity of Subsegments N5 and N6. These species are known occurrences in the Black River which is crossed by Subsegment N6. Town Creek, a tributary of the Black River, may also be considered suitable habitat for the special concern species. Impacts to this species may be avoided by using alternative access routes or structure locations that avoid disturbance below the OHWM. If disturbance below the OHWM cannot be avoided, further assessments would be needed to determine if either of these species are present. If these species are determined to be present, avoidance measures may include removing and relocating individuals within the impacted area to an upstream location. Otherwise, an Incidental Take Permit may be necessary for the threatened species. Construction activities conducted adjacent to these waterways above the OHWM, would require implementation of strict erosion control practices.

Two special concern dragonflies and one state endangered dragonfly have been documented in the vicinity of Subsegment N6. Two of the species prefer bogs and fens which are not habitat that would be disturbed during the construction of this project. Only one of the special concern species is known to occur in Robinson Creek, which is crossed by Subsegment N6. Further assessments would be needed to determine if this species could be present within this stream and other suitable streams, including Coffee Creek, Rudd Creek, and Glenn Creek. Impacts to this species may be avoided by using alternative access routes or structure locations that avoid disturbance below the OHWM. This would include implementing strict erosion control measures. If disturbance below the OHWM cannot be avoided, further assessments may be needed to determine if these species are present. If these dragonflies are determined to be present, additional avoidance/minimization measures may be necessary.

One state threatened mussel has been documented in the vicinity of Subsegments N15 through N21. This species is a known occurrence in the Lemonweir River which is crossed by Subsegments N21 and N16. Both crossings would require work below the OHWM. Further assessments would be needed to determine if this species is present where the work would occur. Impacts to this species may be avoided by using alternative access routes or structure locations that avoid disturbance below the OHWM. If disturbance below the OHWM cannot be avoided, further assessments would be needed to determine if this species is present. If it is determined to be present, avoidance measures may include removing and relocating individuals within the impacted area to an upstream location. Otherwise, an Incidental Take Permit may be necessary.

Segment O
One special concern damselfly has been documented in the vicinity of Subsegments O8 and O9. It can be found in permanent lakes and ponds, which do not appear to be present along these subsegments.

6.3.6.6. Fish

Segment P

Several rare fish species are documented in the NHI database as occurring in the vicinity of Segment P-west and P-east. However, these segment does not cross any waterbodies that would be considered suitable habitat for these species. No further requirements or recommendations are necessary on either of these segments.

One state endangered, two state threatened, and five special concern fish species have been documented in the vicinity of Subsegment P9 and are known occurrences in the Black River. If construction activities would occur below the OHWM of this waterbody, further assessment and/or surveys would be required to determine if these rare fish are present. Potential avoidance measures may include avoiding work in the water during the species' spawning period. For all work conducted above the OHWM, the implementation of strict erosion control practices, in addition to avoiding work during the species' spawning period, would be recommended.

The NHI database documents several fish species in the vicinity of Subsegment P10, including five special concern, one state threatened, and one state endangered species. However, this segment does not cross any waterbodies considered to be suitable habitat for these species, so no further requirements or recommendations are necessary.

Segment N

Several fish species are documented as occurring in the vicinity of Subsegment N1, including four special concern, one state threatened, and one state endangered species. However, this segment does not cross any waterbodies considered to be suitable habitat for these species, so no further requirements or recommendations are necessary.

One state endangered, one state threatened, and one special concern fish species have been documented in the vicinity of Subsegments N3a and N3b and are known occurrences in the Trempealeau River. In addition, several tributaries of the Trempealeau River may also be considered suitable habitat for these rare species. If construction activities occur below the OHWM in the Trempealeau River, further assessment and/or surveys would be required to determine if these rare fish are present. Potential avoidance measures may include avoiding any work in the river during the species' spawning period. Where construction activities would be conducted above the OHWM, the implementation of strict erosion control practices, in addition to avoiding work during the species' spawning period, would be required.

Three state threatened and one special concern fish species have been documented in the vicinity of Subsegments N5 and N6 and are known occurrences in the Black River. Town Creek, a tributary of the Black River, may also be considered suitable habitat for one of the threatened species. If construction activities occur below the OHWM of these waterways, further assessment and/or surveys would be required to determine if the rare fish are present. Potential avoidance measures may include avoiding any work in the water during the species' spawning period. In addition to avoiding work during the species' spawning period, work conducted above the OHWM would require the implementation of strict erosion control practices.

A special concern fish species has been documented in the vicinity of Subsegments N9 and N15-N16. Another special concern fish species has been documented in the vicinity of Subsegment N21. While these segments cross several waterways, there are five waterbodies (Sevenmile Creek on Subsegment N21, two crossings of the Lemonweir River on Subsegments N16 and N21, an unnamed tributary of the Little Lemonweir Creek on Subsegment N15, and the Mud Creek and the South Fork of the Lemonweir River on Subsegment N9) that could have suitable habitat for these species, such as slow sections of medium-large rivers. It appears that work would occur below the OHWM along both crossings of the Lemonweir River; thus, further assessment and/or surveys would be recommended to determine if these rare fish are present. Potential avoidance measures may include avoiding work in the water during the species' spawning period. In addition to avoiding work during the species' spawning period, work conducted above the OHWM would require the implementation of strict erosion control practices.

The same two special concern fish species mentioned above have also been documented in the vicinity of Subsegments N17 through N20 and one in the vicinity of Subsegment N8. While these segments cross several intermittent and permanent waterbodies, none of the waterways appear to be large enough to support these two fish species at the proposed crossing locations.

Segment O
Subsegments O0-O5 has a total of three state threatened and five special concern fish species that are documented in the vicinity. However, these segments do not cross any waterbodies. Thus, no further requirements or recommendations are necessary.

One state endangered, three state threatened, and four special concern fish species have been documented in the vicinity of Subsegment O6 and several of these species are known occurrences in the La Crosse River. In addition, several tributaries to the La Crosse River, including Fish Creek and Dutch Creek, may also be considered suitable habitat for these rare species. If construction activities occur below the OHWM, further assessment and/or surveys would be required to determine if these rare fish are present.

Due to the length of Segment O, further review would be recommended to determine where habitat and species surveys should be conducted. Potential avoidance measures may include avoiding any construction activities in the water during protected species' spawning periods. Wherever work would be conducted above the OHWM adjacent to waterways, the implementation of strict erosion control practices, in addition to avoiding work during the species' spawning period, would be recommended.

6.3.6.7. Plants

Impacts on natural communities can ultimately change habitat conditions and make it difficult for rare plants to persist. Wisconsin's Endangered Species Law protects state-listed endangered and threatened plant species on public lands, but utility, agriculture, forestry, and bulk sampling projects are exempted from this protection. Additional surveys and avoidance/minimization measures for rare plant species are encouraged and recommended. Potential avoidance measures may include conducting plant surveys to determine presence/absence and/or avoiding areas where known plants occur. Other measures, such as winter construction, use of mats to limit direct disturbance, or relocation, can minimize losses. DNR would also recommend that the applicants and landowners with rare species on their property develop a plan to protect these species.

Segments P-west
One state threatened species (Hill's thistle) and three special concern species (dragon wormwood, clustered poppy-mallow, and silky prairie-clover) occur in the vicinity of Segment P-west. In particular, portions of this segment border a potential clustered poppy-mallow site. Suitable habitat for these species includes dry prairies, preferably with sandy soils. This type of habitat could be present along portions of this segment. Due to the length of this segment, further review would be recommended to determine where habitat and species surveys should be conducted.

In addition, two state threatened plants (pale green orchid and prairie milkweed) and one special concern plant (Vasey's pondweed) are known to occur in the vicinity of Segment P-west. These species are found in varying types of moist prairie, wetlands, and aquatic habitats. These types of habitat are not present along this segment. Therefore, no recommended actions would be necessary.

Segment P-east

One state threatened species (prairie milkweed) and one special concern species (Vasey's pondweed) plant species are known to occur in the vicinity of Segment P-east. These species are found in different types of moist prairie and aquatic habitats. These types of habitat do not occur along Segment P-east, and therefore, no recommended actions would be necessary.

Segment P-east also has one state threatened plant (Hill's thistle) and three special concern plants (dragon wormwood, clustered poppy-mallow, and silky prairie-clover) occurring in the vicinity of this segment. In particular, portions of this segment border potential clustered poppy-mallow and silky prairie-clover sites. Suitable habitat for these species includes dry prairies, preferably with sandy soils. This type of habitat could be present along portions of this segment. Due to the length of Segment P-east, further review would be recommended to determine where habitat and species surveys should be conducted.

Segment P

The snowy campion and Vasey's pondweed are state species of special concern that are known to occur in the vicinity of Segment P. The snowy campion is found on stream banks and in streamside meadows, whereas Vasey's pondweed is found in lakes, rivers, and ponds. This type of habitat occurs throughout Segment P, particularly where the proposed route crosses the Black River.

Segment N

The whip nutrush, a state special concern species, has been found in the vicinity of Subsegment N3b. This species prefers moist sandy meadows, sunny margins between barrens, and ditches. This type of habitat occurs frequently throughout Segment N. Due to the length of this segment, further review would be recommended to determine where habitat and species surveys should be conducted.

The NHI database identified one state threatened plant species in the vicinity of Subsegment N5. However, this species is found in upland habitats of sand prairies, bedrock glades, or other dry open habitats that are not present along this subsegment. Therefore, no impacts on this species would be anticipated along this portion of the route.

Five special concern plants (rock clubmoss, prairie fame-flower, small-flowered wooly bean, Fernald's sedge, clustered sedge, and straw sedge), two state threatened plants (dwarf milkweed and brittle prickly-pear), and one state endangered plant (sand violet) are known to occur in the vicinity of Subsegment N6. In particular, the dwarf milkweed, prairie fame-flower, and small-flowered wooly bean are known to occur on or immediately adjacent to the proposed subsegment. All eight species can be found in a variety of upland and wetland habitats including barrens, woodlands, prairies, cliffs, moist meadows, and marshes. Specifically, the dwarf milkweed is periodically found in brushed areas and ROWs and the sand violet can be found on sandstone road cuts or trail sides. Habitat for these species may be present along this subsegment and further habitat surveys may be needed. Due to the length of this segment, further review would be recommended to determine where habitat and species surveys should be conducted.

The NHI database identified one state threatened plant species in the vicinity of Subsegments N13 through N14. However, this species is found in upland habitats of dry prairies and other open habitats that are not present on this subsegment. Therefore, no impacts on this species would be anticipated along this portion of the route.

Three state threatened plant species have been recorded as occurring in the vicinity of Subsegments N15 and N16. One species prefers sedge meadows, wet to mesic prairie, and floodplain forest habitats which are present along both of these segments. The other two species prefer upland habitats of prairies and savannas. This type of habitat is present only along Subsegment N15.

Two plant species, one species of special concern and one state threatened species have been recorded as occurring on or near Subsegment N17. There does not appear to be suitable habitat for the special concern species, as it is an aquatic species associated with ponds and marshes which are not present along this subsegment. The state threatened plant prefers sandy or gravelly open areas which may be present along this subsegment.

Two special concern plant species have been documented in the NHI database as occurring in the vicinity of Subsegments N11 and N12. One is an upland species that prefers sand barrens or other open sandy habitats and the other is an aquatic species that prefers marshes and sedge meadows. The aquatic species also occurs in the vicinity of Subsegment N9 and N10. There may be suitable habitat for the upland plant species along Subsegment N11 and the aquatic plant species along Subsegment N9. However, the remaining subsegments (N10 and 12) do not have suitable habitat, so these species likely would not be impacted.

Three plant species identified in the NHI database as occurring on or near Subsegments N20 through N23 may be present in suitable habitat that is intersected by these subsegments. Two special concern species prefer sedge meadows or other sandy wetlands that occur throughout these segments and one state threatened species prefers prairie or other dry, open, sandy habitat. This type of habitat, while not as common as the wetlands, does seem to be present along these subsegments.

Segment O

One state threatened species is known to occur in the vicinity of Subsegments O0 toO3. This species is found in moist prairie habitat which is not present along these subsegments.

Suitable habitat is likely to be present along portions of Subsegments O0 toO7 for nine of 13 plant species identified in the NHI database: three state threatened species (brittle prickly-pear, Hill's thistle and Carolina anemone) and seven special concern species (marsh horsetail, Vasey's pondweed, prairie false-dandelion, prairie parsley, yellow evening primrose, snowy campion, rope dodder, wild licorice, small-flowered wooly bean, dragon wormwood, clustered poppy-mallow, and silky prairie-clover).

Suitable habitat for these species includes dry-mesic prairies, grasslands, woodland margins, wetlands, and in some cases, disturbed open areas. In particular, portions of this segment border or intersect potential prairie false-dandelion, yellow evening primrose, marsh horsetail, silky prairie clover, and clustered poppy-mallow sites. Due to the length of these subsegments, further review would be recommended to determine where habitat and species surveys should be conducted. The two special concern species (Oregon woodsia and rock clubmoss) require cliff habitats and are not likely to be found on this portion of Segment O.

Suitable habitat is likely to be present along portions of Subsegments O10 to O15 for two special concern species, the snowy campion and azure bluets, as identified by the NHI database. Suitable habitat includes stream banks and meadows and forest margins near streams and rivers, often occurring in reed canary grass or dry prairies, woodlands, and damp meadows. Due to the length of this segment, further review would be recommended to determine where habitat and species surveys should be conducted. One special concern species (musk-root) requires cliff habitat and is not likely to be found in these subsegments.

Suitable habitat is likely to be present along portions of Subsegment O27 for two special concern species identified in the NHI database. This habitat includes moist sandy meadows and sedge meadows that are present along a portion of this subsegment.

6.3.6.8. Natural communities

Natural communities may contain rare or declining species and protection of these communities should be incorporated into the project design as much as possible. Given the predominance of private lands, it is likely that many more diverse, high quality, or rare natural community occurrences likely exist beyond those documented in the NHI database. Minimizing impacts to and/or incorporating buffers along the edges of these natural communities is recommended.

Segments P-west, P-east, and P

Two upland, four wetland, and one aquatic natural community have been documented in the NHI database as occurring along or near Segment P-west. This segment does not cross any wetland or aquatic communities, however, good examples of upland natural communities were identified during the survey completed by the applicants. These included large contiguous stands of upland grasslands.

Two upland, two wetland, and one aquatic natural community have been documented in the NHI database as occurring along or near Segment P-east. This segment also does not crossing any wetland or aquatic communities; however, upland natural communities have been documented nearby.

Segment P has an emergent marsh and riverine lake/pond natural community occurring nearby. While this segment crosses several wetlands and waterways, none would be considered quality wetland and aquatic natural communities.

Segment N

Subsegment N1 has one wetland natural community occurring nearby. While this segment crosses several wetlands, all are too small to be considered quality wetland communities.

One aquatic natural community has been documented near Subsegment N3b. This subsegment crosses several waterways including the Trempealeau River, where a structure may be constructed below the OHWM.

Four upland, four wetland, and one aquatic natural communities are documented Segment N. The applicants conducted habitat surveys along this segment and found several good examples of many types of natural communities. In particular, Subsegment N6 runs along several documented oak barrens considered to be suitable habitat for many of the rare species listed in this chapter.

Three upland and one wetland natural community are documented in the vicinity of Subsegment N9. One of the upland natural communities and a wetland natural community may be present based on habitat surveys conducted by the applicants. The applicants' surveys revealed habitat types including wet meadow, sedge meadow, shrub-car, hardwood swamp, coniferous forest, mixed deciduous/coniferous forest, and deciduous forest.

The NHI database indicates the presence of one upland natural community along Subsegments N11 to N14 and a different upland natural community along Subsegment N12. Good examples of these community types were identified by the applicants including pine plantation, mixed deciduous/coniferous forest and deciduous forest.

Based on the NHI database, Subsegment N15 has two upland and one wetland natural communities noted as occurring in the vicinity of this subsegment. Good examples of these communities, in addition to others, have been identified by the applicants and include sedge meadow, wet meadow, hardwood swamp, shallow marsh, upland grassland, deciduous forest, and mixed deciduous/coniferous forest.

Subsegment N17 contains three upland and four wetland natural communities that have been documented in the NHI database. One of these wetland communities is crossed by Subsegment N16 and four are crossed by Subsegment N17. In addition, examples of upland and wetland communities have been documented along these subsegments through surveys completed by the applicants. The identified upland communities from Subsegment N17 are deciduous forest, mixed deciduous/coniferous forest, upland grassland, and upland shrubland. The wetland communities along Subsegments N16 andN17 are wet meadow, hardwood swamp, shrub-carr, floodplain forest, and sedge meadow.

Further south along Subsegments N18 and N19, four wetland natural communities have been identified in the NHI database as occurring along or near the proposed route. Several wetlands have been identified along these subsegments in surveys completed by the applicants. These wetlands include wet meadow, drainage swale, hardwood swamp, shallow marsh, and shrub-car.

Six upland, five wetland, and one waterbody natural communities are documented in the NHI database as occurring along or near Subsegments N20-N23. Several of these communities appear to be crossed by these subsegments. In addition, good examples of these natural communities were identified in survey completed by the applicants. The surveys revealed forested habitats of mixed deciduous/coniferous and deciduous forests. Other upland habitats include grasslands, old fields, and shrublands. Wetland habitats also were frequently identified and include floodplain and riparian forests, shallow marsh, sedge meadow, hardwood swamp, wet meadow, and shrub-carr.

Segment O

The NHI database noted the occurrence of two wetlands and one aquatic natural community occurring near Subsegments O0 and O1, but there no wetlands or waterbodies are crossed by this portion of the Segment O.

Two upland natural communities have been documented in the vicinity of Subsegments O3 and O4. While some habitat may be present, the likelihood of it being high-quality in such a developed and small, linear area is unlikely.

A total of two upland and five wetland natural communities are documented in the NHI database as occurring near Subsegments O6 and O7. Several of these communities appear to be crossed by these subsegments, including sand barrens and southern sedge meadow. In addition, good examples of these natural communities were identified during surveys completed by the applicants. Identified wetland habitats include floodplain and riparian forests, sedge meadow, shallow marsh, wet meadow, and shrub-carr. Upland habitats include grasslands and shrublands.

A total of four upland natural communities are identified in the NHI database as occurring within or near Subsegment O15. The applicants conducted habitat surveys of this area, and the particular area where these natural communities occur was described as being, "a large contiguous stand of mature, closed canopy, deciduous and coniferous forest dominated by pole and saw size timber."

A total of four upland, four wetland, and one aquatic natural communities are documented in the NHI database as occurring near Subsegments O26 and O27. Several of these communities appear to be bordered or crossed by these subsegments. In addition, good examples of these natural communities were identified during surveys completed by the applicants. Identified wetland and aquatic habitats include wet meadow, hardwood swamp, shrub-carr, coniferous swamp, and several waterways. Upland habitats include deciduous forest.

6.3.6.9. Summary of endangered resource impacts for Segments P, N, and O

Tables 6.3-5 through 6.3-7 identify the general types and numbers of rare species, natural communities, and other features that were identified as potentially present along Segments P-west, P-east, P, N, and O based on information, primarily from the NHI database and some other sources.

Table 6.3-5 Summary of endangered resources along Segment P-west (Subsegments P0-P7)

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidates	Not Applicable
Birds	3	1			
Small Mammals	1				
Herptiles	1	1			
Terrestrial Invertebrates					
Aquatic Invertebrates	1	3			
Fish	2	6			
Plants	3	4			
Natural Communities					7
Summary	11	15	0	0	7

State Required Actions – 8
State Recommended Actions – 25
Federal Required Actions – 0
Federal Recommended Actions – 0

Table 6.3-6 Summary of endangered resources along Segment P-east (Subsegments O0a and P11-P14)

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidates	Not Applicable
Birds	2	1			
Small Mammals	1	1			
Herptiles					
Terrestrial Invertebrates					
Aquatic Invertebrates	1				
Fish	1	5			
Plants	2	4			
Natural Communities					5
Summary	7	11	0	0	5

State Required Actions – 5
State Recommended Actions – 18
Federal Required Actions – 0
Federal Recommended Actions – 0

Table 6.3-7 Summary of endangered resources along Segment P (Subsegments P9-P10)

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidates	Not Applicable
Birds	3	2			
Small Mammals					
Herptiles	2	1		1	
Terrestrial Invertebrates					
Aquatic Invertebrates	3	4			
Fish	3	5			
Plants		2			
Natural Communities					2
Summary	11	14	0	1	2

State Required Actions – 11
State Recommended Actions – 16
Federal Required Actions – 0
Federal Recommended Actions – 1

Table 6.3-8 Summary of endangered resources along Segment N

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidates	Not Applicable
Birds	1	2			
Small Mammals	1	1			
Herptiles	4	2		1	
Terrestrial Invertebrates	2	11			
Aquatic Invertebrates	4	7			
Fish	4	5			
Plants	7	9			
Other Features			1		
Natural Communities					24
Summary	23	37	1	1	25

State Required Actions – 16
State Recommended Actions – 69
Federal Required Actions – 1
Federal Recommended Actions – 1

Table 6.3-9 Summary of endangered resources along Segment O

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidates	Not Applicable
Birds	3	1			
Small Mammals	2	3			
Herptiles	1				
Terrestrial Invertebrates		1			
Aquatic Invertebrates	4	5			
Fish	4	18			
Plants	3	4			
Other					1
Natural Communities					17
Summary	14	28	0	0	18

State Required Actions – 10
State Recommended Actions – 49
Federal Required Actions – 0
Federal Recommended Actions – 0

6.3.7. Archaeological and historic resources

No intact above-ground historic structures listed with WHS have been identified by the applicants for Segments P, N, or O. Two structures, a farmstead in the town of Onalaska, La Crosse County (Segment O) and a bridge over the south branch of the Lemonweir River in the town of La Grange, Monroe County (Segment N) have been demolished or relocated and are no longer a concern.

6.3.7.1. Segment P

Four archaeological sites listed with WHS could be affected by construction in the ROW of Segments P, P-west, and P-east. All four sites include ceramic pieces and lithic "debitage," or pieces remaining from the chipping and making of stone tools. At the New Amsterdam Grasslands, the P-east site includes projectile points, as well.

If Segments P, P-west, or P-east are part of an approved route for the project, WHS recommends a field survey by a qualified archaeologist where the WHS-mapped site coincides with the proposed ROW. The field survey would assess potential effects on the site and would be intended to ensure the Commission's compliance with the state historic preservation law.

Table 6.3-10 lists the names of the sites occurring on these segments along with additional information from the WHS inventory of recorded sites. The listing of a site with WHS is an indication that the site is considered eligible for the NRHP.

Table 6.3-10 Reported archeological sites along the ROW of Segments P, P-east, or P-west

Site # (Name)	Artifacts/Materials Present	Recommended WHS Action
LC-0118 (Marfilius)	Ceramics/lithic debitage	Archaeological survey
LC-0103 (Spangler I)	Ceramics/lithic debitage	Archaeological survey
LC-0816 (Chalsma I)	Ceramics/lithic debitage	Archaeological survey
TR-0036 (Hunters Bridge)	Ceramics/lithic debitage/stoneware/transfer ware	Archaeological survey

6.3.7.2. Segment N

Along Segment N, the archaeological consultant identified 19 listed archaeological or burial sites. All include lithic debitage and ceramic fragments while some include points or point fragments or fragments of tools. There are also three burial sites, one active cemetery, one site with evidence of a campsite or village, and one site related to a house built in 1880.

If Segment N is part of an approved route for the project, WHS recommends field survey by a qualified archeologist where a WHS-mapped site coincides with the proposed ROW. The survey would assess potential effects on the sites and would be intended to ensure the Commission's compliance with the state historic preservation law. At burial sites, archeological survey must be conducted under the requirements of Wis. Stat. § 157.70, the state burial preservation law to determine if there are human remains. Under Wis. Stat. § 157.70, the applicants must apply directly to WHS for authorization before any ground disturbance at the site may begin, including archeological survey.

Table 6.3-11 lists the names of the sites occurring on these segments along with additional information from the WHS Inventory of recorded sites. The listing of a site with WHS is an indication that the site is considered eligible for the NRHP.

Table 6.3-11 Reported archeological sites along Segment N and off-row access roads

Site # (Site Name)	Artifacts/Materials Present	Recommended WHS Action
TR-0129 (Pellowski I)	Lithic debitage recovered in association with projectile points	Archaeological survey
JA-051 (Higgins A)	Lithic debitage and a stemmed point	Archaeological survey
JA-0424 (Higgins B)	Stemmed point and lithic debitage	Archaeological survey
JA-0063 (Rozmenoski)	Lithic debitage and a side-notched projectile point fragment	Archaeological survey
JA-0222/BJA-0105 (Jann)	Reported historic Native American burial area	Archaeological survey with WHS authorization
JA-0070 (Field)	Historic cultural materials including a clay pipe, earthenware, porcelain, stoneware, and pressed glass	Archaeological survey
MO-0064 (Moore)	Scattered quartzite debitage	Archaeological survey
MO-0065 (Sell)	Scattered lithic debitage and tool fragments	Archaeological survey
BMO-0069 (Town of Lincoln Cemetery)	Burial site with the potential to harbor human remains	Archaeological survey with WHS authorization
MO-0076 (Baldwin)	Extensive scattered lithic debitage	Archaeological survey
MO-0077 (Uschner)	Lithic scatter and lithic debitage	Archaeological survey
MO-0141 (Dietzman)	Several projectile points	Archaeological survey
MO-0017 (Dietzman)	Scattered lithic debitage and ceramics	Archaeological survey
JU-0099	Lithic debitage, broken tools, and grit-tempered pottery	Archaeological survey
JU-0192 (Haschke)	Prehistoric site of unknown cultural affiliation	Archaeological survey
JU-0077/BJU-0128 (Nytsell)	Habitation site and mounds with potential to harbor human remains	Archaeological survey
JU-0054	Lithic quarry and workshop	Archaeological survey
JU-0158	Campsite or village	Archaeological survey
BJU-0172* (Mary Canoe Burial Site)	Burial site with potential to harbor human remains	Archaeological survey with WHS authorization

*Site BJU-0062 is a duplicate listing in the WHS Inventory.

6.3.7.3. Segment O

Along Segment O, the archeological consultant identified 16 listed archeological or burial sites, including 13 campsites or villages, of which four have the potential for human remains, and two other burial sites. The predominate materials that have been recorded for all these sites include scattered lithic materials, ceramics, and miscellaneous artifacts.

Table 6.3-12 lists the names of the sites occurring on Segment O along with additional information taken from the WHS inventory of recorded sites and NRHP. The table excludes sites that would not require additional cultural resource review, as per WHS regulations.

Table 6.3-12 Reported archeological sites along Segment O and off-row access roads

Site # (Site Name)	Artifacts/Materials Present	Recommended WHS Action
LC-0111 (Holmen Honey Wagon)	Prehistoric campsite or village	Archaeological survey
LC-0095/BLC-0071 (Tremaine)	Multi-component prehistoric campsite or village and cataloged burial site	Consultation with WHS and archaeological survey with authorization
LC-0262/BLC-0066 (OT)	Campsite or village with human remains, ceramics, lithic artifacts, metal artifacts, faunal artifacts, faunal remains, and floral remains	Consultation with WHS and archaeological survey with authorization
LC-0149/BLC-0117 (Filler Site)	Habitation site and Native American burial site with ceramics, lithic artifacts, metal artifacts, faunal artifacts, faunal remains, floral remains	Consultation with WHS and archaeological survey with authorization
LC-0249 (You Kids)	Scattered lithics and ceramics	Archaeological survey
LC-0247 (Gamroth Site)	Artifact scatters of cultural materials from Archaic, Late Archaic, and Early Woodland cultural affiliations	Archaeological survey
LC-0046 (Hauser Site)	Scatter of lithics, ceramics, bone, and shell	Archaeological survey
LC-0027 (A. Pralle)	Surface scatter of artifacts	Archaeological survey
LC-0018 (Kramer Site)	Surface artifacts and subsurface features	Archaeological survey
LC-0035 (Jorstad)	Surface scatter of artifacts	Archaeological survey
LC-0030 (H. Pralle)	Surface scatter of Artifacts	Archaeological survey
LC-0482 (Elmwood III)	Hearths, fire-cracked rock, charcoal, burned sand and Oneota artifacts	Consultation with WHS and archeological survey
LC-0023 (Sanwick)	Surface scatter of artifacts, including lithic debitage, and a triangular projectile point	Archaeological survey
LC-0001 (Swennes)	Surface scatter of artifacts	Archaeological survey
LC-0008/BLC0106 (West Salem Mound Group)	Two mounds of the West Salem Mound Group with potential for human remains	Consultation with WHS and archeological survey
BMO-0104 (John Cannon Family Burial Site)	Small private cemetery with potential for human remains	Consultation with WHS and archeological survey

If Segment O is part of an approved route for the project, WHS recommends field survey by a qualified archeologist where a WHS-mapped site coincides with the proposed ROW. The survey would assess potential effects on the sites and would be intended to ensure the Commission's compliance with the state historic preservation law. At burial sites, archeological survey must be conducted under the requirements of Wis. Stat. § 157.70, the state burial preservation law to determine if there are human remains. Under Wis. Stat. § 157.70, the applicants must apply directly to WHS for authorization before any ground disturbance at the site may begin, including an archeological survey.

6.4. COMMUNITY RESOURCES

6.4.1. Land use

In general, residential uses are considered to be more sensitive to impacts from electric transmission lines than commercial or industrial land uses, primarily because of potential adverse aesthetic effects. Greater potential for conflict with land use plans exists in areas of urban development, where existing and planned residential and commercial uses are more common. The potential for conflict is also present in areas undergoing land use change, such as where rural land is being converted to residential use.

Corridor-sharing with different types of infrastructure (for example, transmission lines and multi-lane highways) can mitigate impacts by causing incremental impacts instead of entirely new impacts associated with a new ROW corridor. Not all corridors that can be shared with a transmission line serve to lessen potential impacts, though. Places with narrow, canopy-covered local roads, winding rural roads, and residential areas supporting smaller lots may experience greater impacts from a new high-voltage transmission line.

6.4.1.1. Segment P

These segments begin in the growing urbanized area that includes the village of Holmen and the town of Holland in La Crosse County, an area undergoing conversion from rural to urban uses.

The Briggs Road Substation is located in an area where future planned use is transitional (medium-high density) residential or mixed use. Segment P-east (Subsegments P11-P14) follows existing corridors (primarily highway) for its entire length, except for a short distance where it is in an agricultural field. Segment P-west (Subsegments P0-P7) also mostly follows existing corridors. However, transmission routes following small residential streets with no existing above ground utilities, such as Pedretti Street, does not mitigate impacts, but instead increases most types of impacts.

Segment P-east

Segment Option P-east heads north out of the Briggs Road Substation, crossing USH 53/STH 93 to continue north on the east side of the freeway. Between the substation and CTH MH, the village of Holmen's land use plan shows mixed uses on the west side of the freeway and higher density residential on the east side. The land on the east side of the freeway is already partially developed for multi-family housing. Commercial use is designated for the southwest corner of the junction of USH 53/STH 93 and CTH MH. North of CTH MH, residential uses are shown on both sides of the freeway in the village's smart growth plan and the town of Holland's comprehensive plan. Existing residential development is on both sides of the freeway for 0.25 mile. A large area of single-family home residential development borders the west side of the freeway beyond that point. North of this development is the New Amsterdam Grasslands, a property owned and managed by the Mississippi Valley Conservancy as critical bird nesting habitat (particularly for grassland birds) to be preserved in a natural state .

Across from the conservancy land, this segment passes Prairie View Elementary School. Although the proposed transmission ROW would be within the DOT ROW, building the proposed transmission line on this segment would require removing a line of trees along the edge of the school property that currently screens the noise and traffic of the freeway. The trees will also screen from view the soon-to-be-built CapX 345 kV transmission line, which will be located on the west side of the freeway. A medical clinic is planned for the southeast corner of the intersection of STH 35 and USH 53/STH 93. Holmen has designated the northeast corner as multi-family housing. Commercial and light industrial land is planned for the north end of Subsegment P14.

As proposed by the applicants, the centerline of Subsegment P13 is located 200 feet from the edge of the DOT ROW, paralleling the CapX line. This offset into cropland, at that location would significantly reduce the developable area of the affected parcel if the future land use changes.

Segment P-west

Between the Briggs Road Substation and CTH XX, Subsegment P1 crosses an area of farmland, sharing ROW with an existing DPC 161 kV transmission line, with which it would be double-circuited. The village of Holmen's Smart Growth Plan shows the first part of this segment crossing an area designated for transitional residential development. The next part of the segment crosses an area of planned mixed use development. South of CTH MH, a town of Holland ballpark is immediately west of Subsegment P2 and a planned transitional residential district lies to the east. Additionally, the Holland Sand Prairie SNA is about 500 feet east of the centerline of the subsegment.

The village of Holmen's plan shows single-family residential development for most of the area between CTH MH and STH 35, west of USH 53. Subsegment P3 jogs slightly west and follows Pedretti Street into the new August Prairie subdivision in the town of Holland where a number of homes have already been constructed, and a total of 27 lots (generally less than one acre in size) are located within 300 feet of the proposed transmission line centerline. Since the applicants proposed this subsegment in fall of 2013, a number of people who purchased lots have subsequently suspended building plans. The proposed transmission line would cross five lots, rendering some of them unusable for building a home typical of this development. Continued development in the August Prairie subdivision would likely be hindered by routing the proposed transmission line through this area. Additional discussion about the August Prairie Subdivision is in Section 6.4.2 of this chapter. Another large single-family residential development is located east of the August Prairie development.

North of Old CTH NA, Subsegment P5 crosses through a portion of the New Amsterdam Grasslands and borders the western edge for a distance of 0.8 mile. West of this natural resource property, is an existing residential subdivision. Directly south of STH 35, future land use plans indicate a mixed-use commercial area which is crossed by this subsegment. Between Old CTH NA and STH 35, Subsegment P5 is located in the ROW of an existing DPC 69 kV line that would be double-circuited with the proposed line.

Subsegment P6 closely follows the north side of STH 35. The village created the "Seven Bridges" Tax Incremental District on the north end of the community, between Amsterdam Prairie Road and USH 53/STH 93. Holmen's vision for the district is "to create a distinctive signature entrance into the village of Holmen as one approaches the community from the north and west. Land uses will consist of residential, multi-family, mixed uses, office, light industrial, and green space." The area is currently a combination of agricultural land and open space with some pockets of residential and small commercial businesses. Southeast of the intersection of Amsterdam Prairie Road and STH 35, mixed-use commercial and multi-family housing are shown on Holmen's 2012 future land use map. Mixed use-commercial or light industrial uses are planned for both sides of the highway on the rest of the subsegment. Some residents might consider a transmission line along this entryway to the community an intrusion that detracts from the area's visual appeal.

Segment P (Subsegments P9 and P10)

Segment P begins at the junction of Segments P-west and P-east, about 0.4 mile north of STH 35, and follows the west side of USH 53/STH 93. The Holmen 2012 future land use map shows commercial, mixed use-commercial, and light industrial use south of Old Highway 93 Road, and mixed commercial use and multi-family housing to the north of Old Highway 93 Road. North of these areas, up to Sylvester Road, the map shows single-family residential on both sides of the highway. A golf course and restaurant, Drugan's Castle Mound Country Club, is located on the east side of the highway, south of Sylvester Road. An existing bicycle trail runs on the east side of USH 53/STH 93, just south of Old Highway 93 Road.

North of the Holmen village limits, Subsegment P9 crosses agricultural land where the town of Holland's comprehensive plan shows small lot residential development as the planned land use. As such, the proposed centerline is less than 50 feet from an existing home in this area. Continuing north, the subsegment is directly adjacent to a campground, but farther from existing residences on the east side of the highway. The subsegment passes a wooded area designated for large lot residential development, located on the east side of USH 53/STH 93, between CTH T and a point 0.3 mile south of the Black River. The segment crosses over to the east side of the highway, once it passes several homes on that side of the highway, avoiding a mobile home park on the west side, but substantially impacting an existing wooded residential property abutting the Black River. The entire stretch of highway between the northern boundary of Holmen and the southern boundary of Trempealeau County is included in a "conditional commercial corridor," where future commercial development could be permitted.

After crossing the Black River, the segment heads east a short distance and then turns north to parallel an existing NSPW 161 kV transmission line. This lower-voltage line would be double-circuited with the new CapX transmission line. The segment borders a wooded commercial parcel on two sides. The centerline of the proposed Badger-Coulee line would be located 200 feet west of the CapX centerline for a distance of about 0.5 mile, before the CapX line heads west. Segment N continues north from Segment P, with the proposed Badger-Coulee transmission line double-circuited with the existing 161 kV line that was double-circuited with the CapX line to the south.

6.4.1.2. Segment N

Most areas along Segment N are rural in nature and are currently in agricultural or other undeveloped uses, such as forestry. This segment crosses predominantly farmland and forest land with scattered single-family homes as it follows existing transmission line and interstate highway corridors. The various towns' comprehensive plans designate much of this land as agricultural districts that also allow for the preservation of woodlands, wetlands, natural areas, and the rural atmosphere of the townships. An electric transmission line is usually compatible with these surrounding land uses. Greater potential for conflict exists near the developed areas of cities and villages, such as the areas in and near the cities of Black River Falls and Tomah where residential and commercial development, existing and planned, becomes more common.

Between the start of Segment N in Trempealeau County and the city of Black River Falls where it intersects with I-94 (Subsegments N1-N5), the proposed transmission line would be mostly double-circuited with existing transmission lines. For the remainder of Segment N (Subsegments N6-N23), it would mostly overlap DOT ROW along the interstate. Over the 103-mile length of Segment N, approximately 93 percent follows existing corridors.

The zoning designation for most of the town of Ettrick is rural residential. Southwest of the village of Ettrick, where the segment crosses USH 53, it passes through an area of planned commercial development. North of this planned commercial area, Subsegment N3a enters a planned residential district extending about 0.75 mile north of the Ettrick village limits. The segment then again enters an area of agricultural land.

Beginning near the Tremval Substation, located west of the city of Blair, the proposed transmission line would be double-circuited with an existing east-west NSPW 161 kV transmission line. The segment shares the ROW of the lower-voltage line as it heads east through an area designated for residential development, along the north edge of Blair. Rural-designated lands are encountered again east of Blair, where the segment enters Jackson County. This subsegment crosses lands designated for conservation protection, southwest of the village of Taylor.

Just outside of the Black River Falls city limits, Subsegment N5 crosses a number of lots in a residential subdivision that is ready for home construction. The impact is mitigated somewhat in that the new transmission line would be double-circuited with the existing 161 kV transmission line on the existing lower-voltage line ROW. The proposed line reduces impacts to the city of Black River Fall's Skyline Golf Course by deviating from the existing 161 kV ROW and crossing a corner of the golf course on new ROW. The existing 161 kV line would be relocated to this new ROW, which also crosses private land north of the golf course. The owner of this partially-wooded private land plans to develop the property for residential lots. The new alignment would reduce the number of wooded lots that could be developed on this land.

After the route rejoins the existing transmission line ROW north of the golf course, it borders an area identified in the city of Black River Falls land use plan as a future commercial district before crossing a planned residential district. After crossing I-94, Subsegment N6 follows the freeway south as a single-circuit line.

In land use plans for the Black River Falls area, residential development is indicated on the northeast side of I-94. Some homes are already located in this area, along with other undeveloped lots platted in close proximity to the highway. A mix of residential, commercial, and industrial land is located southwest of the freeway. A block of undeveloped land designated for commercial development is located in the northeast quadrant of the intersection of I-94 and USH 12. A resource protection area flanks the Black River. Existing commercial development is located at the I-94/STH 54 interchange. A campground and mobile home park are east of the freeway and south of this interchange. Land designated rural transitional then extends along both sides of the freeway to the southern city limits.

South of the city of Black River Falls, Segment N enters an extensive area of county and state forest land in Jackson County. Further south, the segment passes between a westbound I-94 rest area and the freeway. The unincorporated community of Millston, consisting of residential and commercial development, lies on the southwest side of the freeway as the segment continues along the east side of the interstate. Subsegment N6 then enters Monroe County.

Near the village of Warrens, this subsegment passes near a few homes. Within the village, commercial and residential land, including a resort and campground, are located near the Segment N, on the east side of the freeway.

North of Tomah, in the town of LaGrange, residential subdivisions of existing homes are found on both sides of I-94. At the northern end of the city of Tomah, near the I-94/USH 12 and I-94/STH 21 interchanges, the segment passes an area of commercial development, with a mobile home park nearby on the northeast side of the freeway. In the village of Oakdale, Segment N is adjacent to a campground on the northeast side of I-90/94. Existing commercial properties and a parcel designated for future commercial development are located at the I-90/94 and the CTH PP interchange. The northwest and southeast quadrants of the interchange are designated commercial redevelopment areas on the village's proposed land use map.

Southeast of the village of Oakdale, Segment N leaves the I-90/94 corridor to avoid interference with Volk Field and impacts on Mill Bluff State Park and Natural Area. In the town of Oakdale, along Subsegment N11, a strip of homes are located on the south side of Horizon Avenue. The segment is located on the north side of this road.

Southeast of Camp Douglas, in the town of Orange, Juneau County, an area designated as rural residential is crossed by the segment. North of the city of New Lisbon, on the southwest side of I-90/94 at CTH M, the town of Lisbon's plan proposes a rural residential area. The city of New Lisbon's plan shows this same area as preservation/open space. The city's plan has designated the southwest side of I-90/94 from the railroad tracks east to the Welch Prairie Road overpass as Highway Commercial development land. This same designation extends on the northeast side of the freeway for most of this distance.

Governmental/Public/Institutional Land associated with the Castle Rock Golf Course is indicated west of STH 58, north of Mauston, in the town of Lisbon's future land use plan. A planned residential subdivision lies about 500 feet east of the segment in the southeast part of the town of Lisbon. The city of Mauston's land use plan shows a commercial development area planned at the junction of I-90/94 and STH 58. Further southeast along the freeway, the city has long-term plans for a high-quality office park. At CTH G, Subsegment N19 crosses to the southwest side of the freeway, touching the corner of an existing residential area, and then enters another planned commercial area that extends from CTH G to just south of STH 82. A planned industrial parcel is located at the northern end of this area.

The town of Lemonweir's future land use plan identifies rural residential areas along CTH N and along N. 19th Avenue, both of which are crossed by Segment N as it follows the southwest side of I-90/94. Another such planned residential area is encountered by southeast of the second crossing of CTH N. The segment also passes between an I-90/94 rest area and the freeway in this same area.

On the border of the towns of Lemonweir and Kildare, a cluster of homes lies south of Subsegment N23 along Town Line Road. A short distance west of the Lemonweir-Kildare town line, the segment joins the ROW of an existing ATC 69 kV transmission line on the southwest side of I-90/94. The proposed line would be double-circuited with this line.

6.4.1.3. Segment O

Most areas along this segment are rural in nature and are currently in agricultural or other undeveloped uses, such as forestry. These uses are expected to continue into the future. An electric transmission line is generally compatible with these surrounding land uses, although the type of agriculture present along the extremely hilly topography (steep-sided slopes and deep valleys) on the eastern two-thirds of Segment O is not necessarily compatible with this type of utility infrastructure. Potential for conflict exists near the developed areas of cities and villages, such as the Holmen and Onalaska area, where residential and commercial development, existing and planned, becomes more common.

The western portion of Segment O is in some locations double-circuited with existing transmission lines and it shares ROW with I-90 and USH 53. For short distances Segment O also parallels local roads. Depending on the size and character of the road corridor, this type of corridor sharing may not mitigate the anticipated impacts of a high-voltage transmission line. Considering the current and future land uses along the route, many different types of properties would likely be impacted by the aesthetics of the new line.

Beginning at the Briggs Road Substation, Segment O follows the west side of the USH 53 freeway south towards the city of Onalaska. The town of Onalaska's land use plan shows urban mixed use for both sides of USH 53. The village of Holmen's plan shows mixed use and single family residential on the west side and single-family and transitional residential on the east side. At the USH 53/STH 35 interchange, Holmen's plan identifies commercial development in the northwest, southwest, and southeast quadrants. The northeast quadrant is shown as residential. Existing residential uses border both sides of the freeway for much of Segment O, between the interchange and the city's southern border. Between Sand Lake Creek and CTH OT, a business park is located on the west side of the freeway and an elementary school is located on the east side.

In the city of Onalaska, undeveloped property designated for commercial use lies southeast of the USH 53/CTH OT interchange. The land to the west of the USH 53 freeway has been predominantly developed for residential use. Vegetation that currently screens the residences from the highway may be removed if the proposed transmission line is constructed on this segment. Homeowners would experience an increase in noise and visual impacts from the highway. To the east, an area of residential development extends south to Riders Club Road. At that point, Segment O crosses to the east side of the freeway. The city's future land use plan shows a mixed use area south of Riders Club Road that extends to a wooded ridge that has been designated as an environmental corridor. The mixed use area currently consists of a home supply store and farm land. South of the designated environmental corridor, there is a commercial strip and then a residential area that extends south to I-90. On the west side of the freeway, opposite the residential area, is a high school.

In the city of Onalaska, there is undeveloped land on the west side of USH 53, along Abbey Road designated as mixed density residential or as a Traditional Neighborhood District. Several multi-family buildings and self-storage warehouses have already been built near the freeway. Beginning near East Avenue and proceeding south, the proposed line would be in close proximity to two other existing electric transmission lines.

The segment then turns east, following the north side of I-90. The segment crosses the edge of a city park in the northeast quadrant of the I-90/USH 53 interchange. East and north of the park is a residential neighborhood. Another residential area is opposite the park, on the south side of the freeway. Segment O then proceeds into a mix of existing and undeveloped commercial and industrial land on the north side of I-90. South of the freeway are apartment buildings. Near the I-90/STH 16 interchange, commercial areas are on both sides of the freeway. East of this area, on the south side of I-90, is a designated residential area with homes already located near the freeway. A city of La Crosse commercial/industrial area is northeast of this, on the north side of the freeway. The city of Onalaska has designated an environmental corridor between this area and the city's eastern boundary.

The town of Hamilton and village of West Salem plans designate the north side of I-90, west of the village, as an area for conservation subdivision development or environmental preservation. Existing agricultural, golf course, and residential land uses are found on the south side of I-90. West of the village, the segment crosses the interstate and passes between the south frontage road and I-90 traversing residential and commercial development. East of the I-90/CTH C interchange, the village's plan shows industrial development on both sides of the freeway. Further east, the plan indicates suburban residential development on the north side of the interstate. The town of Hamilton's plan shows future industrial development bordering both sides of the freeway to the east town line.

At the village of Bangor the segment crosses lands designated for low-density residential development and preservation as conservancy. Bangor High School and Bangor Elementary School are located on the north side of I-90, but the proposed transmission line would be located on the south side of I-90. Medium-high density residential development land is shown north of I-90, at the eastern village limits in the village's plan.

The village of Rockland's future land use plan designates Residential-Commercial use for the area south of I-90, industrial use north of I-90 west of CTH J, and residential use east of CTH J. Segment O passes in front of an interstate rest area south of I-90 and east of CTH J. East of Rockland, the segment enters Monroe County and leaves I-90. It proceeds south and east, mostly on new ROW, until it meets an existing NSPW 69 kV transmission line. The proposed line would be double-circuited with the lower-voltage line within the existing ROW, proceeding south for a distance of about 9.8 miles.

West of the village of Cashton, Subsegment O11 turns east, crossing the southwestern part of the village. The community's plan shows a planned industrial district on the west side of STH 27. South of the village, the proposed line would be double-circuited with an existing DPC 69 kV transmission line, overlapping part of the existing ROW for a distance of about 1.7 miles. The segment then leaves the existing transmission line corridor and continues east on new ROW. In the town of Jefferson, Subsegment O14 passes just south of an active quarry off of Olympic Avenue.

At the city of Elroy in Juneau County, Subsegment O19 crosses the "400" State Trail, which runs adjacent to STH 80/82. This subsegment passes adjacent to existing homes and through and adjacent to areas designated for future residential development on the south side of the city as well as Preservation & Open Space areas along the Baraboo River.

East of Elroy, the route briefly shares a corridor with a Northern Natural Gas pipeline for a distance of approximately 1.1 miles. In the northeast corner of the town of Wonewoc, Segment O crosses an area along Overgaard Road designated for rural residential development. In this area the proposed line would be double-circuited with an existing DPC 69 kV line, following the existing transmission line ROW for about 8.5 miles.

In the town of Summit, the route follows the north edge of a planned rural residential area along Leigh Road. It also borders the north end of a commercial area along STH 58. The segment then continues east on new corridor, ending at I-90/94.

6.4.2. Proximity to residences and potentially sensitive populations

This section discusses the proposed project's proximity to homes, schools, daycares, hospitals, and other places where people frequently gather. Information for this section came from the tables submitted in the project application that categorize the number of residences within specified distances of the proposed centerline of the new 345 kV line and the estimated magnetic fields associated with the different proposed transmission line configurations. Additionally, Commission staff reviewed comments submitted by the public and conducted numerous site visits along the routes.

The proximity of properties to a high-voltage transmission line is important because of real and perceived concerns about local aesthetics, changes to valued viewsheds, personal enjoyment and use of one's property, potential impacts to property values, magnetic fields, and other electrical phenomenon, and personal and public safety.

Commission staff recognizes that individuals and families have substantial financial, physical, and emotional investments in their homes and properties and that the discussions in this document will most likely not adequately address all the issues felt by many individuals owning property along the proposed routes.

A generalized discussion of some of these issues is contained in Chapter 4 including: aesthetics (Section 4.5.1); magnetic fields (Section 4.5.6); noise and corona effects (Section 4.5.10); property values (Section 4.5.11); safety (Section 4.5.14); and stray voltage (Section 4.5.15). Appendix B contains a brief review of the health issues associated with electric and magnetic fields generated by transmission lines. Additionally, the topic of aesthetics is discussed in the following section (Section 6.4.3) for several specific areas or properties along the proposed route and others that are recognized regionally or state-wide for their natural beauty.

Finally, the personal sense of loss and unfairness related to burdening individuals and specific communities with the long-term presence of this high-voltage transmission line cannot be adequately addressed in this document, but a discussion of some special concerns that have been raised follows in the Section 6.4.2.3 below.

6.4.2.1. Residential impacts

Segment P-west

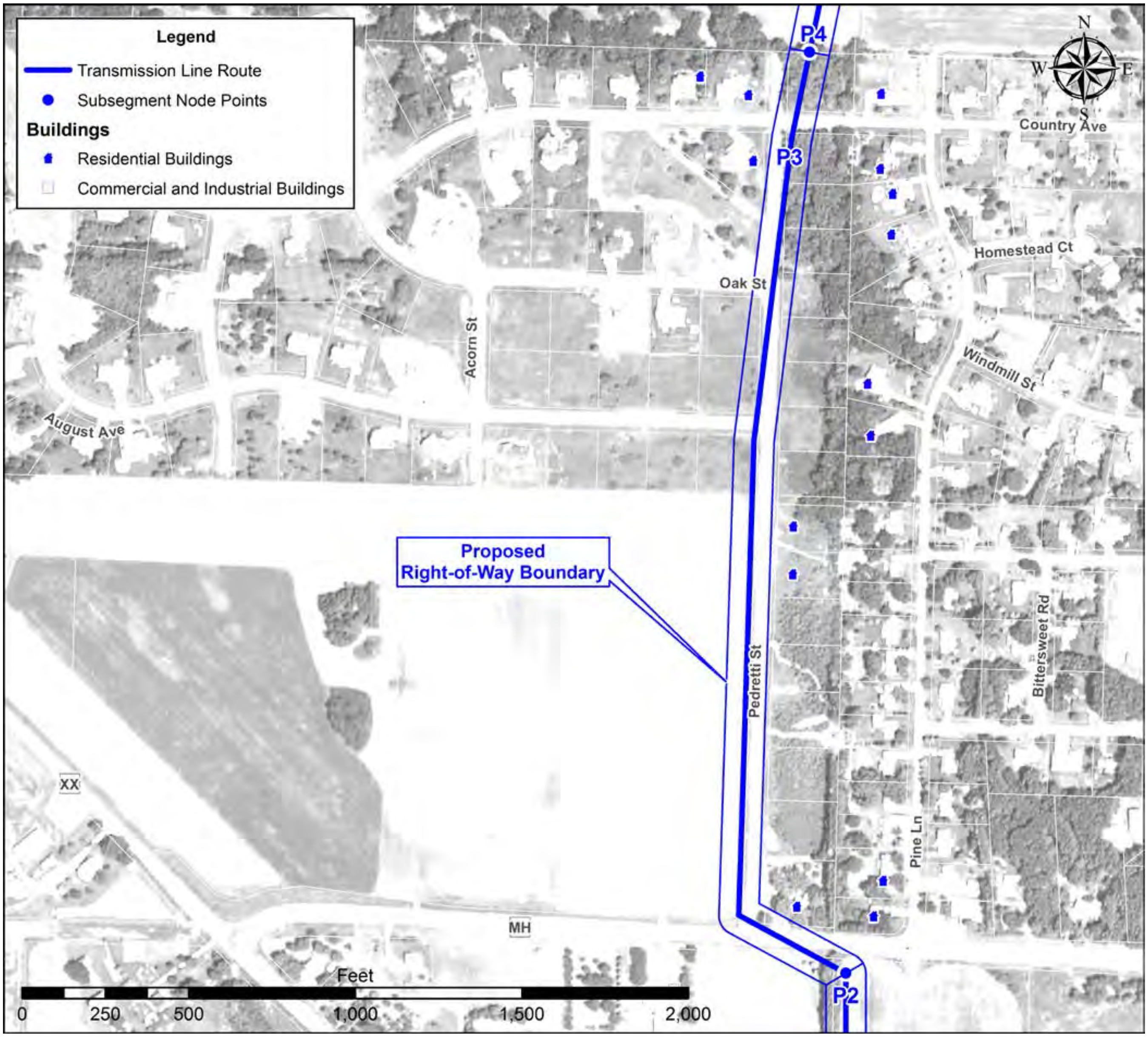
Option P-west exits the Briggs Road Substation and crosses open fields to CTH XX (Subsegment P1) which it parallels for a short distance before turning north, crossing more fields adjacent to the Holland Town Hall and Park and CTH MH, and intersecting Pedretti Street (Subsegment P2). This local road travels through the center of a relatively new subdivision, named August Prairie, where residential lots were actively being sold prior to the proposed transmission project announcements and public meetings.

August Prairie is a westward expansion of an existing rural subdivision in Holmen. Long views to the south, west, and southwest are mostly undeveloped and include wooded hills and large marshes extending to the Mississippi River. The area to the north is currently open fields with wooded buffers. Neighborhoods parks and amenities are close by within the rural residential subdivision east of August Prairie and at the town of Holland property on CTH MH.

Subsegment P3 follows the west side of Pedretti Street for approximately 1,500 feet before angling to the east side of the road to avoid direct impacts on two new homes. These new homes on Pedretti Street were constructed in 2012-2013. They are not shown on the aerial photo data in the application and to date, the applicants have not responded to data requests from Commission staff regarding their proximity to the proposed centerline. As Subsegment P3 angles to the east, the new transmission line would directly impact two undeveloped residential lots south of Country Avenue that were purchased for construction of a new home. The building potential on these two 0.75-acre lots would be substantially affected by the proposed line and ROW, as it would occupy more than one-third of the total area of each lot.

Subsegment P3 continues across Country Avenue, again drastically affecting the viability of a platted lot on the northeast corner of Country Avenue and Pedretti Street. More than half of this 0.8-acre lot would be taken up by the transmission line and ROW. Directly across Pedretti Street on the north side of Country Avenue is another new home that is approximately 100 feet from the proposed ROW. Figure 6.4-1 highlights the project's potential adverse effects on new homes and platted lots in the August Prairie Subdivision. Further discussion about the potential adverse effects of the proposed 345 kV transmission line on the development of this approved and platted subdivision in the village of Holmen can be found in the previous section, Section 6.4.1 on Land Use.

Figure 6.4-1 Impacts of Badger Coulee project (Segment P-west) on the August Prairie Subdivision



After leaving the August Prairie subdivision, Subsegment P4 crosses through open fields and an active farm operation and residential property, passing between the farm buildings. The farm owner has expressed safety concerns about his ability to move large farm equipment within his property, including large grain augers and grain elevators.

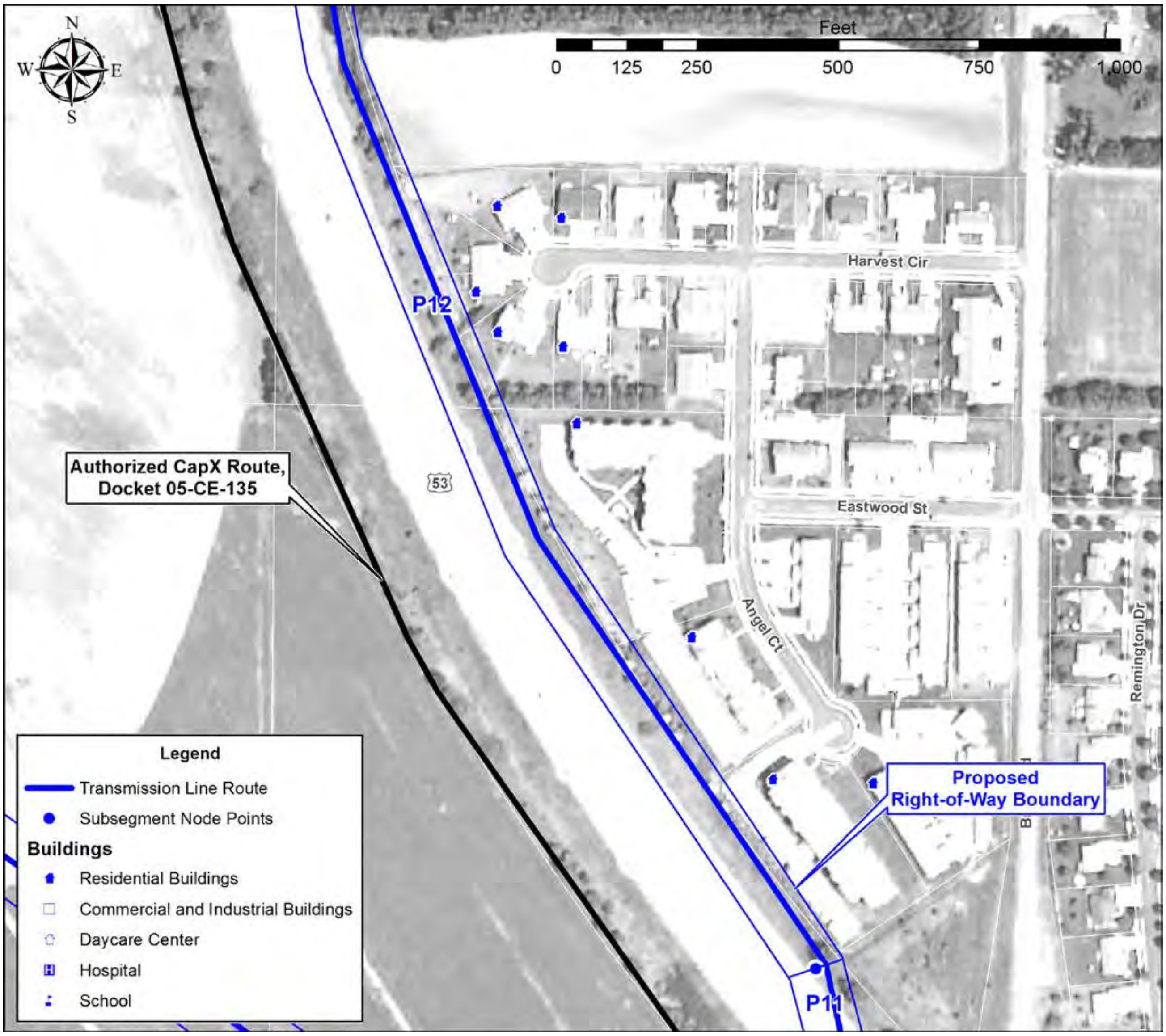
Continuing north, Subsegment P5 crosses and borders the New Amsterdam Grasslands along the east side of Rotterdam Road. At least nine residences within 300 feet of the proposed centerline are located on the west side of Rotterdam Road and on adjacent side roads overlooking this large natural area managed by the Mississippi Valley Conservancy.

Segment P-east

This segment, which includes Subsegments P11 through P13, parallels USH 53 for most of its length and crosses directly through the town of Holland and the village of Holmen. It runs parallel to and east of the approved CapX transmission line route over its entire distance, and eventually crosses the CapX line north of the USH 53/STH 35 interchange.

At the south end of Subsegment P12, there are nine apartment buildings within 300 feet of the proposed centerline, totaling more than 100 housing units. Two of these apartment buildings are less than 100 feet from the centerline (see Figure 6.4-2). As the segment progresses north, there are numerous residences within closes proximity to the line, as well as Prairie View Elementary School. The potential impacts of the proposed transmission line on this school are discussed in greater detail below in Section 6.4.2.3. After passing through the STH 35/USH 53 interchange, Subsegment P14 crosses USH 53 and intersects with Segment P (Subsegment P8).

Figure 6.4-2 Impacts of the Badger-Coulee project on multi-housing residential units on Subsegment P12



Segment P

The portion of Segment P consisting of Subsegments P9 and P10 travels up the west side of USH 53/35 adjacent to the WisDOT ROW. Several individual homes fronting the road are in close proximity to the proposed centerline. One residence appears to be partially within the proposed ROW and approximately 53 feet from the centerline. The family residing here has horses and recently invested in the construction of a large indoor riding facility. Another wooded residential property directly adjacent to the Black River on the east side of USH 53 would be substantially affected as the proposed ROW veers away from the highway corridor as it approaches the river crossing from the south. A number of trees on the property would be removed opening some views from the home to the busy highway and new transmission line.

Table 6.4-1 Number of residential structures within 300 feet of the proposed centerline on Segments P-west, P-east, and P

Segment Combinations	Distance to Proposed Centerline				Total
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	
P-west and P		1	21	26	48
P-east and P		4 and 4 apt. units	12 and 121 apt. units	19 and 16 apt. units	35 and 141 apt. units

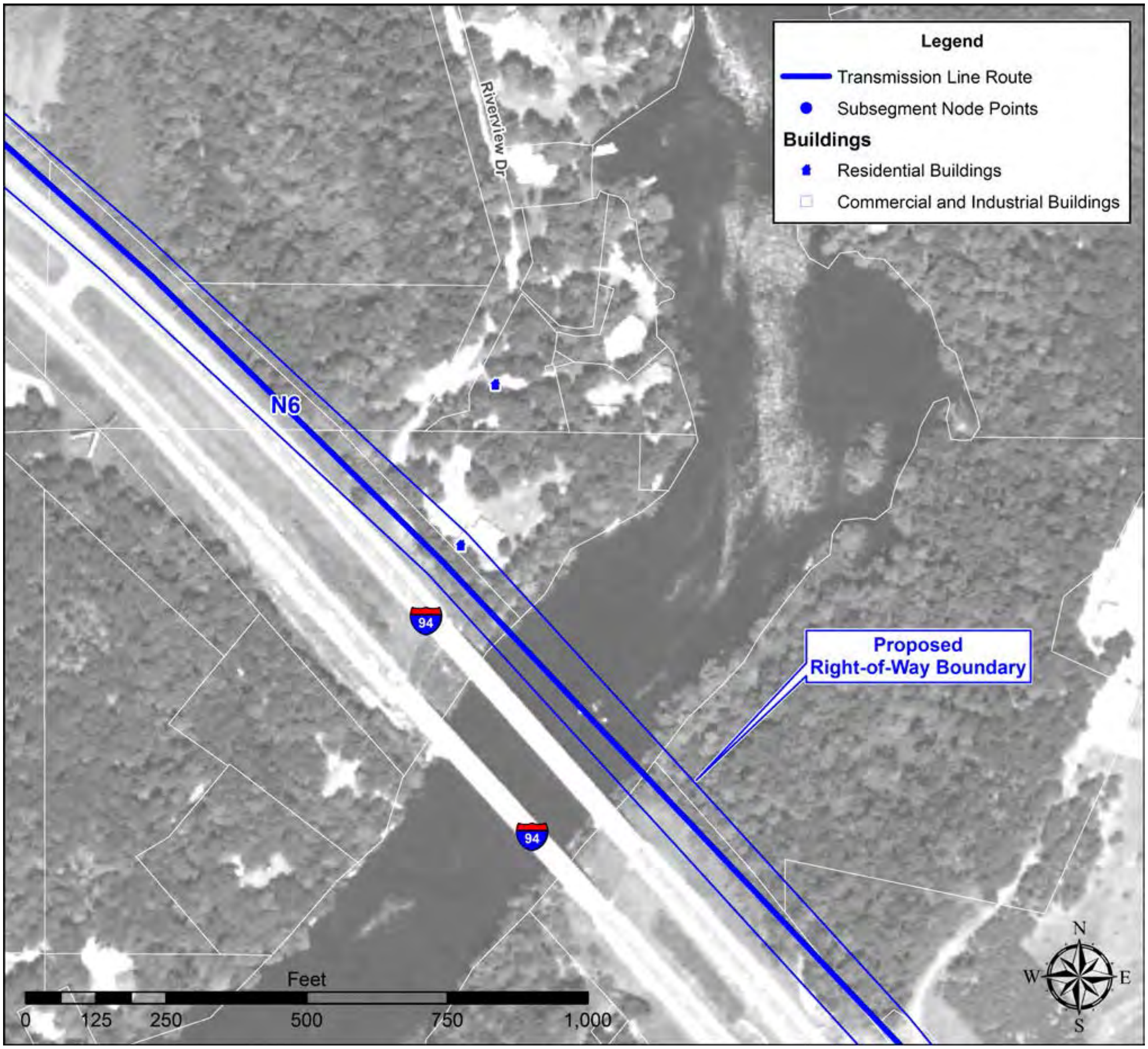
Segment N

Beginning with Subsegment N1 near Galesville and continuing north and east to the beginning of Subsegment N6 on the outskirts of the city of Black River Falls, there are relatively few residences and farmsteads less than 300 feet from the proposed centerline and none less than 100 feet from the centerline. This is primarily due to the fact that the intervening Subsegments N1-N5 run cross-country over most of their length, following existing transmission line corridors. Most of the homes present along this portion of the segment are at locations where the route crosses local and county roads, and USH 53. The residents may be accustomed to the impacts and views of NSPW's existing 161 kV transmission lines, but the new taller 345/161 kV double-circuited line and the clearing that would be required for the wider ROW and access roads through this hilly terrain could change local viewsheds substantially.

As Subsegment N6 parallels the north side of I-94, skirting the north edge of the city of Black River Falls, it passes a number of homes and two buildings that appear to be duplexes. Most are west of the USH 12 interchange and approximately 200 feet or more from the proposed centerline, although one of the apartment buildings (duplexes) would be approximately 115 feet from the centerline.

In addition, one well-maintained permanent residence in a wooded setting at the south end of Riverview Drive, directly adjacent to the Black River, is partially within the proposed transmission line ROW, with the home approximately 28 feet from the centerline. The property abuts the Black River and has a landscaped yard with amenities, indicating frequent outdoor use. Some of the existing landscaping and all of the wooded buffer that shield this residence from the interstate corridor would be removed (see Figure 6.4-3).

Figure 6.4-3 Potential impacts on a residence along the Black River on Subsegment N6

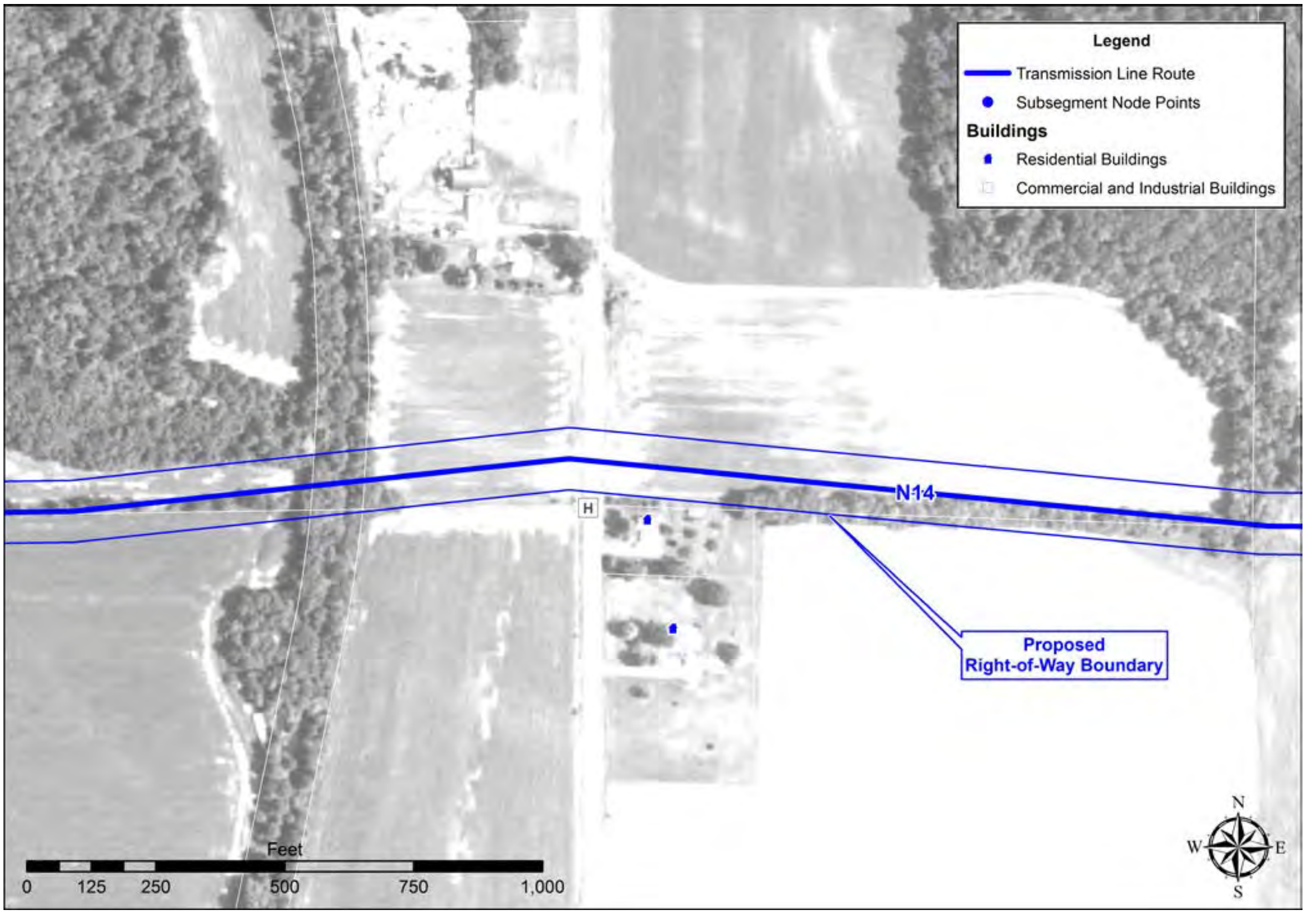


Over the next 15 miles southward, there are very few homes, as Segment N is paralleling the interstate corridor and passing mostly through county and state forest lands. A cluster of nine homes on Subsegment N7 on the north side of Tomah, tucked between the interstate and USH 12 would be impacted by removal of part of the wooded buffer along I-94, but most of the homes are 150 feet or more from the proposed centerline. A nearby daycare center is approximately 415 feet from the centerline.

Farther south on Subsegment N8, an isolated home at the end of a local road would be less than 80 feet from the proposed centerline. ROW clearing for the proposed transmission line would leave no vegetation between the residence, the new 345 kV line, and the interstate. Also on this subsegment, a large mobile home park located north of the intersection of STH 21 and I-94 includes a number of residences in close proximity to the proposed centerline. Three are within 100 feet and the closest is 45 feet from the centerline.

In the town of LaGrange south of Tomah (Subsegment N9), a similar situation exists for a farmstead with a long driveway off of Forest Avenue where a house would be within 80 feet of the proposed centerline. Continuing south and east around Volk Field and Mill Bluff SNA, Subsegment N14 bends slightly to the north to minimize the potential impacts on two residences along CTH H in the town of Orange (see Figure 6.4-4).

Figure 6.4-4 Subsegment N14 deviation to avoid residential impacts

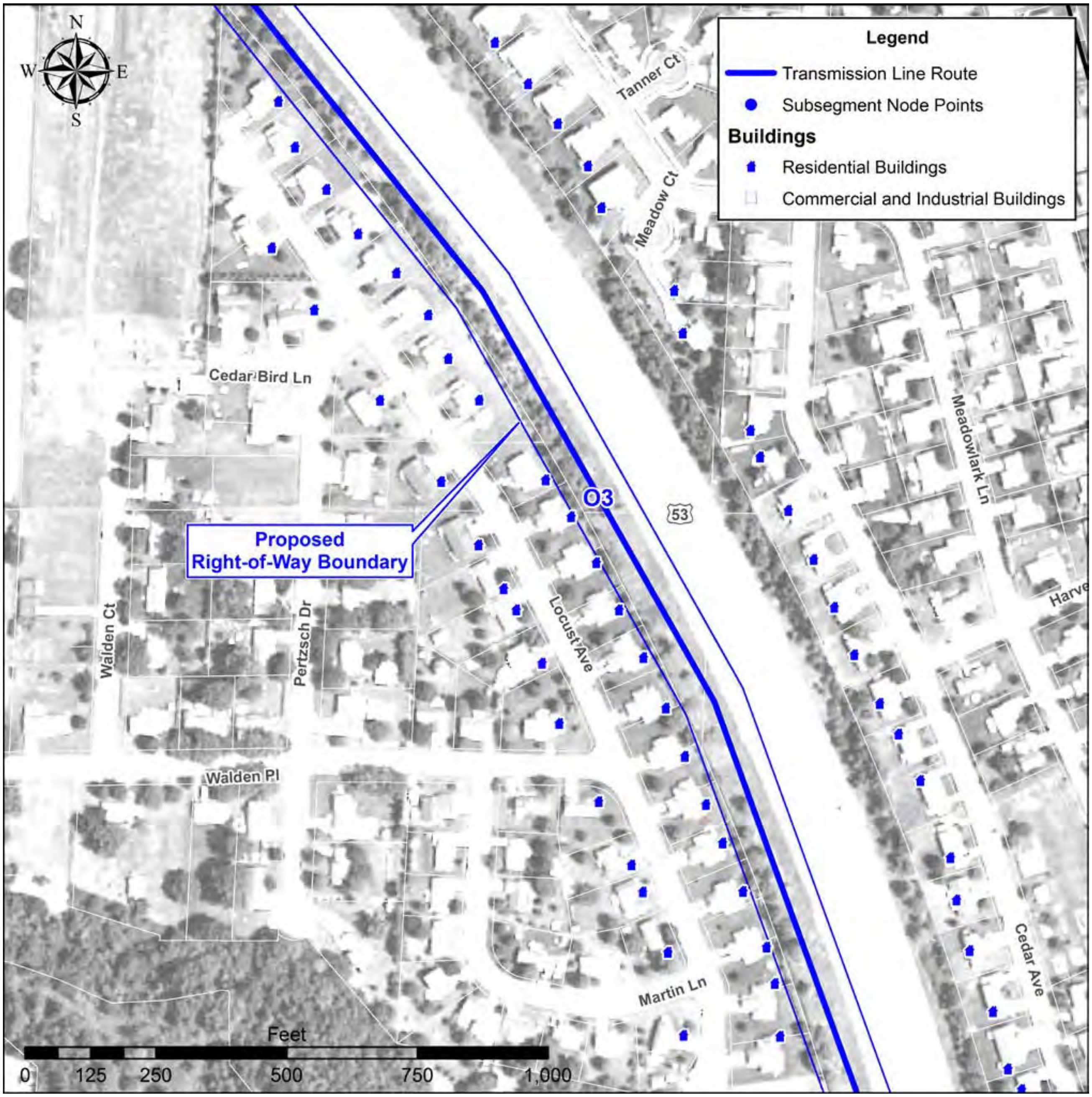


Near the node for Subsegments N19 and N20 there is another concentrations of homes near the proposed transmission line in the city of Mauston near CTH G. Several homes are less than 300 feet from the centerline and one is less than 100 feet. Farther south, on Subsegments N21 and N23, there are several additional residences within 300 feet from the centerline as the route drifts slightly south, running parallel to, but approximately 500 feet south of the I-90/94 corridor.

Segment O

The initial portion of Segment O passes through a very urban part of the village of Holmen and the city of Onalaska. Subdivisions and clusters of homes and apartment complexes are common over the first 7.0 miles of this long segment. Beyond that point, the residences become more scattered and are interspersed with farmsteads.

Figure 6.4-5 Residential impacts on Locust Avenue along Subsegment O3



As Segment O exits the Briggs Road Substation and begins heading south through the village of Holmen, adjacent to USH 53, there is a cluster of residences on S Cherry Lane across the highway from Subsegment O1. In addition, there are several apartments across the highway on Crooked Avenue (Subsegment O3).

Some of the residential structures closest to the proposed centerline include a string of 21 duplexes on Locust Avenue, whose backyards are partially within the proposed transmission line ROW. All but seven of these duplexes would be less than 100 feet from the centerline and the remaining seven would be between 100 and 120 feet from the centerline. Nine single-family homes and five additional duplexes on the west side of Locust Avenue are within 300 feet from the proposed centerline (see Figure 6.4-5).

As Segment O proceeds south, several other residential neighborhoods back up onto the proposed transmission line and ROW. One residential neighborhood, directly south of Strawberry Commons Park, has eight residences that are approximately 200 feet from the proposed centerline. Just north of where the 345 kV line would cross to the east side of USH 53, near Menards (Subsegment O4), another group of more than a dozen homes would be even closer to the centerline.

A daycare facility, located along Main Street E near STH 157 and on the east side of USH 53, is approximately 155 feet from the proposed centerline. In addition, near the intersection of USH 53 and I-90, a number of homes in the neighborhood surrounding Sandalwood Park are less than 300 feet from the proposed centerline, with three or four residences less than 100 feet from the proposed centerline.

Moving out of the urban/suburban communities of Holmen and Onalaska, there are few residences until reaching the village of West Salem where about ten homes on the south side of I-90 and fronting CTH C would be within 300 feet of the proposed centerline. One home in the town of Bangor is at the edge of the ROW and within 58 feet of the proposed centerline on Subsegment O6, while another on Jackpot Avenue (Subsegment O7b) would be a similar distance from the line. On Subsegments O10 to O13 that approach and wrap around the community of Cashton, there are at least seven residences that are approximately 100 to 120 feet from the proposed centerline. These homes are mostly farmsteads and scattered rural residences. One residence, near Olympic Avenue, would be 100 feet from the proposed line. All of the mature trees between this house and the line would be removed from the proposed 150-foot wide ROW.

Farther west, as the proposed line cuts a new cross-country path through the steep hills and deep valleys north of STH 33, residences become fewer. However, a portion of Subsegment O15 deviates to the north to avoid directly impacting three homes near Ordway Road and Niagra Avenue. Subsegment O16 crosses a more open landscape than the previous portion of the route. Two residences here on the southwest corner of Osborne Avenue and CTH V would be less than 120 feet from the proposed centerline. However, it appears that little, if any, of the existing landscaping and trees would need to be removed.

Subsegment O19 again enters more wooded hilly terrain, although there are more farm fields present than in the areas near Cashton and Ontario. Again, there are a number of scattered residences within 300 feet of the proposed centerline. One, off of Lincoln Street, near the south edge of Elroy would be approximately 75 feet from the centerline, and on the edge of the ROW. This eastern end of this subsegment, as well as O20, briefly follows a gas pipeline ROW. Subsegment O21 angles to the north and then back down to an existing 69 kV line ROW to avoid cutting directly through a group of farm buildings, but there is apparently no residence present on the site.

The western end of Subsegment O22 passes through and over some rolling hills, but as it continues farther east, the landscape opens up to more gently sloping and flatter agricultural land with smaller tracts of woodlands. The remaining few miles of Segment O heads toward Lyndon Station generally follows a path between the low hills, staying on more open and level terrain. A few residences are present, primarily along CTH O and USH 12. The closest are between 100 and 130 feet from the proposed centerline, but most are nearly 200 feet or farther from the proposed line.

Table 6.4-2 Number of residential structures within 300 feet of the proposed centerline on Segments P-west, P, and N versus Segments P-east, P, and N versus Segment O

Segment Combinations	Distance to Proposed Centerline				Total
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	
P-west, P and N	2	5	47 and 4 apt. units	92 and 4 apt. units	146 and 8 apt. units
P-east, P and N	2	5 and 4 apt. units	38 and 125 apt. units	85 and 20 apt. units	133 and 149 apt. units
O		8 and 26 apt units	20 and 16 apt. units	123 and 96 apt. units	151 and 138 apt. units

6.4.2.2. MAGNETIC FIELDS

Some background information and a general discussion of EMF is found in Section 4.5.6 of Chapter 4 and in Appendix B of this EIS. Due to questions and concerns from the public, the Commission requires applicants for transmission line projects to provide magnetic field data for locations where there are existing transmission lines along the project routes and the estimated magnetic field levels at varying distances from the centerline of the proposed project, for both normal load and peak load conditions, at one and ten years after the new line is placed in operation.[147] The magnetic field profiles included in the application appear to be reasonably representative of the potential circuit configurations. Below are brief summaries of the estimated magnetic field levels for the proposed 345 kV transmission line on Segments P, N, and O. More detailed information can be found in Appendix G of the Badger-Coulee application.[148]

Segment P-west

Along CTH XX, Pedretti Street and through the Spangler farm on Subsegments P2 through P4, the maximum magnetic field levels at 25 feet from the proposed centerline would range from 34.7 to 43.5 mG under normal and peak load conditions, respectively. At 100 feet from the centerline, magnetic field levels would decrease to approximately 6.6 to 8.3 mG under the respective load conditions. At a distance of 200 feet, the magnetic field levels would be 1.9 to 2.3 mG. On Subsegment P5 along Rotterdam Road, the new 345 kV line would be double-circuited with a 69 kV line (DPC N-226) and the maximum magnetic field levels would be slightly lower. At 25 feet from the proposed centerline, the magnetic field levels would range from 32.2 to 40.2 mG under normal and peak load conditions, respectively. At 100 feet from the line, the estimated magnetic fields would be 5.4 to 6.8 mG and drop to less than 2 mG at 200 feet from the proposed centerline.

Segment P-east

There are numerous apartments and single-family homes on Subsegments P12, P13, and P14. The maximum estimated magnetic fields at 25 feet from the proposed centerline under normal and peak load conditions are 35.8 and 44.7 mG, respectively. At 100 feet from the proposed centerline, the estimated magnetic field levels are 8.2 and 10.2 mG at normal and peak load conditions. The estimated magnetic field levels provided in the application for distances of 150 and 200 feet from the proposed Badger-Coulee 345 kV line are higher than those estimated for 100 feet from the centerline. This is because the approved, but not yet constructed, CapX 345 kV line will be located 200 feet west of much of Segment P-east, thereby affecting the magnetic field levels estimated for the Badger-Coulee transmission line. However, most, if not all, of the residential structures within 300 feet of the Badger-Coulee line on this subsegment are located east of the proposed line and the anticipated magnetic field levels east of the centerline would continue to decrease from the 8.2 and 10.2 mG reported for the 100-foot distance.

147 Peak load is defined as 100 percent of estimated peak, system normal configuration and normal load is defined as 80 percent of peak load. Values provided above are for 2018, the anticipated initial year of operation.
148 PSC REF#: 191904 and 191905.

Segment P

On Subsegment P9 where most of the residences on Segment P are located, the CapX transmission line will be located across USH 53 and more than 1,000 feet to the east, thereby having no influence on the estimated magnetic fields for this subsegment. The maximum magnetic field levels estimated at 25 feet from the proposed centerline on Subsegment P9 range from 34.7 to 43.7 mG under normal and peak load conditions, respectively. At 50 feet from the centerline, the estimated field levels would range from 18.2 to 22.7 mG. At a distance of 150 feet from the proposed centerline, the magnetic field levels are anticipated to range from 2.9 mG to 3.6 mG. The estimated magnetic field levels are 2.1 mG or less at a distance of 200 feet from the proposed centerline.

On Subsegment P10 where there are three residential buildings, the estimated magnetic fields are very similar to those described above for Subsegment P9. However, due to the closer proximity of the CapX transmission line, the magnetic field levels would not decrease as rapidly with distance from the proposed 345 kV line.

Segment N

On the north-south portion of Segment N (Subsegments N1-N3a) where a few residences are between 125 and 200 feet from the proposed centerline, the maximum magnetic field levels at 25 feet from the line would be 30.1 mG and 37.6 mG under normal and peak load conditions, respectively. These field levels would drop to less than 2.0 mG at a distance of 150 feet from the proposed centerline.

Several residences are located approximately 150 feet from the proposed line along Subsegment N3b where the estimated magnetic field levels at 25 feet from the centerline would be 40.9 to 51.1 mG under normal and peak load conditions, respectively. At a distance of 150 feet from the proposed centerline, they would range from 4.4 to 5.4 mG. At a distance of 300 feet, the magnetic field levels would be less than 2 mG under all load conditions.

On Subsegment N6 approaching the Black River on the north edge of Black River Falls where there is a residence that is partially within the proposed transmission line ROW and about 30 feet from the centerline, the maximum magnetic field levels would range from 34.8 to 43.5 mG under normal and peak load conditions, respectively, at 25 feet from the centerline and from 19.3 to 24.1 mG at 50 feet. At 200 feet from the proposed centerline, the magnetic field levels would ranges from 1.9 to 2.3 mG under normal and peak load conditions.

Near Tomah on Subsegments N8 and N9, where there are at least three residences within 100 feet of the proposed centerline, the magnetic field levels over all decreasing distances from the centerline are very similar to or slightly lower than those described above for Subsegment N6.

Where the new 345 kV line would cross to the southeast side of the I-90/94 corridor near Mauston, there are a few homes less than 300 feet from the proposed centerline. Maximum magnetic field levels are estimated at 12.2 to 15.2 mG at 25 feet from the centerline under normal and peak load conditions, respectively. At a distance of 100 feet they would decrease to 4.1 to 5.2 mG and continue decreasing to less than 2.0 mG at a distance of 200 feet from the proposed centerline.

Farther south near the end of Segment N, there are few, if any residences less than 200 feet from the proposed transmission line which would be double-circuited with a 69 kV line at this location.

Segment O

The estimated magnetic field levels for the new 345 kV line under normal and peak load conditions in the first year of operation are very similar along Subsegments O3 through O6 where most of the single-family homes, duplexes and apartment buildings along this segment are located.[149] The maximum magnetic field levels at 25 feet from the centerline range from 34.2 to 34.8 mG under normal conditions and 42.7 to 43.5 mG under peak load conditions. At 100 feet from the proposed centerline these field levels would range from 5.5 to 6.8 mG under normal operation to 6.9 to 8.6 mG under peak load conditions. At 200 feet from the proposed centerline, the magnetic field levels are 2.0 mG or less at most locations. The presence of several existing transmission lines (DPC Q-1D, DPC N-222, and NSPW W3203) results in some higher magnetic field levels farther away from the proposed 345 kV line in a few very specific locations.

On Subsegment O6 where a farmstead is at the edge of the ROW and approximately 58 feet from the proposed centerline, the estimated magnetic field levels would range from 34.7 to 43.4 under normal and peak load conditions, respectively, at 25 feet from the centerline and 17.7 and 22.2 mG at 50 feet from the centerline. At 200 feet from the proposed centerline the magnetic field levels, under all operating conditions are expected to be less than 2 mG. Along Jackpot Avenue where another residence is on the edge of the proposed ROW, the estimated magnetic field levels would be slightly lower at all distances (12.9 to 16.2 mG at 50 feet under normal and peak load conditions) and would decrease to less than 2 mG by 150 feet from the proposed centerline.

The estimated magnetic field levels for Subsegments O13 through O16 where the proposed transmission line would be single-circuit and on large H-frame structures are higher than on other portions of this segment that are on single-pole structures. On these subsegments, the anticipated magnetic field levels at 25 feet from the centerline would range from 54 to 67.6 mG under normal load and peak load conditions, respectively. At 50 feet from the centerline, field levels would be 27.3 and 34.1 mG and at a distance of 200 feet from the proposed centerline, the estimated magnetic field levels are 1.9 and 2.4 mG.

On Subsegment O17 where the 345 kV line would be double-circuited with a DPC 69 kV line, the magnetic field levels at 25 feet from centerline that currently range from 13.0 to 16.2 mG at normal and peak load conditions would increase to 29.5 to 36.9 mG in the initial year of operation. At 100 feet from the proposed centerline, the existing magnetic field levels of 1.3 to 1.7 mG would increase to 4.1 to 5.1 mG at normal and peak load conditions. At a distance of 200 feet from the centerline, the magnetic field levels for the double-circuit 345/69 kV line would be less than 1.5 mG.

Subsegments O22 through O25 would also be double-circuited with an existing 69 kV transmission line and the magnetic field levels would be very similar to those described above, with the exception of Subsegment O23 which follows Leigh Road where one home is approximately 100 feet from the proposed centerline. On that subsegment, the existing magnetic field levels are 17.5 and 21.9 mG at 25 feet from the centerline at normal and peak load conditions; these field levels would increase to 36.3 and 45.5 mG for the new double-circuit line. At 100 feet from the line, the current magnetic field levels are 1.4 and 1.8 mG. These would increase to 3.3 and 4.2 mG with the new project in place. AT 200 feet from the proposed centerline, magnetic field levels under both operating conditions would be less than 1.0 mG.

6.4.2.3. Potentially sensitive populations and properties

Prairie View Elementary School

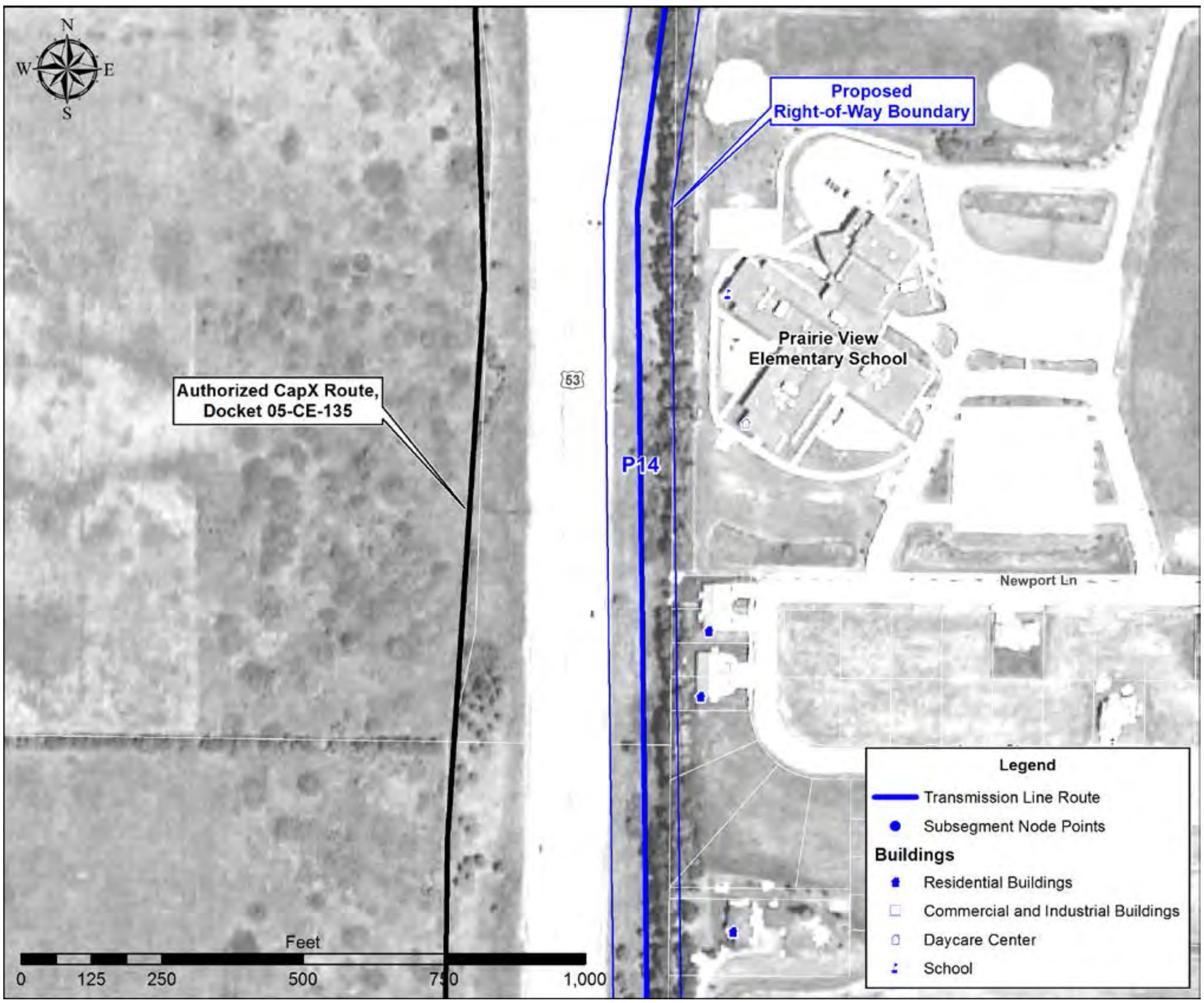
Prairie View Elementary School, a facility in the Holmen School District, is a relatively new school that was built in 2009 on a 30-acre site. During the 2012-2013 school year, the school had 414 students

[149] With the exception of portions of Subsegments O4 and O5, which are an anomaly due to the intersection of several existing transmission lines with the proposed 345 kV line. This results in both the existing and proposed magnetic field levels being higher at decreasing distances from the proposed centerline, depending on the proximity of nearby transmission lines.

enrolled in grades ranging from 4 year-Kindergarten through Grade 5 and a staff of approximately 50 teachers and service providers. Portions of the school building are also used for early morning and after-school daycare for some elementary students.

At its closest point, Prairie View School is approximately 160 feet from the proposed centerline of the new Badger-Coulee transmission line on Subsegment P14. (See Figure 6.4-6). Because the staff parking lot is in the front of the school facing east toward CTH HD, much of the playground equipment and some play areas are at the rear of the school closer to the proposed transmission line. Currently these areas are screened from the traffic and vehicle noise by a wooded buffer. However, the ROW necessary to accommodate the new high-voltage line would require most, if not all, of this buffer to be removed. This would expose the school students and staff to more traffic noise both inside and outside of the building and have an adverse effect on the sense of well-being for this new school community.

Figure 6.4-6 Impacts of the Badger-Coulee project (Segment P-east) on the Prairie View Elementary School



Amish Community

Wisconsin has the fourth largest Amish population in the nation, and the largest Wisconsin Amish settlement is in Cashton, a Monroe County community located along Segment O of the Badger-Coulee transmission line routes. Subsegments O10a to O15 approximate the extent of the proposed transmission line's possible impacts on this Amish community.[150]

This Amish settlement around Cashton was founded in 1966, and has grown significantly. The Amish community is organized by church districts, with each district consisting of a bishop, several ministers, and approximately 15 to 30 Amish families. In 2009, there were 13 church districts in and around Cashton, and there are likely more at this time. Another older but smaller Amish settlement is located east of Blair in Trempealeau County, along Subsegment N3b, near Skutley and Blair Roads.

Gatherings for church services are usually in the homes of members, and schools are often one-room buildings that are not readily identifiable as schools. Commission staff is attempting to identify the location of all Amish schools within 300 feet of the proposed ROW to include in the final EIS.

Many of the Amish families in the project area operate farms. Some supply milk for a local Amish cheese cooperative/factory on CTH D near Cashton where over 20 varieties of cheese are produced. In Cashton, Ontario, and in the local area between these villages, there are other Amish-run businesses, including bulk food stores, bakeries, hardware stores, buggy and cabinet makers, etc. The economies of the Amish and the non-Amish in this area are interdependent. With few local job opportunities, the goods provided by the Amish create jobs for area residents and also attract visitors that spend dollars at local shops and restaurants in the region.

Because of their lifestyle and religious beliefs, the Amish communities along the proposed project routes may be impacted by the Badger-Coulee 345 kV transmission line in a way that is unlike the impact on other property owners or communities along the routes.

Part of the expected impact relates to the basic unfairness of having to accept the burden of the new, large transmission line while not depending in any direct way on the electricity that the line transports or benefiting from the project in the form of improved electric reliability or lower electric rates.

The Cashton Amish community appears to be a fairly conservative Amish community. By choice, this community does not connect its homes, barns, and outbuildings to the electric grid, and thus they are not generally consumers of electricity nor ratepayers.

Other potential types of impact could result directly from the placement of the line on Amish farms. Farming is still the full or part-time occupation of most Amish. Family farms are often held and passed on to offspring for many generations. By choosing to farm, the Amish commit to a way of life that fosters family unity and religious strength. In keeping with their religious, family and community values, they complete much of their work without the technology used on many present-day non-Amish farms. Work is generally done using simple iron tools and implements, including horse-drawn plows and wagons and hand tools for seed broadcasting, cultivating, weeding, and harvesting. Practices that avoid or minimize soil erosion and runoff and provide sustainable soil fertility are used, as the land must continue to provide much of the food for the family and farm animals, in addition to sufficient income to purchase other necessary goods and services.

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[150] As of the printing of this draft EIS, Commission staff's efforts to acquire more precise information about the number of Amish farms, schools, and churches directly affected by the proposed project is incomplete. The final EIS could contain more detailed information.

The field work with horses could be adversely affected if transmission structures are placed in the farm fields of these families, as the structures present obstacles to the safe and efficient operation of the horse-drawn field equipment that the families must use. The additional turns or starts and stops performed by the horses could also cause additional wear and tear on the horses. As with other operators' farm fields, the weed refuges that could develop around the structures would add to the field work burden in terms of the additional weed control work necessary.

The valued quality and productivity of the soil in this particular region could also be adversely affected. The extremely hilly topography, steep-sided slopes, and deeply incised valleys along the portion of Segment O that passes through the area where many Amish families live and farm will require much wider than typical ROWs. The new 345 kV transmission line stretching eastward from Cashton toward Ontario would be constructed on large two-pole H-frame structures, 80 to 180 feet in height, with each pole requiring a large concrete foundation. On Subsegment O13, the proposed ROW width is 150 feet, on Subsegment O14 it ranges from 150 to 330 feet in width, and on Subsegment O15 it ranges from 170 to 230 feet in width. These wide ROWs crossing steep wooded slopes would be cleared of all woody vegetation and graded to enable the movement of concrete trucks, cranes to set pole segments, and other necessary construction vehicles. Even with implementation of BMPs and erosion control devices, the ROWs could be subject to soil erosion and heavy runoff during large rain events and rapid spring snowmelt, potentially affecting local stream quality and soil fertility. Because Amish farms are smaller than many other Wisconsin farms, impacts on productivity could be felt more acutely.

In summary, the religious beliefs and lifestyles of the Amish could result in their community bearing the impacts of the line crossing their properties in ways more deeply felt than many other families would experience.

Buddhist Foundation Diamond Way Property (Subsegment O14)

In the town of Sheldon, Monroe County, Subsegment O14 crosses the northern boundary of a 90-acre Buddhist retreat owned by The Buddhist Foundation Diamond Way and named the Heartland Retreat Center (HRC). The HRC is to be used as a multiple-venue retreat center and a coordination hub for national and international projects. The property was purchased "specifically for its inspiring, unspoiled views of nature conducive to Buddhist meditation retreat." The property supports a diversity of vegetation types (numerous meadow openings, dense oak forests, oak savannah, etc.) and topography (valleys, rolling hills and ridge tops) that can accommodate different sizes and levels of meditation groups including individuals, small groups, and large classes (>200 participants).

If the new 345 kV transmission line were constructed on the proposed 120- to 150-foot tall structures, the transmission line and the cleared 120-foot ROW would be visible from many areas of the property.

Although the Diamond Way Buddhist community has hundreds of centers worldwide, HRC commented that there are very few retreat centers that serve the purpose for the deep, nature-inspired meditation that is practiced at this location. Buddhists regularly travel from Minneapolis, Milwaukee, Chicago, and Madison for small group retreats. A national course held at the HRC in 2013 had over 200 participants from across the Americas and overseas. A number of improvements have been made to accommodate the increasing number of visitors to the HRC and future plans for the property show new roads, septic and utilities, a large meditation hall with 360 degree views of the surrounding hills and forest, as well as dormitory and cafeteria buildings. The owners of this property think the proposed transmission line and cleared ROW would substantially harm the potential to develop this property for the purpose for which it was purchased.

6.4.3. Aesthetics and visual impacts

Aesthetics and visual impact are closely related and often used interchangeably. Aesthetics tends to encompass the sights, smells, sounds and perceptions one experiences from the surrounding environment; whereas visual impact is more directly related to views, sightlines and viewsheds.

The following discussion of aesthetic is based on Commission staff's visits to the project area and the following underlying assumptions:

- Different viewers may have different levels of visual sensitivity.
- The physical setting can influence the degree of visual impact.
- Viewing conditions can influence the degree of visual impact.

In general, aesthetic and visual impacts are difficult to measure and tend to be perceived as greater in natural or scenic settings. However, homeowners in very newly developed or partially developed residential settings can also experience significant aesthetic and visual impacts related to siting a new high-voltage line through their neighborhood, especially if no other aboveground utility infrastructure is present in the area.

Segments P, N, and O differ greatly in the types of land use that are present along the segments, although they also share some similarities and thus, some of the same potential for aesthetic and visual impacts.

Segments P and O originate in a relatively urbanized environment, but Segment P quickly transitions to a more rural setting; whereas Segment O heads south through heart of the village of Holmen and the city of Onalaska for a number of miles, then parallels the I-90 corridor for a short distance before entering and crossing through nearly 60 miles of rural environment known for its unique coulee and ridge topography. Segment N begins in a rural setting east of Galesville and continues across an agricultural landscape dissected by the Trempealeau River and many of its tributaries until reaching the I-94 corridor near Black River Falls. From this point southward, Segment N crosses a mix of land uses as it visibly parallels the interstate corridor for roughly 65 miles. The discussion below identifies the major aesthetic and visual impacts related to the proposed project along these segments.

6.4.3.1. Segment P

Segment P-west

The new transmission line would exit the Briggs Road Substation and head northwest to CTH XX along an existing transmission line ROW. After briefly following the county road, the line would swing north and pass between a town of Holland park and the Holland Sand Prairie SNA before crossing CTH MH and continuing north along a local road (Pedretti Street) into the newly developing August Prairie subdivision.

South of CTH MH, users of the town park and the SNA property would experience the visual impact of the new transmission line along the edge of the park. Within the August Prairie subdivision, the presence of the large transmission structures and conductors would be visually and aesthetically incompatible with the relatively small residential lots (most are less than one acre) and new homes present. No other above-ground electric infrastructures is present, as the developer and landowners have paid to have the distribution electric lines installed below ground. Many more of the platted lots have been sold, but not yet developed and in addition to the visual impacts on the properties where homes have already been constructed, the proposed line and 120-foot wide ROW requirements would render one or more lots undevelopable and limit the landscaping opportunities on several other properties.

After crossing Old CTH NA, the high-voltage line enters the New Amsterdam Grasslands, a property owned and managed by the Mississippi Valley Conservancy for the protection of grassland birds and other avian species. The line runs across the southern portion and along the western boundary of the 310-acre property. From some vantage points on the vast prairie/savanna habitat, views of the hills and bluffs along the Mississippi River to the west and northwest would be compromised by the sight of the transmission line along the property edge.

Segment P-east

On Subsegments P12, P13 and P14, the transmission line would result in an incremental adverse visual impact on residential properties, especially those in very close proximity to the line. The traffic and noise associated with USH 53 already affects the aesthetics of the area, and the transmission line would add to this by its presence, and the necessary removal of many trees that currently provide some screening from the busy highway.

Also, on P14 the transmission line would pass within 150 feet of the Prairie View Elementary School which also functions as an early/afterschool daycare for some students. Although the transmission structures would be placed within the WisDOT ROW, the wooded buffer screening the school from the sights and noise of USH 53 would be removed, exposing students and staff at the school to direct views of the Badger-Coulee and CapX 345 kV transmission lines, in addition to the busy highway.

Segment P

The proposed transmission line would pass several residential properties and a campground as it heads north on the west side of USH 53. The ROW clearing required to accommodate the transmission line would remove many trees on these properties resulting in direct views of the transmission line and the highway in some locations as well as increased traffic noise. A wooded residential property that directly abuts the south side of the Black River would be substantially affected by construction of the proposed project on Subsegment P9. The adverse visual impacts include the loss of many trees as the line angles from the road ROW toward their home and clear views of the line crossing their property.

Boaters and paddlers heading downriver into the Van Loon Bottoms on the Black River at this location would also be able to see the conductors of the line at the river crossing which would incrementally add to the adverse visual effects of the USH 53 bridge and the traffic noise at this location.

6.4.3.2. Segment N

Subsegments N1 through N3b traverse very hilly topography typical of the Western Coulees and Ridges Ecological Landscape. The new 345 kV transmission line would be double-circuited with an existing 161 kV transmission line in this area and it would follow the existing transmission line ROW. The ROW width would need to be expanded by 35 to 50 feet, resulting in the loss of many additional trees on the forested slopes along the route. The existing 161 kV line is on lower wooden H-frame structures; while the new 345/161 kV line would be on much taller, steel single-pole structures. Thus, the new line and the expanded ROW would result in an incremental visual impact on landowners along the route and people in Ettrick, Blair, Taylor and many of the other small communities who work in and travel through this area.

Near the community of Blair, the transmission line would cross the Trempealeau River, a waterway of high ecological value, at five locations. Although it would be following an existing utility ROW, at each crossing, additional floodplain vegetation would be removed to accommodate the line. Paddlers and anglers along this stretch of the river would experience incremental visual impacts due to the loss of this vegetation and the presence of the large double-circuit line.

A small Amish community lives in the Skutley Creek area without the amenities that access to electricity provides. The double-circuit transmission line on tall steel structures and widened ROW would adversely affect the aesthetic of this community's simple lifestyle.

Near Black River Falls, the proposed transmission on Subsegment N5 deviates from the existing ROW as it crosses the Skyline Golf Course on a diagonal path. The existing lower-voltage transmission would be removed from its current ROW and double-circuited with the new 345 kV line. While the physical impacts on the golf course may be reduced by using this new ROW, it nonetheless would result in the removal of additional vegetation from the golf course property and the adjacent wooded property to the north that was avoided by the existing transmission line and planned for residential development. The new line would result in a possible beneficial visual impact for the golf course due to the removal of the existing transmission line from the interior of the property. However, the landowner to the north would experience a new visual impact as the new double-circuit line intrudes across the portion of the planned development closest to the golf course.

On Subsegment N6 at the Black River, a residence abutting the river would be partially within the new transmission line ROW. All of the existing mature trees and vegetation that screen this home from the adjacent I-94 transportation corridor would be removed, resulting in a substantial adverse visual and aesthetic impact for the owner of this home.

From the beginning of Subsegment N6 through the end of Segment N (N23), the new transmission line would parallel the interstate corridor, passing through a diverse mix of land uses and vegetation types. It would highly visible to drivers and passengers in vehicles on the freeway. I-90/94 is a high-volume transportation corridor and thus, the number of people that would see the line on a daily basis would be quite high. But the fact that they would be driving at a high rate of speed and mostly intent on reaching their destination would likely decrease their visual sensitivity to the presence of a high-voltage transmission line.

Farther south along I-94, the transmission line crosses the edge of the Jackson County Forest and the Black River State Forest for distances of five and seven miles, respectively. Some trees would be removed along the property boundary. However, because the transmission line would not be easily accessible from the forest interior for most of these distances, it is unlikely that forest users would be able to view the line while recreating, hunting or working in the forests. For people driving past these publicly-owned forest resources, the roadway and associated traffic is probably the dominant experience. At most, the new high voltage transmission line would be an incremental visual impact.

Although Subsegments N11-N14 were sited to avoid potential impacts on Mill Bluff State Park and SNA, a new 345 kV transmission line in some of this area would create a permanent visual scar on the hilly landscape as the new 120- to 150-foot wide ROW cuts across the heavily wooded slopes and valleys on the southern half of Subsegment N12 and Subsegment N13.

Where the proposed transmission line crosses the Lemonweir River, the stream is heavily braided and popular with paddlers and anglers. The transmission line would create an incremental visual impact at the locations where it crosses the river, adding to the presence of the interstate bridge and the existing traffic noise on the roadway.

6.4.3.3. Segment O

Shortly after exiting the Briggs Road Substation, the new high-voltage transmission line would run adjacent to a large number of duplexes and single-family homes along Locust Avenue where more than a dozen of these residences are less than 100 feet from the proposed centerline. The transmission line route would pass near to many more homes over the next four to five miles before the line would turn east and begin paralleling the I-90 corridor. Many of these residences and apartment buildings along the USH 53 corridor that would be in close proximity to the line are already adversely affected by the noise and sights of the heavily trafficked transportation corridor, as well as multiple existing transmission lines (W3203, Q1-D, N-222). The 345 kV transmission line would be create an additional visual impact within this busy urban environment.

A property adjacent to the La Crosse River that is managed as a DNR Fishery Area is clearly well-used by local residents as an aesthetic retreat from the surrounding urban environment. Several landscaped gardens have been planted, and some benches and outdoor artwork have been installed in the shaded setting next to the river. The presence of the new transmission line and its cleared ROW would adversely affect the aesthetics of this property for all who use it.

The proposed 345 kV transmission line would also be visible to users of the La Crosse River State Trail, located north of the interstate corridor. The line would be an incremental visual impact, as the trail currently parallels another lower-voltage transmission line.

The Badger-Coulee transmission line would leave the interstate corridor near Rockland and head east and south towards Cashton, initially on new ROW; some of it following small local roads. South of Subsegment O7d, the line would corridor share and be double-circuited with an existing lower-voltage transmission line (W3414) until reaching a location 0.7 mile south of the Cashton Substation. From this point, the new 345 kV line turns southeast and east and begins a long cross-country run on new ROW that would vary between 120 and 330 feet in width as it climbs up and down the steep slopes and spans the narrow valleys typical of this region.

Although the coulee region is not a heavily populated part of the state, the people who live there appreciate the natural beauty and peaceful aesthetics of their surroundings. The hills and valleys, supporting a mix of diverse deciduous forests, small farm fields and pastures, springs, and numerous winding streams, provide an overall environment and quality of life that its residents feel strongly about preserving. A large Amish community lives in this area, as well as many others who purposefully left behind busy, urban lifestyles to come to a place where they could feel safe, less harried and part of a rural community dependent on the land. The intrusion and physical scar that the proposed high-voltage line and the cleared ROW would create across this landscape would have a significant aesthetic and visual impact on the people that live and work in this region.

In addition, many of the residents have expressed concerns about the adverse effects of the proposed transmission line on tourism and visitors to the area. Numerous businesses in Cashton and Ontario are dependent on tourism and many of the goods and products that are sold are produced by local residents. STH 33 is a highway used by both locals and tourists to travel through the area. The proposed transmission line and its ROW would be very visible from this road in many locations as it cuts across the hills and valleys north of STH 33. While transmission lines are a common sight in many locales across the state and beyond, this area has no large-scale transmission lines and very few low-voltage lines. From hill tops, the views are, for the most part, unobstructed. The permanent impacts that would occur as a result of constructing the Badger-Coulee line and the long-term presence of the line itself would detract significantly from the current aesthetic appeal of the region.

Near Elroy, the new transmission line would cross the 400 State Trail, which is used for bicycling and snowmobiling, as well as hiking. The trail parallels the east side of STH 80 at this location, but it is within a wooded buffer that separates the trail from the highway. The clearing of a 120-foot wide ROW through this wooded area for the new high-voltage line would have a negative aesthetic impact on trail users.

6.4.4. Public lands and recreation

This section primarily describes the recreational properties and resources that could be directly affected by the construction and presence of the proposed Badger-Coulee 345 kV transmission line between the Briggs Road Substation and Lyndon Station. Other areas, such as IBAs or properties managed primarily for the purpose of providing fish or wildlife habitat, are discussed earlier in this chapter in Section 6.3.2 (Natural Resource Properties). Also, the overall effect of the proposed transmission line on aesthetics and tourism-related business is covered in Section 6.4.3 (Aesthetics and visual impacts) of this chapter.

Although the potential adverse impacts of this project on hunting and some passive recreational activities such as hiking, bird watching, and leisure enjoyment of natural resources are not discussed with respect to individual private properties in this EIS, Commission staff acknowledges the numerous comments that have been received from owners of rural, undeveloped properties supporting woods, meadows, waterways, and wetlands.

6.4.4.1. Segments P and N

P-west

In the town of Holland, a parcel owned by the town and supporting the town hall and a park is directly adjacent to the north end of Subsegment P2. Two ball diamonds face the proposed route and a buffer of mature trees along the town's property boundary would likely need to be removed. The Holland Sand Prairie SNA (a non-DNR owned property) lies 500 to 600 feet east of this segment. While not directly affected by the proposed transmission line, the line would be clearly visible from the property.

Subsegment P5 crosses the western edge of the New Amsterdam Grasslands, which is owned and managed by the Mississippi Valley Conservancy to provide habitat for grassland birds. Many adjacent and nearby landowners spend leisure time walking and bird watching in this area. A number of them have expressed comments about the potential presence of the new high-voltage line and its potential adverse effect on their enjoyment of this property.

P-east

The Holland Sportsmen's Club is on a privately-owned parcel abutting the east side of Subsegment P12. The proposed line should not affect the current recreational use of this property. The Prairie View Elementary School is farther north adjacent to Segment P14. This property is discussed in greater detail in Section 6.4.2 .3of this chapter.

Segment P

Along Subsegment P9 on the opposite side of USH 53 is Drugan's Castle Mound Country Club which includes a golf course and restaurant. The proposed line would likely have no effect on the use of this property. However, farther north, the route is directly adjacent to the privately-owned Whispering Pines Campground. Some of the campsites are within 100 to 125 feet of the proposed centerline and a wooded buffer that currently screens the view of USH 53 and helps to muffle the noise of the busy roadway would need to be partially cleared, exposing the campers to increased noise and traffic.

Prior to crossing the Black River, Subsegment P9 crosses to the east side of USH 53 to avoid crossing the state-owned Van Loon Floodplain Savannah SNA; however, the proposed 345 kV line would be within 150 feet of the SNA's eastern property boundary and 1,100 feet west of the CapX 345 kV transmission line corridor.

Segment N - Blair to Black River Falls Area

The northern edge of two DNR-owned parcels totaling 80 acres and managed as wildlife habitat are crossed by Subsegment N3b in the town of Springfield. These properties are a mixture of mixed pine-oak forest and pine plantation with scattered open areas. It is unknown how or if the parcels are used by local residents. These properties are discussed in more detail in Section 6.3.2.

Approximately 0.5 mile west of these DNR properties, Subsegment N3b crosses a Jackson Country snowmobile trail in the town of Springfield. Farther east, Subsegment N6 crosses another Jackson County snowmobile trail in the town of Adams, located approximately 1.0 mile west of the USH 12/I-94 interchange. No long-term recreational effects are expected to the trails or their use. Timely contacts with county trail officials and adequate signage to warn of possible hazards during construction should reduce the potential for accidents.

Segment N5 crosses the northwest corner of the publicly-owned Skyline Golf Course. If the project is approved along Segment N, a large double-circuit 161/345 kV corner structure would be constructed approximately 20 to 30 feet from a cart path that partially circles the green on the sixth hole.

In the town of Brockway and continuing south, Segment N6 crosses approximately 4 miles of Jackson County Forest as it follows the north side of the I-94 corridor. Closer to the town of Millston and continuing south for nearly 5.0 miles, Subsegment N6 also crosses the Black River State Forest over a distance of approximately 5.0 miles. Additionally in the town of Lincoln, the route crosses a corner of the Monroe County Forest. As the transmission line parallels the edge of the WisDOT ROW, it is unlikely that the transmission line would have an adverse effect on recreating within these county or state forests.

Segment N - Camp Douglas Area

Near Tomah, Subsegment N8 crosses a Monroe County snowmobile trail near the intersection of STH 21 and I-94 and another crossing occurs along Subsegment N9 near the village of Oakdale. Except for during construction, the transmission line should not adversely affect use of the trail. Timely pre-construction communication with county trail officials and posting of adequate signage during construction should minimize the potential for any accidents.

North of Camp Douglas, Subsegment N10 crosses private property adjacent to Mill Bluff State Park. No adverse effects on recreating within the park or its associated SNA would be expected to occur.

As the proposed route detours away from the interstate corridor to avoid potential conflicts with Volk Field, Subsegment N14 crosses the Omaha Trail, a state bicycle trail, perpendicular to the trail. As this portion of the bike trail is approximately 0.75 mile from the interstate and surrounded by wooded hills and open fields, the presence of the large, new transmission line could adversely affect viewsheds from the trail and the users' enjoyment of the trail. The trail is also used by snowmobiles in the winter months and similar aesthetic concerns are applicable.

Table 6.4-3 Potentially affected recreational resources on Segments P and N

Segment P-west
Holland Town Hall and ball park
New Amsterdam Grasslands
Segment P
Whispering Pines Campground
Skyline Golf Course
Segment N
Two Jackson County snowmobile trails
Two Monroe County snowmobile trails
Omaha State Trail

6.4.4.2. Segment O

Onalaska Area

As it follows the west side of USH 53, Subsegment O3 runs adjacent to West Cedar Meadows Park located south of the residential neighborhood on Martin Lane and Locust Avenue. Some trees that provide screening and a buffer to the busy traffic on USH 53 would likely need to be trimmed or removed. Similarly, Subsegment O4 passes by Strawberry Commons Park in the city of Onalaska. While the proposed 345 kV line would be constructed within WisDOT's ROW, it is possible that some trees buffering the east edge of the park would need to be trimmed or removed, exposing park users to increased traffic noise and views.

Subsegment O6 crosses several recreational resources as it heads northeast away from the Onalaska/La Crosse area. At the intersection of USH 53 and I-90, this subsegment passes through Sandalwood Park, a local green space serving a nearby residential neighborhood. While the proposed transmission line is routed as closely as possible to WisDOT's ROW, the towering transmission line structures would be out of context in this setting as the route skirts two sides of the park and would result in the removal of a number of trees.

The southwest corner of a DNR-owned wildlife and fisheries area along the La Crosse River (adjacent to N. Kinney Coulee Road) also would be crossed by Subsegment O6. It is evident that local residents use the area for relaxing, nature watching and picnicking, as several landscaped gardens have been planted and some natural artwork and benches have been placed on the site. It is likely that several mature trees in the riparian zone would have to be cleared where the transmission line ROW would overlap a corner of the site. Also, construction access would extend from N. Kinney Coulee Road, and pass through the small parking area to reach the proposed ROW on the south side of the La Crosse River. This would permanently change the aesthetics of the area and could discourage continued recreational use, especially during line construction.

Less than 2,000 feet east of the La Crosse River, Subsegment O6 crosses the La Crosse River State Trail along the north side of I-90 in the town of Hamilton. Temporary construction disturbance could impact bicyclists and walkers in summer months and snowmobiling and skiing during winter months. The applicants would have to work with DNR trail managers and post warning signs to minimize potential hazards. Aesthetic issues should not be a substantial concern as the trail currently follows an existing 69 kV transmission line and the Badger-Coulee line crossing would occur just north of the location where the trail crosses I-90.

Subsegment O7d crosses the south end of DNR-managed wildlife area bordering the Little La Crosse River. The area should be able to be spanned without the placement of poles on state property. As this relatively narrow property is privately-owned and directly adjacent to STH 27, few if any impacts on active recreation are expected. The scenic enjoyment of this property could, however, be adversely affected by the presence of the high-voltage transmission line.

Cashton to Lyndon Station Area

South of the intersection of STH 33 and STH 27, Subsegments O10 and O11 cross two Monroe County snowmobile trails, and farther east Subsegment O15 crosses another snowmobile trail near CTH Z in the town of Wellington. It is likely that the portions of Segment O that traverse Juneau County also cross one or more snowmobile trails but an updated 2013-2014 trail map was not available. With timely pre-construction communication with county officials and appropriate signage to warn trail users about possible construction disturbances, the potential for hazards during construction should be avoided.

The 400 State Trail which parallels STH 80 near the city of Elroy is crossed by Subsegment O19. The trail is within a wooded buffer on the east side of this major highway and the transmission line crossing is perpendicular to the trail. The need to clear a 120-foot wide ROW for the new high-voltage line through a heavily wooded area east of STH 80 would increase the aesthetic impact on trail users. The transmission line was routed through this wooded area to avoid several homes on Ackerman Road and increase the distance between the proposed project and a large city-owned park on the south edge of Elroy.

Table 6.4-4 Potentially affected recreational resources on Segment O

Segment O
West Cedar Meadows Park
Strawberry Commons Park
Sandalwood Park
La Crosse River wildlife area
La Crosse River State Trail
Three Monroe County snowmobile trails
400 State Trail

6.4.5. Airports and airstrips

As Segments N, P, and O are some of the longer segments comprising the proposed routes, the number of airport and airstrips is greater, particularly on Segment N. Near Segments P and N, there are 14 airports and airstrips, including those associated with military facilities. Of these, two could be impacted by the proposed transmission line and would require some additional coordination with the WisDOT Bureau of Aeronautics and the specific airport operator to mitigate possible conflicts. Along Segment O there are three airports and airstrips of which one, the La Crosse Municipal Airport, would require new no hazard determinations from FAA prior to the start of construction.

6.4.5.1. Segments P and N

Starting at the Briggs Road Substation, the Holland Airpark and the Parkway Farm Strip are present near the proposed alignment; both are privately-owned. The asphalt runway of the Holland Airpark is 3,200 feet long and runs in a north/south alignment. This airstrip is approximately 0.4 miles from Subsegment P9. The proposed alignment does not appear to impact FAA horizontal and conical surface requirements, but if construction occurs on this segment, the applicants would coordinate with the appropriate local officials, WisDOT Bureau of Aeronautics, and the airpark operator.

The Parkway Farm Strip is a 2,500-foot turf runway which runs in a north/south alignment. This airstrip is approximately 0.4 miles from the intersection of Subsegments P6 and P5. Similarly, there appear to be no impacts on FAA horizontal and conical surface requirements, but the applicants would coordinate with appropriate staff and agencies to mitigate any possible conflicts.

Near the community of Blair, the Blair Airstrip is approximately 1.2 miles from the western edge its runway to Subsegment N3a and 1.3 miles south of Subsegment N3b. The runway is a turf surface that is 1,900 feet long and runs in an east/west alignment. The proposed alignment shows some possible issues with FAA conical surface requirements. The proposed 345 kV transmission line would be double-circuited with an existing 161 kV transmission line primarily along the current alignment of the 161 kV line. If the project is approved and this segment is chosen, the applicants would coordinate with the appropriate local officials, WisDOT Bureau of Aeronautics, and the airport operator to mitigate possible conflicts.

Continuing east along Segment N, the Lewis Airstrip is located west of Black River Falls in the town of Albion. It has a turf runway of 2,400 feet long and runs in an east/west alignment. This airstrip is approximately 0.9 miles from Subsegment N3b at its closest point. This alignment does pose a possible issue with FAA horizontal and conical surface requirements to the north of the runway. The proposed transmission line would be double-circuited with an existing 161 kV transmission line along the lower-voltage line's current alignment which parallels the runway. If this segment is ordered, the applicants would coordinate with the appropriate local officials, WisDOT Bureau of Aeronautics, and the airport operator to mitigate any conflicts.

A heliport associated with Black River Falls Memorial Hospital within the city of Black River Falls and the Black River Falls Municipal Airport several miles south of the city off of STH 27 would not be affected by the proposed alignment.

In the city of Tomah, Bloyer Field, a public airport and the private Tomah Memorial Hospital Heliport are 1.3 and 2.2 miles from the proposed alignment, respectively, but neither would be adversely affected by construction of the proposed transmission line. In addition, several small airstrips associated with local agricultural operations are located northeast of Tomah; all are greater than 3.0 miles from the route and would not be impacted by the project.

The proposed routes already take into account the flights and activities related to the Volk Field training facility near Camp Douglas. (See discussion in Section 2.2.2 of this EIS.) WisDOT Bureau of Aeronautics database has no information available regarding the Duncan Airstrip east of Oakdale, nor is it readily visible on aerial photographic images. Its operational status is unknown at this time.

South of the village of Camp Douglas is the Target Bluff Airport, located 0.3 mile directly south of Subsegment N14. According to WisDOT Bureau of Aeronautics, it is currently inactive.

Farther south on Segment N, the privately-owned Mauston Mill Bluff Heliport and the public Mauston-New Lisbon Union Airport are about 1.3 and 1.8 miles from Segment N, respectively. No potential issues with incoming or outgoing flights at these facilities would be expected.

6.4.5.2. Segment O

On Segment O heading south from the Briggs Road Substation, the first potential problem encountered is with the La Crosse Municipal Airport. Subsegment O5 is approximately 1.8 miles from the closest point of the runway. FAA indicates that the anticipated structure heights that would accommodate a future double-circuit 345/161 kV line would increase the instrument flight altitude within the terminal area of this airport. NSPW's existing 161 kV line is currently located on an alignment that is about

1.6 miles from the end of the runway, but it is likely that the existing structures are lower in height than the proposed structures for Subsegments O5 and O6. The other Segment O concern was regarding the horizontal or conical imaginary surface that FAA has established. Part of this area is in a location where the proposed structures would be shielded by a bluff and existing overhead transmission lines.

Several steps have been and will be taken to address FAA's concerns related to the La Crosse Municipal Airport. First, during the detailed design phase, the applicants would obtain new topographical survey data and be able to determine the exact structure locations and heights. Second, any required notices to FAA would be refiled and modeling data would be provided. Third, once FAA issues new determinations, the applicants could ask FAA to complete studies and surveys to explore ways to address these issues if needed. The applicants would use this information to work through the concerns and find agreed upon remedies.

Just west of the village of Rockland, the database indicates the presence of the Webster airstrip. It would be approximately 0.6 miles from the segment; however, WisDot Bureau of Aeronautics does not have any information about the operational status of this airstrip nor is it visible from aerial photographs. No additional information is available regarding this facility. Further east on Subsegment O6, the NIMBY Airstrip located east of Rockland off of I-90 is approximately 0.3 miles from the proposed transmission alignment. It has a turf runway approximately 2,680 feet in length.

Table 6-4-5 Potentially affected airports or airstrips

Segments P and N	Segment O
Holland Airpark	La Crosse Municipal Airport
Parkway Farm Strip	
Blair Airstrip	
Lewis Airstrip	

CHAPTER
7

7. Environmental Analysis: Lyndon Station to Wisconsin Dells (Segments M-L and M-K)

7.1. SEGMENT COMPARISONS

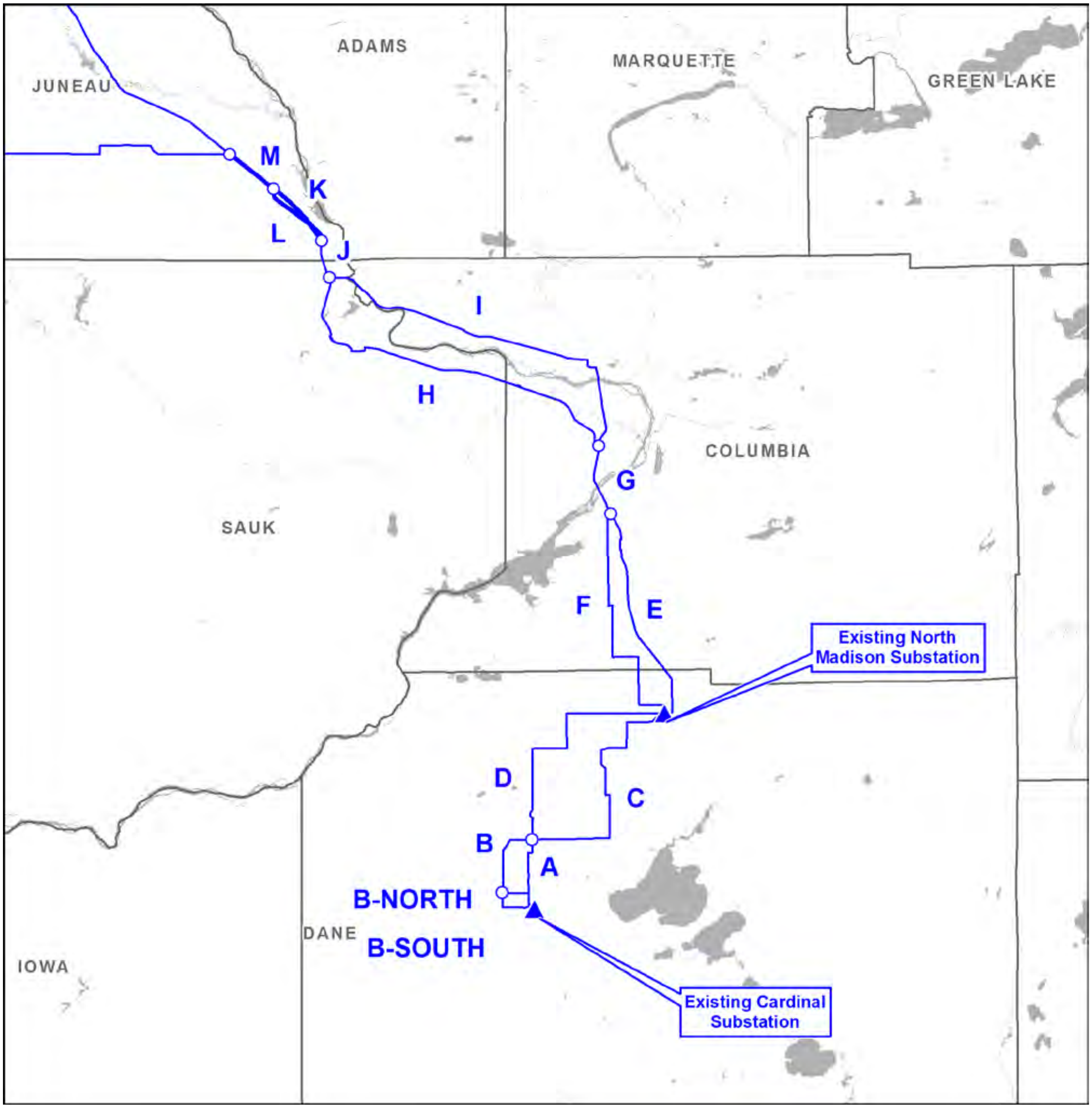
Segments N and O connect to the common Segment M in the town of Kildare, north of the village of Lyndon Station, Juneau County near the west side of the interstate (I-90/94). Segment M is relatively short at 3.3 miles long and connects at its southern end to either Segments L or K at Koval Road. There are no alternative segments for Segment M; it is common to all route options.

Segment M
Segment M is located along an existing ATC 69 kV transmission line ROW. The 69 kV line (Y-101) would be underbuilt on the proposed 345 kV delta-configured structures. This segment is located near but does not overlap the I-90/94 ROW. The distance of the centerline of the lower-voltage line from the edge of the WisDOT ROW ranges from approximately 385 feet at the northern end of Segment M to 80 feet at the southern end as it curves closer to the interstate. The existing 69 kV line ROW is 60-feet wide and would be expanded about 30 feet on both sides of the existing ROW (60 foot expansion resulting in a total ROW width of 120 feet) to accommodate the larger structures. None of the proposed transmission line ROW would overlap WisDOT's ROW. The typical height of the proposed structures would range from 125 to 150 feet above ground. Span lengths would range from 700 to 1,000 feet. Land cover within the area required for ROW expansion includes predominantly upland and wetland forest land, with lesser quantities of prairie/grassland.

Segments K and L
Segment L parallels Segment K. While Segment K is located near the west side I-90/94, Segment L initially veers south for 0.5 mile before paralleling a railroad and curves to within a couple of hundred feet of Segment K. The segments begin in the town of Lyndon and end at the northern boundary of the Wisconsin Dells. Land cover in this area is primarily upland woodland.

Segment K is 4.2 miles long and continues along the west side of I-90/94 as new transmission ROW. Approximately 70 feet of ROW for the proposed line would overlap the WisDOT's ROW. The remaining ROW width would be from private properties that abut the highway. The proposed line would be constructed on single-circuit delta-configured structures. The typical height of the structures would range from 105 to 125 feet above ground. Span lengths would range from 850 feet to 1,000 feet.

Figure 7.1-1 Badger-Coulee Segments M, K, and L



Segment L is 4.3 miles long. It initially runs south for about 0.5 mile. Configured similar to Segment M, the existing ATC 69 kV transmission line (Y-101) would be underbuilt on the proposed 345 kV structures. It would follow the existing transmission line ROW adjacent to Koval Road. The lower-voltage transmission ROW width would be expanded approximately 42 feet onto private properties to the west. Prior to crossing the railroad and USH 12, Segment L turns southeast to parallel the north/east side of the railroad. The proposed line for this subsegment would be single-circuited with delta-configured structures. The required ROW width of 120 feet would partially overlap the railroad ROW. The typical height of the structures would range from 105 to 155 feet above ground. Span lengths would range from 800 to 1,100 feet.

Table 7.1-1 Comparison of ROW characteristics for the routes from Lyndon Station to Wisconsin Dells

Segment Combination	Length (miles)	Total ROW Required (acres)	Existing ROW Shared (acres)	New ROW (acres)	Percentage of ROW Shared
M and K	7.5	108.6	60.4	48.1	55.6
M and L	7.6	109.8	50.9	58.8	46.4

7.2. CONSTRUCTION SPECIFICS

7.2.1. Construction issues

Off-ROW access roads become necessary where there are natural constraints such as steep hills, large high-quality natural resources, or other limitations where direct access from public roads is not possible. A brief discussion of the role of off-ROW access roads for this project is included in Section 2.1.4. If the proposed transmission line is built, all necessary access roads will be 16 feet wide and constructed with the ability to support the movement of heavy construction equipment. If the project is approved, the applicants will re-evaluate the proposed access routes. After construction is completed, off-ROW access roads may be restored to pre-construction conditions or, depending on negotiations with the property owner, access roads constructed in upland areas may be left in place.

Table 7.2-1 Off-ROW access roads impacts by segment combinations*

Segment Combinations	Number of Roads	Length (miles)	Wetlands (acres)	Upland Forest (acres)
M and K	3	0.2	0	0.1
M and L	0	0	0	0

* Data compiled from Application, Appendix B, Table 10.

There are no off-ROW access roads proposed for constructing the proposed transmission line on Segments M or L.

Subsegment K runs parallel to I-90/94. There are three off-ROW access roads proposed for this subsegment, all of which are due to restrictions on equipment access and/or steep embankments or overpasses along the interstate ROW. In total, 0.23 miles of access roads would be constructed parallel to Koval Road and 63rd Street. Approximately 0.1 acre of upland forest would be removed from existing clearings for adequate construction equipment access.

7.2.2. Electric distribution lines along Segments M, K, and L

There are distribution lines owned by WP&L along Segment M that would require relocation if the proposed project is approved. No distribution lines would require relocation along Segments L or K. The distribution lines require relocation because either they are located in areas that pose physical conflicts with the proposed 345 kV line or their proximity to the transmission line might result in stray voltage concerns, also known as NEV. No distribution lines are proposed to be underbuilt on the new 345 kV structures.

There is a general consensus that distribution lines located less than 150 feet from and parallel to a transmission line for a continuous distance greater than 1,000 feet can cause impacts on farms with confined animals. In Chapter 4, Section 4.5.15 of this EIS, the cause, impact, and mitigation of NEV issues are discussed in detail. In addition, the Commission may require the applicant to conduct pre-construction and post-construction testing of potentially impacted farms and lines.

All distribution modifications required as a result of this project would be made by the distribution owners including distribution line design, relocation, and associated permitting. For cost estimation purposes (see Section 2.4 of this EIS), all modified distribution lines were assumed to be relocated underground and the related costs are factored into the total costs presented.

On common Segment M, a WP&L distribution line is currently underbuilt on ATC's 69 kV transmission line (Y-101) starting just south of CTH HH. If the project is approved, the lower-voltage line (Y-101) would be underbuilt on the new 345 kV structures and the distribution line would be relocated. Two portions (2,200 feet and 5,300 feet lengths) of the distribution line totaling 1.4 miles would be relocated.

Table 7.2-2 Distribution lines that would be relocated

Segment	Number of Locations	Miles of Distribution Line
M	2	1.4

7.3. NATURAL RESOURCES

7.3.1. Agriculture

The continuing presence of a high-voltage transmission can adversely affect farm operations and field productivity. Refer to Chapter 4, Section 4.5.2, for a discussion of potential impacts associated with transmission line construction and operation in agricultural fields. DATCP will present its analyses of the potential impacts of the proposed project to farmed fields in the AIS it is preparing. See Chapter 1, Section 1.4.2 for a discussion of the role of DATCP in this project. The table of contents of the AIS is included in Appendix D. The acreage figures used below were obtained from DATCP, and may differ from those supplied by the applicants due to the possible exclusion in the application of cropped wetlands from the cropland totals.

Segments M, L and K primarily pass through forested lands. No agricultural land is found on Segments L or K. Additionally no dairy operations (10 or more animals confined in a facility) are located within a half mile of the proposed centerline and no non-residential agricultural buildings are located within 300 feet of the centerline.

All of the agricultural land on Segment M is active cropland. The majority of the crops are corn and soybeans; however, wheat and alfalfa/hay fields also occur. No other specialty crops, such as ginseng, orchards, or cranberry bogs, are grown within the proposed ROW Segment M.

Segment M
A total of 1.4 acres of agricultural land are within the proposed transmission line ROW, all of which is active cropland. No temporary, off-ROW access routes crossing agricultural lands are needed.

No dairy operations (ten or more animals confined in a facility) are located within 0.5 mile of the proposed segment centerline. One non-residential agricultural building is located within 300 feet of the centerline. Limited aerial applications of herbicides, fungicides, and pesticides may occur along the route, though no specific information is known. The applicants should work with landowners where aerial spraying would be affected by transmission line placement to minimize potential impacts.

The segment would require the clearing of approximately 53 feet of windbreaks or tree lines. No known organic farm operations are located along this segment.

Table 7.3-1 Potential agricultural impacts on Segments E, F, and G

Segment Combinations	Total ROW (acres)	Agricultural Land (acres)	Percentage of ROW in Agriculture	Dairy Operations within 0.5 Mile
M and K	108.6	1.4	1.3	0
M and L	109.8	1.4	1.3	0

7.3.2. Natural resource properties

This section discusses the properties in this part of the project area that are managed primarily for protecting natural resource habitat. These properties may include publicly-owned lands and also private lands covered by a conservation easement or agreement. There may be some overlap in this section with properties discussed in Section 7.4.4 Public lands and Recreation because some properties serve multiple functions or have multiple designated uses.

No properties on Segment M have been identified as being managed specifically for natural resource protection. A narrow strip of heavily wooded land between Subsegments K and L, paralleling I-90/94 and the railroad corridor is identified on application maps as a "sensitive area." This land is privately owned and it is not clear at this time how it is being managed. A larger parcel of federal land held in trust for the Winnebago Indian Tribe is located northeast of the interstate corridor.

7.3.3. Forested lands

7.3.3.1. Existing environment

Segments M, K, and L run along the western edge of the Central Sand Plains and the Central Sand Hills Ecological Landscapes, as described in Chapter 2, Section 2.3. The Central Sand Plains is characterized as a flat, sandy area of outwash, and lacustrine deposits. Sandstone buttes and stream bottoms are also common. The potential natural vegetation is jack pine and scrub oak forests, barrens, and sedge meadow, and conifer swamp wetlands. The Central Sand Hills is characterized by glacial outwash with extensive eskers and drumlins, ice contact deposits, rolling ground moraines, and steep end moraines. The potential natural vegetation of this region is primarily oak savanna with areas of sedge meadow.

Woodlands in this area tend to be larger, more contiguous blocks of forest (over 10 acres on average) than in the agricultural areas further south. The deciduous forests along these segments are dominated by pole and saw timber-sized oaks, hickory, and maples, while the mixed deciduous-coniferous forests are dominated by pole and saw timber-sized oaks, pines, and quaking aspen. Minor species include quaking aspen, black locust, ash, and black cherry. Coniferous stands include white and red pines. The understory commonly includes sumac, buckthorn, and honeysuckle.

Wooded wetlands, primarily hardwood swamps, are common on Segment M. Dominant species include red maple, American elm, green and black ash, quaking aspen, and river birch.

Forest use is primarily recreational. Forested lands are privately-owned, with the exception of small areas owned by the village of Lyndon Station and the city of Wisconsin Dells. Other publicly-owned woodlands are located where adjoining forests extend into WisDOT's interstate highway ROW.

7.3.3.2. Potential impacts

Segment M

A total of 8.0 acres of upland woods and 8.9 acres of wooded wetland would be cleared, for a total permanent loss of 16. 9 acres of woodland. This clearing would result from widening the existing I-90/94 corridor. No clearing would be required for off-ROW access routes.

Segment M has three pine plantations or forests along its ROW. Removing pine trees creates the possibility of introducing annosum root rot.

This segment passes through blocks of MFL land adjacent to the interstate near Lyndon Station. It is likely that ROW clearing would impact forested land enrolled in the MFL program in this area.

Segment L

A total of 40.0 acres of upland woodland and 1.4 acres of wooded wetland would be cleared, for a total permanent forest impact of 41.4 acres. The clearing would result from widening existing railroad and road corridors. No clearing would be required for off-ROW access routes.

The segment passes through an area of MFL land midway between Lyndon Station and Wisconsin Dells. It is possible that ROW clearing could impact forested lands enrolled in the program in this area.

Segment K

A total of 27.5 acres of upland woodland and 3.9 acres of wooded wetland would be cleared, for a total permanent forest loss of 31.4 acres. This clearing would result from widening the existing I-90/94 corridor. Off-ROW access routes would require an additional 0.12 acre of wooded wetland clearing.

Segment K has seven pine plantations or forests along its ROW. Removing pine trees creates the potential for introducing annosum root rot.

This segment passes through an area of land enrolled in the MFL program midway between Lyndon Station and Wisconsin Dells. It is possible that ROW clearing could impact enrollment in the program.

Table 7.3-2 Summary of woodland loss on Segments M, K and L

Segment Combinations	Upland Woods Cleared (acres)	Forested Wetland Cleared (acres)	Total Acres Cleared
M and K	35.5	12.8	48.3
M and L	48.0	10.3	58.3

7.3.4. Wetlands

Construction in wetlands could alter wetland hydrology, vegetative character, and function. More specifically, forested wetlands would be permanently lost and converted to shrub wetlands or sedge meadow and the likelihood of invasive species being introduced to the site would be greater. Furthermore, minimizing impacts is necessary and might be achieved by restricting construction to winter or periods of low flow, implementing requirements of Wis. Admin. Code ch. NR 40 for invasive species, and using matting or other low ground pressure equipment. After completing construction of the transmission line, the applicants would conduct site restoration and compensatory mitigation activities as required. General information about wetland resources and the potential short- and long-term potential impacts of constructing transmission line through and across wetlands can be found in Section 4.5.17.

Segments M, L, and K cross a number of wetlands and wetland types. The applicants conducted field analyses of the wetlands crossed by project routes where the wetlands were accessible along existing electric transmission and public ROWs. Thus, a substantial portion of some segments were not field surveyed. The applicants evaluated wetlands on private properties using available desktop resources such as the WWI, soil maps, and recent aerial photographs.

The applicants intend to provide compensatory mitigation for permanent and conversion wetland impacts by using either existing mitigation banks, Wisconsin's In-Lieu Fee Program or, if no other option exists, permittee-responsible mitigation. As part of the permitting process, DNR and USACE would review any mitigation proposal for this project, prior to the start of construction.

Segment M

Segment M is a short common segment that would be double-circuited with an existing transmission line. Requiring 47.5 acres for the 120-foot-wide ROW, about half of the segment is located in wetlands. Tributaries of Lyndon Creek cross the route in multiple locations impacting a number of wetlands. The segment crosses 15 wetlands, of which six are considered high-quality. In total, Segment M would impact 26.05 acres of wetland (16.53 acres of forested wetlands and 9.52 acres of non-forested). This segment crosses two large wetland complexes, including 927 feet of one wetland associated with Tracy Creek, a designated ASNRI and 2,882 feet of another wetland complex. The wetland associated with Tracy Creek is primarily composed of weedy vegetation sloping into a hardwood swamp located off of the highway ROW. The other wetland complex is composed of several types of wetlands, including sedge meadow, and contains diverse plant communities. On Segment M, 14 structures would be built in wetlands, of which five would be located within the two larger complexes.

Segment K

Segment K (4.2 miles in length) continues southeast adjacent to and partially within the I-90/94 ROW. The majority of Segment K is composed of upland hardwood forest, though some wetlands are present. Segment K crosses seven wetlands, all of which are considered significant high-quality wetlands. Construction of Segment K would result in 7.5 acres of total wetland impacts (3.86 acres of forested wetland and 3.64 acres of non-forested). Within the proposed ROW, the longest wetland crossing is 1,715 feet. This wetland contains native herbaceous species within the interstate ROW and transitions to a hardwood swamp outside of the interstate ROW. This segment also crosses a wetland associated with Gilmore Creek, which is an ASNRI-designated waterway. This segment would require construction of seven structures in wetlands.

Segment L

The first 0.5 mile of Segment L (Subsegment L1) is located along an existing transmission corridor and thus was fully surveyed by the applicants. Two small contiguous wet meadow wetlands are crossed by this portion of the route. The remainder of the segment (Subsegment L2) shares ROW with a railroad corridor and approximately 38 percent of this subsegment was field surveyed. From desktop resources, the applicants determined that this subsegment crosses an additional five wetlands, of which one is considered a significant high-quality wetland. In total, Segment L crosses seven wetlands and would result in 2.97 acres of potential impacts (1.42 forested and 1.55 non-forested). If constructed along this segment, two structures would be constructed in wetlands.

Summary

Segments M and K would have slightly more wetland impacts than Segments M and L. Segment K has more contiguous wetland complexes than Segment L and would potentially impact more forested wetland acres and require more wetland matting.

Table 7.3-3 Summary of wetland impacts of Segments M, K, and L

Segment Combinations	Forested Wetland				Non-Forested Wetland			Total Wetland Impact (acres)	Significant/ High-quality Wetlands
	Existing Shared ROW Not Cleared* (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Forested Wetland Impact (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Non-forested Wetland Impact (acres)		
M and K	1.2	8.9	11.5	20.4	7.3	5.9	13.2	33.6	11
M and L	0	8.0	10.0	18.0	5.5	5.5	11.1	29.1	6

* This column is a subset of the Existing Shared ROW.

7.3.5. Lakes, rivers, and streams

Some of the waterways crossed by the proposed project have significant scientific value, and are identified by DNR as ASNRI for their protection under Wis. Admin. Code § NR 1.05. ASNRI designations are given to water bodies that meet one of a number of criteria representing high ecological value such as ORWs, ERWs, and trout streams (Class I, II, and III). See Figure Vol. 2-4.02 for a map depicting the region's waterways.

Some waterways crossed during construction would require a TCSB or a bridge requiring support below the OHWM. These waterways could be adversely affected by removal of stream bank vegetation, excavation, potential soil erosion and sedimentation, and temporary closure to users of the river. Impacts may be minimized by implementing requirements of Wis. Admin. Code ch. NR 40 for invasive species, completing site restoration and revegetation activities as required, as well as following BMPs and Erosion Control Plan specifications. General information about lakes, rivers, and streams, and the potential impacts to this resource from transmission line construction can be found in this EIS in Section 4.5.16.

The applicants identified navigable waterways intersected by the proposed routes based on a review of desktop information and data, and aerial photographs; field observations were made along accessible routes. DNR has final jurisdictional authority over navigability determinations. Some non-navigable and intermittent streams may also be present along the routes. These resources would be identified during a pre-construction engineering survey if the proposed project is approved.

Segment M

Though Segment M is relatively short, this segment crosses the upper reaches of three Class III trout streams (Hotzlander, Tracy, and Lyndon Creeks). All three creeks are ASNRI waterways and use of TCSBs during construction would be necessary. Bridge placement and removal must comply with all permit conditions. Furthermore, vegetative clearing on the bank should be minimized to maintain the integrity of the streams. A structure is proposed to be located near Holtzlander Creek. If it cannot be located farther away from the creek, strict erosion controls must be utilized to minimize impacts.

Segment K

Segment K intersects three waterways (Gilmore Creek and two unnamed tributaries to Gilmore Creek). Gilmore Creek (ERW) is an ASNRI waterway and a Class I trout stream and would require installation of a TCSB during construction. Although no structures are proposed to be constructed within 300 feet of Gilmore Creek, TCSB standards and conditions to minimize impacts such as bridge placement, removal, and vegetative/bank clearing should be followed.

Segment L

Segment L crosses only one waterway (Gilmore Creek). The same precautions should be taken to avoid negative impacts to Gilmore Creek (ERW), as described above. Also, though no structures are proposed near the stream, installation of a TCSB would be needed during construction.

7.3.5.1. Summary of waterway impacts of Segments M-K and M-L

Segments M-K impacts more waterways than Segments M-L. More specifically, Segment M-K crosses six waterways, four of which are designated trout streams. Segment M-L crosses four waterways, all trout streams. Segments K and L both cross Gilmore Creek (ERW), a Class I trout stream. Vegetative clearing on the bank of these waterways and the placement of TCSBs could adversely impact these high-quality streams. TCSB standards and conditions must be followed to minimize impacts, as well as proper erosion control measures.

Table 7.3-4 Summary of waterway impacts on Segments M-K and Segments M-L

Segment Combinations	Waterway Crossings	ASNRI Waterway Crossings	TCSBs required	TCSBs Over ASNRI Waterways
M and K	6	4	4	4
M and L	4	4	4	4

7.3.6. Rare species and natural communities

This section discusses the potential impacts to endangered resources that might be affected by construction or operation of the proposed project along Segments M, L, and K. A general discussion of rare species is presented earlier in this EIS in Chapter 4, Section 4.5.

Endangered resources include rare or declining species, high quality or rare natural communities, and unique or significant natural features. Endangered resources are tracked via the state's Natural Heritage Inventory (NHI) database which is maintained by the DNR Bureau of Natural Heritage Conservation. The project area evaluation consists of both the specific route and a buffer of 1.0 mile for terrestrial and wetland species and a 2.0-mile buffer for aquatic species.

The combined presence of natural habitat and man-made disturbances must be taken into consideration to evaluate whether there is a likelihood that rare species are present and the potential for negative impacts on those species. For the purposes of this document, rare species are defined as federal- or state-listed threatened and endangered species, federal candidate and proposed species, and state special concern species. These species are not common which means they are low in numbers or restricted to small geographical areas, *i.e.*, difficult to find. Therefore, while the existing sources of information are important for estimating impacts to rare species, they are incomplete. Additional rare species beyond those identified may actually be present in potentially impacted areas.

Also, the Wisconsin NHI database only has information on rare species for areas that have been previously surveyed for that species or group during the appropriate season and the observation recorded. Not all areas of the state have been surveyed, especially most privately-owned lands. Therefore, potential endangered resource impacts along segments dominated by private properties may be incomplete.

For specific route segments, an incidental take of state threatened or endangered animal species may occur as defined by Wis. Stat. § 29.604. Further consultation under DNR's incidental take process may be needed and an incidental take permit may be required for construction to proceed on those segments.

Instances where existing information indicates that additional assessment or consultation for incidental take would be needed are described in this EIS.

This section identifies the endangered resources that could be present, the project's potential impacts on these resources, and the mitigation measures that should be implemented. Rare species are discussed as taxa groups or individually if there is a high level of concern. This list and information are taken from existing sources within DNR, such as the NHI database, as well as some external sources, including landowners and surveys completed by the applicants.

7.3.6.1. Birds

Almost all bird species are protected by the MBTA. Under the MBTA, it is unlawful to take, capture, kill, or possess migratory birds, their nests, eggs, and young. This may apply to birds nesting in or adjacent to the ROW if construction disturbance results in nest abandonment. Avoiding impacts to nesting birds can be achieved if construction activities are scheduled in habitat areas outside the breeding and nesting season, from approximately March through August.

Segment M

According to landowners, a state threatened bird and two special concern bird species nest along this segment, near the junction of I-90 and CTH HH. The applicants did not conduct bird surveys for this segment. However, because the segment has numerous areas of wetland and forested habitat that could support rare birds, bird surveys along the entirety of Segment M are highly recommended.

Segment K

The NHI database indicates an occurrence of a special concern and federally-protected bird in the vicinity of Segment K. It is unknown whether this species is present along this segment because no bird surveys were conducted in this area. This bird is heavily associated with trees in proximity to large lakes and rivers. This habitat does not occur along Segment K, but does occur more than 0.5 mile away. It is likely that the proximity of the segment to I-90 reduces the quality of nesting habitat for this species, however if this segment is chosen by the Commission, additional bird surveys may be required.

Segment L

No rare bird occurrences were noted on Segment L.

7.3.6.2. Herptiles – amphibians and reptiles

Segment M

No rare herptile occurrences were noted on Segment M.

Segment K

Two state endangered herptiles may occur in the vicinity of Segment K. One of the species would not be impacted and therefore, no measures are required for this species.

The other state endangered herptile prefers sandy oak savannas, prairies, fields, and woodland habitats. These kinds of habitats do appear to be present on Segment K. Typically presence/absence surveys would be required before proceeding with minimization/avoidance measures; however for this species, no survey method is considered 100 percent effective for determining presence or absence. Therefore, if the Commission approves Segment K, habitat surveys would be required and potentially, an Incidental Take Permit.

In addition, the NHI database identifies one special concern herptile occurring in the vicinity of the segment. This species prefers a wide variety of aquatic habitats and their associated uplands. Voluntary avoidance/minimization measures include: avoiding habitat areas during specific times of the year, installing exclusion fencing in areas of suitable habitat before the species becomes active and could move into the workspace, and/or scheduling construction activities outside of hibernation areas during winter. When access to private lands or wet conditions precludes timely and effective installation of exclusion fencing, monitoring and removal can be effective if the ground surface is visible and the space to be cleared is relatively small.

Segment L

Two state endangered herptiles may occur in the vicinity of Segment L. One of the species would not be impacted and therefore, no measures are required for this species.

The other state endangered herptile prefers sandy oak savannas, prairies, fields, and woodland habitats. These kinds of habitats do appear to be present on Segment L. Typically presence/absence surveys would be required before proceeding with minimization/avoidance measures; however for this species, no survey method is considered 100 percent effective for determining presence or absence. Therefore, if the Commission approves Segment L, habitat surveys would be required, and potentially an Incidental Take Permit.

In addition, the NHI database identifies one special concern herptile occurring in the vicinity of the project area. This species prefers a wide variety of aquatic habitats and their associated uplands. This segment crosses seven wetlands and their associated uplands which may be habitat for this species. Voluntary avoidance/minimization measures include: avoiding habitat areas during the appropriate times of the year, installing exclusion fencing in areas of suitable habitat before the species becomes active and could move into the workspace, and/or scheduling construction activities outside of hibernation areas during winter. When access to private lands or wet conditions precludes the timely and effective installation of exclusion fencing, monitoring and removal can be effective if the ground surface is visible and the space to be cleared is relatively small.

7.3.6.3. Aquatic invertebrates

Segment M

No rare aquatic invertebrate occurrences were noted on Segment M.

Segment K

Two state endangered mussels (one is federally-listed as endangered), one state threatened mussel, and one special concern mayfly have been documented in the vicinity of Segment K. Although there is not much known about the mayfly, it appears unlikely that any of these aquatic invertebrates would be impacted by construction along this segment. Additionally the mussels preferred habitat is medium to large rivers and there is no waterbody sufficiently large enough along Segment K.

Segment L

Two state endangered mussels (one is federally-listed as endangered), one state threatened mussel, and one special concern mayfly have been documented in the vicinity of Segment L. Although there is not much known about the mayfly, it appears unlikely that any of these aquatic invertebrates would be impacted by construction along this segment. Additionally the mussels preferred habitat is medium to large rivers and there is no waterbody sufficiently large enough along this segment.

7.3.6.4. Fish

Segment M
No rare fish occurrences were noted on Segment M.

Segment K
Two state threatened and four special concern fish species have been documented in the vicinity of Segment K. While this segment crosses three waterbodies, only one (Gilmore Creek) could be considered suitable habitat for those six fish species. In particular, one of the special concern species is known to occur in that waterway. If work would occur below the OHWM, further assessment and/or surveys would be needed at the Gilmore Creek crossing to determine if these rare fish are present. Potential avoidance measures may include avoiding impacts to Gilmore Creek during each species' spawning period and/or implementing strict erosion control practices.

Segment L
Two state threatened and four special concern fish species have been documented within the vicinity of Segment L. This segment crosses Gilmore Creek, which may be suitable habitat for the six fish species. In particular, one of the special concern species is known to occur in Gilmore Creek. If the Commission were to choose Segment L and if work were to occur below the OHWM, further assessment and/or surveys would be needed at the Gilmore Creek crossing to determine if these rare fish are present. Potential avoidance measures may include avoiding impacts to Gilmore Creek during each species' spawning period and/or implementing strict erosion control practices.

7.3.6.5. Plants

Impacts on natural communities can ultimately change habitat conditions and make it difficult for rare plants to persist. Wisconsin's Endangered Species Law protects only state-listed endangered and threatened plant species on public lands, but utility, agriculture, forestry, and bulk sampling projects are exempted from this protection. Additional surveys and avoidance/minimization measures for rare plant species are encouraged and recommended. Potential avoidance measures may include conducting plant surveys to determine presence/absence and/or avoiding areas where known plants occur. Other measures, such as winter construction, use of mats to limit direct disturbance, or relocation, can minimize losses. DNR also recommends that applicants and landowners with rare species on their property develop a plan to protect these species.

Segment M
Suitable habitat for five special concern plant species may occur on Segment M. Four species prefer wetlands of various types and one species prefers prairie or other open habitat, including dry and wet prairies and sparsely wood openings.

Segment K
Suitable habitat is likely to be present on Segment K for 12 of the 15 plant species identified in the NHI database. One state endangered and three special concern species prefer wetlands of various types; four special concern species prefer prairie or other open habitat, including dry and wet prairies and sparsely wooded openings; and four special concern species prefer mesic-dry wooded habitat. The rare plants not likely to be found on Segment K require cliff habitats.

Segment L
Suitable habitat is likely to be present on Segment L for 12 of the 14 plant species identified in the NHI database. One state endangered and three special concern species prefer wetlands of various types; four special concern species prefer prairie or other open habitat, including dry and wet prairies and sparsely

wooded openings; and four special concern species prefer mesic-dry wooded habitat. The rare plants not likely to be found on Segment K require cliff habitats.

7.3.6.6. Natural communities

Most occurrences of high-quality natural communities documented in the NHI database are from surveys conducted on public lands. In areas where there is a predominance of private lands, many more diverse, high-quality, or rare natural community occurrences likely exist, but remain undocumented and underrepresented in the NHI database. Below is a discussion of those natural communities identified in the NHI database. Natural communities may contain rare or declining species and their protection should be incorporated into the project design as much as possible. Minimizing impacts to and/or incorporating buffers along the edges of these natural communities is recommended.

Segment M

Segment M crosses no natural communities identified in the NHI database. However, four wetland natural communities are located near the segment. Applicant surveys also found good examples of wet meadow, sedge meadow, coniferous bog, hardwood swamp, shallow marsh, and shrub-carr communities. In addition, this segment crosses five significant or high-quality wetlands and three waterways where additional rare species may be located.

Segment K

Segment K crosses no natural communities identified in the NHI database. However, seven upland and two aquatic natural communities are located near the segment. Applicant surveys also found good examples of mixed deciduous/coniferous forest, deciduous forest, and coniferous forest. In addition, this segment crosses six significant or high-quality wetlands and three waterways where additional rare species may be located.

Segment L

Segment L crosses no natural communities identified in the NHI database. However, seven upland and two aquatic natural communities are located near the segment. Applicant surveys also found good examples of mixed deciduous/coniferous forest and deciduous forest. In addition, this segment crosses one significant or high-quality wetland and one waterway where additional rare species may be located.

7.3.6.7. Summary of endangered resource impacts for Segments M, K, and L

Tables 7.3-5, 7.3-6, and 7.3-7 identify the general types and numbers of rare species, natural communities, and other features that were identified as potentially present along Segments M, L, and K based on information primarily from the NHI database and some other sources.

Table 7.3-5 Summary of endangered resources along Segment M

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidate	Not Applicable
Plants		5			
Natural Communities					4
Summary	0	5	0	0	4

State Required Actions – 0
State Recommended Actions – 9
Federal Required Actions – 0
Federal Recommended Actions – 0

Table 7.3-6 Summary of endangered resources along Segment K

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidates	Not Applicable
Birds		1			
Herptiles	2	1			
Aquatic Invertebrates	3	1	1		
Fish	2	4			
Plants	2	13			
Natural Communities					9
Summary	9	20	1	0	9

State Required Actions – 7
State Recommended Actions – 31
Federal Required Actions – 1
Federal Recommended Actions – 0

Table 7.3-7 Summary of endangered resources along Segment L

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidate	Not Applicable
Herptiles	2	1			
Aquatic Invertebrates	3	1	1		
Fish	2	4			
Plants	2	12			
Natural Communities					9
Summary	9	18	1	0	9

State Required Actions – 7
State Recommended Actions – 29
Federal Required Actions – 1
Federal Recommended Actions – 0

7.3.7. Archaeological and historic resources

No intact above-ground historic structures listed with WHS have been identified by the applicants for Segments M, L, or K.

No previously recorded archaeological or cemetery/burial sites are identified within the ROW of Segments M, L, or K; thus, no further cultural resource review is recommended for the current alignment of Segments M, L, and K.

7.4. COMMUNITY RESOURCES

7.4.1. Land use

In general, residential uses are considered to be more sensitive to impacts from electric transmission lines than commercial or industrial land uses, primarily because of potential adverse aesthetic effects. Greater potential for conflict with land use plans exists in areas of urban development, where existing and planned residential and commercial uses are more common. The potential for conflict is also present in areas undergoing land use change, such as where rural land is being converted to residential use. Corridor-sharing with different types of infrastructure (for example, transmission lines and multi-lane highways) can mitigate impacts by causing incremental impacts instead of the entirely new impacts associated with a new ROW corridor. Not all corridors that can be shared with a transmission line serve to lessen potential impacts, though. Places with narrow, canopy-covered, local roads, winding rural roads, and areas crowded with small lots may experience greater impacts from a new high-voltage transmission line.

Most areas along these routes are rural in nature and are currently in agricultural or other undeveloped uses, such as forestry. These uses are expected to continue into the future. In general, an electric transmission line is usually compatible with these surrounding land uses. Greater potential for conflict exists near the developed areas around Lyndon Station, where residential and commercial development, existing and planned, is more common.

7.4.1.1. Segment M

Segment M parallels the southwest side of I-90/94. An existing ATC 69 kV transmission line would be underbuilt on the new high-voltage line. The new line would share the ROW of the lower-voltage line for the full length of the segment, approximately 3.25 miles.

As the segment passes through the northern part of the village of Lyndon Station adjacent to I-90/94, it passes a truck stop, wastewater treatment plant, and an area designated for industrial development. Southeast of the village of Lyndon Station, the town of Lyndon's land use plan shows business development as the future use of the land between the interstate, Koval Road, and the Canadian Pacific railroad corridor.

7.4.1.2. Segment K

Segment K follows the southwest edge of I-90/94 from Koval Road to the northern edge of the city of Wisconsin Dells. The town of Lyndon's land use plan shows an extensive area of large lot residential usage northeast of the freeway, for the first 1.1 miles. A campground is also located northeast of the freeway. Further south, a residential subdivision is adjacent to the northeast side of the freeway. The wooded landscape and the distance between the interstate and the residences would effectively screen these areas from the line.

This entire segment shares ROW with existing corridors. Considering the current and future land uses along the route, residential properties would be the most likely land use to be impacted by the aesthetics of the new line.

7.4.1.3. Segment L

Segment L leaves the interstate to follow Koval Road south until it reaches the north side of the Canadian Pacific railroad corridor. This first part of the segment (Subsegment L1) would carry the existing 69 kV (Y-101) as underbuild and share its ROW. It then turns southeast, becoming a single-circuit line and follows the north side of the railroad track, paralleling USH 12. South of USH 12 is a mix of residential and commercial development. According to the town of Lyndon's land use plan, areas to the north would remain undeveloped. South of 63rd Street/Dees Road, where the railroad tracks and USH 12 diverge, two residential developments occur southwest of the rail corridor.

This entire segment shares ROW with existing corridors, including a multi-lane freeway, railroad tracks, and a 69 kV transmission line. This mitigates the potential aesthetic and land use impacts on the surrounding lands to some extent. Considering the current and future land uses along this segment, residential properties would be the most likely land use to be impacted by the aesthetics of the new line.

7.4.2. Proximity to residences and potentially sensitive populations

This section discusses the proposed project's proximity to homes, schools, daycares, hospitals, and other places where people frequently gather. Information for this section came from the tables submitted as part of the project application that categorize the number of residences within specified distances of the proposed centerline of the new 345 kV line and the estimated magnetic fields associated with the different proposed transmission line configurations. Additionally, Commission staff reviewed comments submitted by the public and conducted numerous site visits along the routes.

The proximity of properties to a high-voltage transmission line is important because of real and perceived concerns about local aesthetics, changes to valued viewsheds, personal enjoyment and use of one's property, potential impacts to property values, and personal and public safety.

Commission staff recognizes that individuals and families have substantial financial, physical and emotional investments in their homes and properties and that the discussions in this document will most likely not adequately address all the issues felt by many individuals owning property along the proposed routes.

A generalized discussion of some of these issues is contained in Chapter 4 including: aesthetics (Section 4.5.1); magnetic fields (Section 4.5.6); noise and corona effects (Section 4.5.10); property values (Section 4.5.11); safety (Section 4.5.14); and stray voltage (Section 4.5.15). Appendix B contains a slightly more in-depth review of the health issues associated with the electric and magnetic fields generated by transmission lines. Additionally, the topic of aesthetics is discussed in the following section (Section 7.4.3) for several specific areas or properties along the proposed route that are recognized regionally or state-wide for their natural beauty.

Finally, the personal sense of loss and unfairness related to burdening individuals and specific communities with the long-term presence of this high-voltage transmission line cannot be adequately addressed in this document, but a discussion of some special concerns that have been raised follows in the sections below.

7.4.2.1. Residential impacts

Segment M is common to all routes. No residences appear to be present on Segment M or Segment K.

On Segment L, two separate housing developments each appear to harbor six residences that are located northeast of USH 12 and southwest of the rail corridor. In the Arbor Circle development all six homes are greater than 300 feet from the proposed centerline. Farther south in the Arbor Lake development, most of the residences are also beyond the 300-foot distance.

Table 7.4-1 Number of homes within 300 feet of the proposed centerline

Segment Combinations	Distance to the Proposed Centerline				
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	Total
M and K					0
M and L				4	4

No churches, schools, hospitals or known daycare facilities are located within 300 feet of the proposed centerline on either Segment M, L or K.

7.4.2.2. MAGNETIC FIELDS

Some background information and a general discussion of EMF is found in Section 4.5.6 of Chapter 4 and in Appendix B of this EIS. Due to questions and concerns from the public, the Commission requires applicants for transmission line projects to provide magnetic field data for locations where there are existing transmission lines along the project routes and the estimated magnetic field levels at varying distances from the centerline of the proposed project, for both normal load and peak load conditions, at one and ten years after the new line is placed in operation. [151] Below are brief summaries of the estimated magnetic field levels for the proposed 345 kV transmission line on Segments M, L, and K. More detailed information can be found in Appendix G of the Badger-Coulee application.[152]

A new 345 kV line constructed on Segment M would support a 69 kV transmission line underbuild, resulting in estimated magnetic field levels of 14.8 and 18.6 mG at 25 feet from the centerline under normal load and peak load conditions, respectively. These field levels would decrease to 1.4 and 1.8 mG at 200 feet from the proposed centerline.

On Subsegment L1, the new transmission line configuration would be similar to that for Segment M, resulting in nearly identical magnetic field levels. On Subsegment L2, the maximum magnetic field levels would be higher at 33.7 and 42.1 mG under the load conditions described above. At a distance of 200 feet from the proposed centerline, the magnetic field levels would be nearly identical to those on L1.

Because Segment K parallels the interstate corridor and no residences or businesses are within 300 feet of the line, magnetic field levels are not reported here.

7.4.3. Aesthetics and visual impacts

Aesthetics and visual impact are closely related and often used interchangeably. Aesthetics tends to encompass the sights, smells, sounds and perceptions one experiences from the surrounding environment; whereas visual impact is more directly related to views, sightlines and viewsheds. The following discussion of aesthetics is based on Commission staff's visits to the project area and the following underlying assumptions:

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[151] Peak load is defined as 100 percent of estimated peak, system normal configuration and normal load is defined as 80 percent of peak load. Values provided are for 2018, the anticipated initial year of operation.
[152] PSC REF#: 191904 and 191905.

- Different viewers may have different levels of visual sensitivity.
- The physical setting can influence the degree of visual impact.
- Viewing conditions can influence the degree of visual impact.

Segments M, L, and K cross through a relatively rural environment with few residence or commercial/retail businesses present. While heavily wooded, this area is not recognized on a statewide or regional basis for its scenic qualities.

Segments M and K closely parallel the I-90/94 corridor. No residences are present on either of these segments. Thus, drivers and passengers in cars and trucks using the freeway would be the primary viewers of the proposed transmission line and the additional loss of trees required to accommodate the line.

I-90/94 is a high-volume transportation corridor and the number of persons that would see the line on a daily basis would be quite high. But the fact that they would be driving at a high rate of speed and mostly intent on reaching a destination beyond Segments M and K, would likely translate to a decreased visual sensitivity to the presence of a high-voltage transmission line.

Segment L follows a railroad corridor located between USH 12 and the I-90/94 corridor. Two small housing developments and another separate single-family home are located along this segment. Most of the homes are greater than 300 feet from the proposed line and all would have a buffer of mature trees separating their homes from the proposed transmission line that would block direct views of the line for much of the time. However, the line would be seen as the residents travel to and from their homes on a daily basis.

In summary, aesthetic and visual impacts are difficult to measure and tend to be perceived as greater in natural or scenic settings.

7.4.4. Public lands and recreation

Although the potential adverse impacts of this project on hunting and some passive recreational activities such as hiking, bird watching, and leisure enjoyment of natural resources are not discussed with respect to individual private properties in this EIS, Commission staff acknowledges the numerous comments that have been received from owners of rural, undeveloped properties supporting woods, meadows, waterways, and wetlands.

Segments M, L, and K
No identified parks or recreation areas were identified on Segment M. However, the new transmission line would cross several waterways that may be used locally for boating, paddling, or fishing. These streams include Tracy Creek, Holzlander Creek, Lyndon Creek, and an unnamed tributary to Lyndon Creek.

Similarly, as the proposed route directly parallels the interstate corridor, no identified parks or recreation areas were identified on Segment K. However, the new transmission line would cross Gilmore Creek and several other small waterways that may be used locally for boating, paddling, or fishing.

Segment L also crosses Gilmore Creek and a few other small waterways that may be used for paddling and fishing. No identified recreational resources appear to be present on this segment.

7.4.5. Airports and airstrips

One privately-owned airstrip, identified as Yukon Trails Camping Airport, is within approximately 0.4 mile of Segment M. According to the WisDOT Bureau of Aeronautics, its status and use are unknown at this time.

No airports or airstrips are known to be present along Segments L or K.

In summary, no airports or airstrips in this portion of the project area appear to be impacted by the proposed project.

CHAPTER

8

8. Environmental Analysis: Wisconsin Dells to Town of Caledonia (Segments J-H and J-I)

8.1. SEGMENT COMPARISONS

Segments K and L connect to Segment J in the city of the Wisconsin Dells, Juneau County along the west side of I-90/94. Segment J is 2.3 miles long and at its southern end connects to either Segments H or I. There are no alternative segments to Segment J; it is common to all route options. Segments H and I start in Wisconsin Dells, running southeast and ending at the intersection of interstates I-39 and I-90/94. Segment I primarily parallels STH 16, north of the Wisconsin River and Segment H parallels I-90/94, south of the Wisconsin River. Segment I requires two crossings of the Wisconsin River – in Wisconsin Dells and at its southern end. Segments H and I are both about the same length, approximately 22 miles long. Segment H and I terminate at the start of Segment G.

8.1.1. Detailed descriptions of Segments J, H, and I

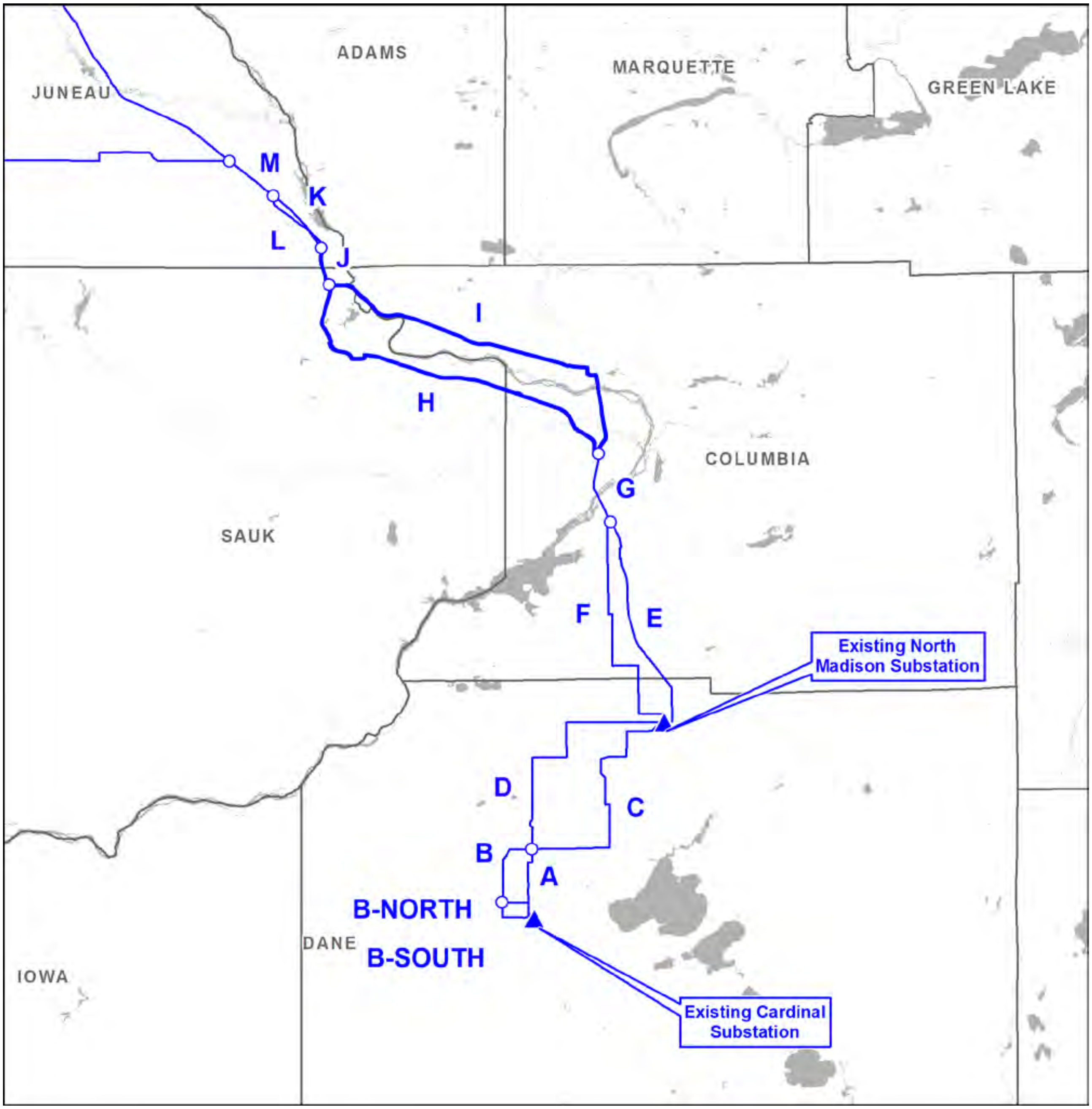
Segment J

Segment J is a continuation of Segment K, in that it is also follows the west side of I-90/I-94. It starts in Juneau County, crosses a small portion of the town of Lyndon before crossing into the town of Delton, Sauk County and then ends in the city of Wisconsin Dells.

At the intersection of the railroad and I-90/94 (ending point of Segments K and L), Segment J proceeds south out of Wisconsin Dells, detours around the outside of the USH 12 interchange, and ends just north of the CTH HH underpass where it crosses to the east side of I-90/94. The segment is located on the opposite side of the interstate from Rocky Arbor State Park and does not cross the nearby Hulburt Creek Woods SNA.

Segment J requires a 120-foot-wide ROW which overlaps the WisDOT ROW. One span requires a 195-foot wide ROW due to topographic relief. On average, an additional 62 feet of ROW width would be required from private property owners that abut the interstate. The proposed transmission line would consist of a new 345 kV line in a single-circuit delta configuration. The typical height of the structures would range from 100 to 135 feet above the ground surface. The landscape crossed by the segment is primarily upland woods with some agricultural fields and commercial development near the interchanges.

Figure 8.1-1 Badger-Coulee Segments J, H, and I



Segment H

The transmission line proposed for construction along Segment H would be single-circuit with a delta configuration. For the most part, the ROW width required is 120 feet, except along Subsegments H2 and H6-north. Typical heights of the transmission structures would range from 105 to 160 feet tall. This segment parallels I-90/94, mostly along its west/south side. For short distances it jumps to the opposite side of the interstate and at Subsegment H4 it briefly departs south of the interstate corridor to avoid crossing Ho-Chunk Nation-owned properties. The full length of the segment is approximately 22 miles.

Subsegment H1 runs 3.6 miles along the west side of I-90/94. It crosses over the highways of CTH H, STH 13, and STH 23. This subsegment starts in Wisconsin Dells and briefly extends through the town of

Delton before entering the town of Lake Delton and ending again in the town of Delton. The route spans Delton Creek at its southern end. The proposed ROW would partially overlap the WisDOT ROW. On average, approximately 73 feet of new ROW width would be required from private properties that abut the freeway. However, in some locations, the full width of the ROW would be required from private properties. These include two areas where WisDOT considerations require the route to provide additional distance from WisDOT structures: 1) at the Trout Road overpass, and 2) at the STH 23/interstate interchange. Land cover along this subsegment quickly transitions from urban development at the highway/interstate interchanges to undeveloped lands dominated by upland woods. Additionally, there are numerous nearby developed recreation properties, such as golf courses and summer resort housing.

Subsegment H2 crosses to the southwest side of the interstate and proceeds adjacent to I-90/94, overlapping part of the WisDOT ROW for a distance of 0.8 miles through the town of Delton. The route avoids impacts to a camp resort on the opposite side of the interstate. For this subsegment, the required ROW width is reduced from the standard 120 feet to 100 feet. On average, 27 additional feet of ROW width would be required from Mirror Lake State Park and the adjacent property owner, although it could be as much as 55 feet. The land cover is primarily upland woods and some open grasslands.

Subsegments H3 and H4 constitute a departure from the interstate corridor to avoid the USH 12/I-90/94 interchange and properties owned by the Ho-Chunk Nation. Together, the subsegments total 1.4 miles. For the first 2,000 feet, the route parallels the interstate. It then angles south, around the outside of the USH 12 and I-90/94 interchange, continuing south along the west side of USH 12. At Deer Run Road, Subsegment H4 turns east crossing USH 12 and extending east for approximately 4,000 feet. Afterwards, the subsegment turns north and heads back towards the interstate. The required ROW width for these subsegments is 120 feet. For parts of Subsegment H3, the proposed ROW would partially overlap WisDOT ROW. On average, 86 additional feet of ROW width would be required from private properties, though in some places the full width of the ROW would be required. Land cover is primarily upland woods. In contrast, Subsegment H4 requires all new ROW to be acquired through agricultural fields and large wooded fencerows. The proposed centerline of the new 120-foot-wide transmission line ROW is approximately 170 feet from the edge of field boundaries. Wooded areas between the fields and small blocks of woods would be cleared to the full ROW width required.

Subsegment H5 parallels the southwest side of I-90/94 for a distance of 9.2 miles, crossing CTH A and CTH T. It starts in the town of Delton, Sauk County, crosses through the town of Fairfield, and then proceeds into the town of Caledonia, Columbia County. Connecting from Subsegment H4, the route turns southeast to parallel the interstate again. While part of the required 120-foot width of the ROW overlaps WisDOT ROW, the interstate ROW varies in many locations requiring much of the ROW width to be acquired from private and state properties that abut the interstate. The first two-thirds of Subsegment H5 crosses agricultural fields and some blocks of woodland. For approximately 1.7 miles the last third of Subsegment H5 crosses forested uplands and wetlands of the state-owned Pine Island State Wildlife Area (SWA).

Subsegment H6 was originally proposed by the applicants to cross the USFWS-owned Fairfield Marsh along the southwest side of the interstate. However, on February 26, 2014, USFWS denied the crossing of the federal property and the applicants created Subsegment H6-north which avoids the marsh by crossing to the north side of I-90/94 for approximately 0.34 miles.[153] This subsegment starts 127 feet north of the USFWS property boundary and crosses to the northeast side of the interstate for the distance of one span

[153] The applicants replied to Data Request 1.17, PSC REF#: 201191, pg. 3 regarding the USFWS application rejection. The data request response included the USFWS letter, PSC REF#: 201192.

and then crosses back to the southwest side of the interstate 100 feet south of the USFWS property boundary, requiring four single-circuit dead-end structures. The required ROW width is 80 feet and it would mostly overlap WisDOT ROW with some additional width acquired from the state-owned Pine Island Wildlife Area. This subsegment crosses a wooded upland and grassland/prairie in the natural area and on WisDOT ROW.

Subsegment H7 continues east along the southeast side of the I-90/94 corridor for a distance of 5.3 miles. It begins where Subsegment H6-north terminates and crosses the state-owned Pine Island Wildlife Area, STH 33, and the Baraboo River. Similar to other portions of Segment H, it overlaps WisDOT ROW, requiring a total ROW width of 120 feet. Due to the variability of the WisDOT ROW, on average, 86 feet of ROW would need to be acquired from private property owners; however in some locations, the full 120-foot width would be required from private properties. The first half of this subsegment crosses state-owned wetlands in the wildlife area. The remainder is predominantly wooded wetlands, a ski resort, and a mix of upland woods and cropland. Subsegment H7 is across the interstate from the USFWS Baraboo River Waterfowl Production Area (WPA).

The last subsegments of Segment H, H8 and H9, are 0.8 miles long. They begin just north of where I-90/94 joins I-39. They constitute a detour around the west side of the interchange. The new transmission line on Subsegment H8 would be double-circuited with an existing ATC 69 kV transmission line (Y-16) along the west side of Kinney Road. The existing lower-voltage line has a ROW width of 80 feet which would be expanded by as much as 40 feet into the commercial properties that border Kinney Road. At one location, Subsegment H8 overlaps WisDOT ROW for a distance of approximately 570 feet. Subsegment H9 ends by crossing to the east side of I-90/94/39. The subsegments pass through primarily commercial properties located very close to the interstate, some undeveloped parcels, and the corners of two farm fields.

Segment I

Segment I starts on the north side of CTH H at the location where it intersects I-90/94. It runs east through the city of Wisconsin Dells in Sauk County and crosses the Wisconsin River in front of the Kilbourn Dam entering Columbia County. Segment I turns southeast and runs adjacent to a railroad corridor within an existing transmission line ROW. The new 345 kV transmission line would be double-circuited with this existing 138 kV line along the rail corridor for much of its length. After leaving the rail corridor, Segment I turns south along the east side of I-39 until meeting Segment H, just south of the interchange of I-39 and I-90/94. The typical height of the proposed transmission structures would range from 105 to 150 feet tall. In total, the segment is 21.9 miles long and crosses the cities of Wisconsin Dells and Portage and the towns of Newport, Lewiston, and Caledonia.

The first three Subsegments I1-I3 cross east through 1.4 miles of a commercial district in the city of Wisconsin Dells. Subsegment I1 requires new transmission line ROW with a width of 120 feet, mostly on private properties. The ROW partly overlaps CTH H. Where CTH H turns south, Subsegment I2 continues east following the same alignment as an existing ATC 69 kV transmission line (Y-101). The existing lower-voltage line would be underbuilt on the new transmission structures. The existing transmission line ROW is 60 feet wide but only 40 feet of width is currently cleared. The proposed multi-circuited transmission line requires a ROW width of 120 feet which would result in acquiring an additional 30 feet of ROW overlapping a private golf course to the north and an additional 30 feet of ROW cleared on forested private lands to the south. Subsegment I3 continues east on new transmission line ROW, first through some undeveloped properties and the back lots of several commercial properties, before crossing diagonally through the broad intersection of USH 12 and STH 13. After it crosses to the south side of STH 13, it briefly parallels the road to a hilltop parking area overlooking the Kilbourn Dam.

A very large commemorative flag pole and plaque are located here and it is possible that construction of the transmission line would require removing or relocating this large commemorative flag pole. Subsegment I3 turns to cross the Wisconsin River and ends near the Kilbourn Substation.

Subsegments I4 and I5 continue southeast through the southern end of the city of Wisconsin Dells following the ROW of an existing 138 kV transmission line. They then cross the town of Newport and end in the town of Lewiston. These subsegments are 7.6 miles long and the new transmission line would be double-circuited with the existing the ATC 138 kV transmission line (X-68) paralleling a railroad. The existing transmission line ROW is 75 feet wide; thus, 45 additional feet of ROW width would be acquired for the new double-circuit line. Where the route is adjacent to the railroad, some additional ROW width would come from railroad-owned property, resulting in fewer acres of new ROW needed from private properties.

Within the urban landscape of Wisconsin Dells, residential neighborhoods and parks are separated from the proposed transmission line by the railroad. After leaving the city, the route continues through upland wooded areas of the state-owned Dells of the Wisconsin River SNA and privately-owned bluffs along the Wisconsin River. After crossing CTH O, the river meanders away from the utility/railroad corridor and the landscape becomes more agricultural. Subsegment I5 ends near the Lewiston Substation.

Subsegments I6 and I7 are short segments that total 1.4 miles in length. Subsegment I6 leaves the existing transmission line/railroad corridor to skirt around the Lewiston Substation and some residential buildings. As a single-circuit transmission line again, Subsegments I6 and I7 parallel the north side of CTH O. New 120-foot wide transmission line ROW would be required; some of this ROW would overlap CTH O. Where CTH O bends south, Subsegment I7 continues east across an agricultural field and rejoins the railroad corridor and the existing 138 kV line.

Subsegment I8 is 4.4 miles long. The transmission line/railroad corridor parallels STH 16. Near the eastern end of the subsegment, it passes along the northern boundary of the state-owned Pine Island Wildlife Area. Similar to Subsegment I5, the existing transmission ROW is 75 feet wide and the new required ROW width for the double-circuit 345/138 kV line is 120 feet. The new ROW would partially overlap the railroad corridor and require an expansion of the existing transmission line ROW. Land cover along the route includes wetlands interspersed with wood lots and farm fields.

Subsegment I9 is 0.5 miles long and departs from the existing corridor to skirt around the Trienda Substation. It bends to the south on new 120-foot-wide ROW and would be a single-circuited line.

Subsegment I10 is 0.3 miles long and continues east, sharing ROW with the railroad corridor and the existing ATC 138 kV transmission line (X-19). The lower-voltage transmission line would be double-circuited with the new 345 kV line, requiring an expansion of the existing 50-foot-wide ROW to 120 feet wide. The proposed ROW width would overlap the railroad and require on average approximately 62 additional feet of ROW width from private property owners. Land cover on this subsegment is primarily residential woodlots.

Subsegment I11 crosses to the north side of the railroad. The existing 138 kV line would also cross to the north and continue as a double-circuit 345/138 kV line sharing railroad ROW east for 0.7 miles and ending in the city of Portage. This subsegment crosses private wooded lots and undeveloped property owned by city of Portage.

Subsegment I12 is 0.8 miles long. It turns south crossing the railroad tracks and briefly paralleling Boeck Road. This subsegment loops south and east towards the interstate. It ends by crossing to the east side of

I-39. I12 is a new cross-country route and the proposed transmission line would be a single-circuit line in a delta configuration. It would require a 120-foot-wide ROW. This portion of the route passes through agricultural fields interspersed with woodlots and some wetlands.

Subsegment I13 continues south passing through the city of Portage and sharing ROW with the I-39 corridor. I13 crosses the Wisconsin River, enters the Pine Island SWA, and continues south crossing STH 33. This subsegment enters the town of Caledonia and crosses the Baraboo River. It is located on the opposite side of I-39 from the USFWS Baraboo River WPA and the DNR Baraboo River Floodplain Forest SNA. It continues south and terminates below the I-39/90/94 interchange at the start of Segment G. Subsegment I13 would be a single-circuit line in a delta configuration. On average, approximately 68 feet of ROW width would be required from private and state properties. The land cover is primarily natural wetland communities (forested and non-forested) interspersed with some farmlands.

Table 8.1-1 Comparison of ROW characteristics for the routes from Wisconsin Dells to the town of Caledonia

Segment Combination	Length (miles)	Total ROW Required (acres)	Existing ROW Shared (acres)	New ROW (acres)	Percentage of ROW Shared
J and H*	24.3	350.0	117.5	232.4	66.4
J and I	24.2	352.2	203.2	148.9	57.7

*Segment H is calculated using Subsegment H6-north because Subsegment H6 is not feasible.

8.1.2. Leopold-Pine Island Important Bird Area

Clear concerns have been expressed about the proximity and potential impacts of Segments I and H on the Leopold-Pine Island IBA and its associated properties. The proposed route options, potential ROWs, and structure alternatives have all been important aspects of these concerns. Discussions were initiated during the pre-application phase and are expected to continue throughout the regulatory review process.

8.1.2.1. Leopold-Pine Island IBA Partnership

The Leopold-Pine Island IBA is located in both Sauk and Columbia Counties, straddling the Wisconsin River between the cities of Wisconsin Dells and Portage, including about 16 miles of Wisconsin River frontage (Figure Vol. 2-7). It is generally bordered on the north by STH 16 and on the south by I-90. It includes a diverse natural landscape encompassing 16,000 acres of marshlands, grasslands, barrens, floodplain and upland hardwood forests, and agricultural lands. The IBA is implemented by the Wisconsin Bird Conservation Initiative and is a part of an international effort to identify and conserve areas that are vital to birds and biodiversity. As with all IBAs, the area's designation as an IBA does not confer any legal status or carry any regulatory requirements, and the inclusion of land within an IBA boundary is entirely voluntary.

However, the Leopold-Pine Island IBA has been the subject of intensive survey work and strategizing. It has a wild character but has been intensively managed and researched for wildlife conservation for decades. It includes large tracts of public land, as well as private lands available for cooperative management, a mosaic of marsh, grassland, barrens, floodplain and upland hardwood forest, and agricultural land. Breeding bird surveys in 2005 and 2011 have identified 155 bird species including five state threatened and seven special concern species. In addition, the International Crane Foundation (ICF) estimates that 10 percent of Wisconsin's Sandhill Crane population, and a few re-introduced Whooping Cranes, stage here during fall migration. The identification of the extraordinary number of important bird species in this area led to the creation of a large partnership to manage the IBA. The Leopold-Pine Island

IBA Partnership (Partnership) now collectively manages and advocates for the IBA, following an explicit, published strategic vision for managing it as a landscape.[154]

The Partnership includes a diverse set of properties (and landowners) including the Leopold Memorial Reserve (Aldo Leopold Foundation), Pine Island State Wildlife Area (DNR), Baraboo River Waterfowl Production Area (USFWS and NRCS), Lower Baraboo River Floodplain Forest (USFWS), Sand County Foundation, Wisconsin Waterfowl Association, and various private landowners (see Figure Vol. 02-07). Another important participant in this Partnership is ICF.

8.1.2.2. Partnership concerns

Several written public comments and statements at public meetings have revealed substantial concerns about the proximity and potential impacts that the proposed project would have on this culturally and biologically sensitive and significant area. Comments from the Sand County Foundation, the Aldo Leopold Foundation, the Leopold-Pine Island IBA Partnership, ICF, and Riverside Farms are included in Appendix C. The two proposed route alternatives, Segment H and Segment I, would potentially affect different landowners and properties associated with this Partnership in different ways. Segment I passes through the northern boundary of the IBA along an existing transmission line corridor on the Pines family property (Riverside Farms), and Segment H follows the I-90/94 corridor that passes through the southern boundary of the IBA and possibly within the viewshed of the Aldo Leopold National Historic Landmark (NHL). Stated concerns have focused on:

- The integrity of the IBA and the cultural significance of the Aldo Leopold NHL.
- The impact of disturbance on nesting birds during construction.
- The direct loss of breeding bird habitat.
- Aesthetics and potential visual impacts.
- Bird collision risk associated with overhead power lines and how that may impact populations of breeding and migrating birds.

Inside the landscape of this Partnership is the Aldo Leopold Farm and Shack (See Figure Vol. 2-7), a designated National Historic Landmark (NHL) signifying its exceptional cultural and national historic value. See Section 8.3.7 for the discussion of the historical significance of the Leopold Shack. This property, owned and managed by the Aldo Leopold Foundation, encompasses 264 acres of rural sand country in central Wisconsin and is buffered by the 2,000-acre Leopold Memorial Reserve. The Leopold property is located on the south shore of the Wisconsin River between the two proposed route segments. A new high-voltage line constructed on Segment H is likely to be within the viewshed of the Aldo Leopold NHL. Photo simulations of appropriate views from the Leopold property are likely necessary to determine potential visual impacts on the Aldo Leopold NHL.

Another property, the Fairfield Marsh WPA in Columbia County, is a part of the wildlife refuge system owned and managed by USFWS (see Figure Vol. 02-07). The WPA is wetland and grassland habitat preserved and managed by USFWS for waterfowl and other wildlife. Segment H (particularly Subsegment H6) traverses the northern edge of this property. The USFWS has determined that the necessary ROW will not be granted, either by permit or by divestiture pursuant to the National Refuge Improvement Act of 1997 (see Appendix C). USFWS states that the transmission line corridor must avoid the Fairfield Marsh, and thus, the applicants have proposed a reasonable alternative route, Subsegment H6-north

[154] Mossman, M.J., Steele, Y., Swenson, S. 2006. A Strategic Vision for Bird Conservation on the Leopold-Pine Island IBA. In http://www.aldoleopold.org/Programs/IBA_Report.pdf.

(Figure Vol. 021.38). However, Subsegment H6-north crosses I-90/94 from the south side to the north side and back again. The applicants' response to data request 1.52 (see Appendix C) indicates that the crossing cannot be done safely or reliably with H-frame structures but would have to be completed using single pole structures that would be about 20 feet taller and have the conductors configured more vertically. This would present a greater obstacle to bird flight than that desired and requested by the Partnership (of which USFWS is a member) for the nearby IBA land north of I-90/94.

8.1.2.3. Avian impacts

The Partnership has raised two main concerns related to avian impacts: the increased potential for bird-wire collisions and the potential for local loss of bird habitat.

One of the main concerns raised by the Partnership involves avian interactions with proposed transmission facilities. Collision risks associated with overhead power lines and large-bodied birds such as those that use the IBA are a significant concern. The stretch of the Wisconsin River that is home to the Leopold-Pine Island IBA, lying between the two proposed transmission routes, hosts many sandbars that serve as ideal roosting and staging habitat for resident and migrating cranes, according to the ICF. Of particular concern are sandhill cranes that utilize the area heavily during fall migration. Their daily low-altitude flight patterns consist of leaving their roosts along the river to forage in nearby agricultural fields, crossing over both proposed routes with heavier use of the fields to the north across Segment I. Known heavy use of the area by large-bodied birds indicates a high potential for collision by the birds with transmission conductors.

Another concern raised involves the local loss of bird habitat. Construction of either of the proposed route segments would also result in temporary or permanent local losses of breeding bird and wildlife habitat. Impacts to grassland birds are anticipated to be low because maintenance of the transmission line ROW in the vicinity of the IBA has the potential for enhancing savanna and grassland breeding bird habitat, if appropriately managed. On the other hand, birds that prefer shrub-land and forest may be more adversely impacted during construction and the conversion of existing shrub-land and forested areas to new ROW corridor because these areas would require permanent tree removal and periodic maintenance of woody species that would re-establish.

8.1.2.4. Mitigation options

Engineering factors that could influence the bird collision risk include line placement, orientation, configuration and visibility, line and structure height, wire exposure zone, and the number of wire planes. Modification of these factors could minimize or eliminate collision risks with the large-bodied birds of the IBA.

Interested parties, as well as the applicants, have explored various mitigation measures to minimize bird collision risk along the proposed route options. These measures include installing line marking devices and changing structure configurations. Line marking devices, such as aerial marker spheres, spiral vibration dampers, and swan flight diverters have been discussed in this context to increase the visibility of the top-most shield wires allowing birds to see them earlier and avoid them during flight (see Appendix C). If installed correctly, marking devices have been shown to reduce bird collision rates with overhead power lines significantly. Preliminary cost estimates by the applicants to install Swan Flight Diverters along portions of Segments H and I are approximately $390,000 and $560,000, respectively.

In addition to installing line marking devices, changing the proposed structure configurations along portions of Segments H and I would help reduce bird collision risk by reducing structure and line height, wire exposure zone, and the number of wire planes. Various transmission structure diagrams are included in Appendix C. Single-circuit H-frame horizontal configuration structures are significantly shorter (85 feet tall versus 105 to 130 feet tall), have fewer wire planes (two versus three), and reduced vertical wire exposure zones (29 feet of exposure versus 40 to 67 feet of exposure) than the currently proposed single-circuit delta configurations and double-circuit vertical configurations. According to the applicants, these structures could be installed for much of Segment H but are not practicable (due to reliability concerns) for Segment I (see Figure Vol. 02-07). Preliminary estimates by the applicants to install H-frame horizontal structures would be based on an additional $20,000 per structure, totaling approximately $1,340,000 along Segment H and $400,000 along Segment I. In addition, increased ROW widths would be required (approximately 10 to 20 feet), impacting additional public and private properties, habitat, and land use.

During construction, nesting birds are also at risk, although this is generally an avoidable impact. The applicants have agreed to follow, to the extent possible, the avoidance measures during the stated exclusion dates for threatened and endangered bird species, as described in the DNR-approved Endangered Resource Review. If avoidance is not possible, impact minimization measures must be implemented in coordination with DNR and the Partnership.

The applicants also state that other mitigation options, where and when feasible, could include managing the surrounding land use to influence bird use, removing the shield wire where lightning is not an issue (or if lightning arresters can be used instead), rerouting the line, burying the lines, clustering multiple lines in the same ROW, decreasing the span lengths, and modifying line placement and orientation to consider migratory patterns, high bird-use areas, bird flight paths, prevailing winds, and topographical features.

Enhancement options exist for reducing the impact of proposed transmission facilities on resident and migratory birds in the project area. These include, and are not limited to, developing nest platforms, managing habitats to benefit migratory birds (especially within existing IBA boundaries), and working cooperatively with agencies, landowners, and organizations to employ proactive measurements.

Moreover, additional research (pre- and post-construction) would help elucidate the preference and utility of these areas by resident and migrating large-bodied bird populations. In addition, it would inform decisions about line placement, construction, and marking of current and future high-voltage transmission line projects in Wisconsin.

After its discussions with the applicants, the Partnership has communicated its recommendations for transmission line segment routing, structure design, and information needs.

- Regarding routing, the Partnership "strongly rejects" Segment I because of potential bird impacts, engineering constraints, and habitat impacts, and states that Segment H is the more "bird-friendly" option.
- Regarding structure design, the Partnership "strongly recommends" utilizing the shorter H-frame structures, with their horizontal arrangement of conductors, and wire visibility markers between structures.
- Regarding information needs, the Partnership expresses interest in the applicants' participation in the pursuit of answers to some "questions that could help inform planning and minimization of impacts for the cultural and biological integrity of the IBA." Items of interest include: the height of sandhill cranes crossing I-90/94; whether sandhill cranes fly lower in bad weather; where the most bird traffic occurs along the proposed transmission route; and the feasibility of potential bird-friendly structure design or wire visibility measures.

8.2. CONSTRUCTION SPECIFICS

8.2.1. Construction issues

Off-ROW access roads become necessary where there are natural constraints such as steep hills, large high-quality natural resources, or other limitations where direct access from public roads is not possible. A brief discussion of the role of off-ROW access roads for this project is included in Section 2.1.4. If the proposed transmission line is built, all necessary access roads will be 16 feet wide and constructed with the ability to support the movement of heavy construction equipment. If the project is approved, the applicants will re-evaluate the proposed access routes. After construction is completed, off-ROW access roads may be restored to pre-construction conditions or, depending on negotiations with the property owner, access roads constructed in upland areas may be left in place.

Additionally, there are locations where alternate foundations or construction techniques would be useful or necessary to avoid significant impacts on natural resources. More information about these construction techniques can be found in Chapter 2, Section 2.1.2. In addition, Chapter 4, Section 4.4 discusses the phases of construction in detail.

Table 8.2-1 Off-ROW access roads impacts by segment combinations*

Segment Combinations	Number of Roads	Length (miles)	Wetlands (acres)	Upland Forest (acres)
J and H	9	1.1	0	0.4
J and I	5	0.8	0.3	0.3

* Data compiled from Application, Appendix B, Table 10.

Segment J
There are no off-ROW access roads proposed for construction of Segment J.

Segment H
Much of Segment H shares some ROW with the I-90/94 WisDOT ROW. Off-ROW access on this segment is required where the embankments at county highway crossings are too steep to safely allow access along the ROW. In total, nine off-ROW access roads are proposed for Segment H, totaling 1.14 miles in length and requiring the clearing of 0.4 acre of upland forest. No wetlands or potential wetland impacts were identified in connection with the proposed off-ROW access roads.

The interstate crosses some steep-sided hills and valleys along Subsegment H1. Approximately 0.4 miles of off-ROW access is proposed along Jones Road, then through a field road to connect to the proposed route.

Along Subsegments H5 and H7, a significant number of transmission structures would be installed in wetlands. This area is part of the Leopold Pine Island Area which includes natural resources managed by a variety of public and private entities. The use of alternative construction methods such as helicopters may reduce the impacts to this large significant natural resource. See the previous section, Section 8.1.2 for more information regarding the potential impacts of this project on the Aldo Leopold Pine Island IBA Partnership.

Segment I
Segment I follows a route north of the Wisconsin River through many flat wetland areas, including areas of the Leopold-Pine Island IBA Partnership (See Section 8.1.2). The off-ROW access roads proposed for this segment are all related to construction of the proposed transmission line on Subsegment I13, along

the I-39 ROW. In the areas near ramps or road crossings, there are steep embankments or access limitations. In total, there are five off-ROW access roads proposed on Segment I, totaling 0.8 miles in length. These pass through a range of different types of land cover and would impact 0.3 acres of wetlands, 0.3 acres of upland forest, and 0.5 acres of agricultural land. Access through the wetlands would require a permit from DNR for the use of temporary fill or matting. The routes through agricultural lands would most likely result in soil compaction.

Starting at the north end of Subsegment I-13, off-ROW access would be needed need to access the corner structure required for the 90-degree turn south along I-39. The access road is located behind and near a residential development. It would require the removal of approximately 0.1 acre of mature trees that currently screen these homes from the noise and views of the interstate. Further south, an access road is proposed from Cascade Road to the proposed transmission route. The applicants propose to cross an unnamed tributary of the Baraboo River on an existing farm road that has a culvert/bridge to cross the creek. The culvert and access road would need to be evaluated for their suitability for use by heavy construction equipment; one or both may require improvements. Additionally, some trees would be cleared from either side of the farm road.

Along Subsegments I5, I8, I12, and I13, there are a significant number of transmission structures proposed to be installed in wetlands. This area is part of the Leopold Pine Island Area that includes natural resources managed by a variety of public and private entities. The use of alternative construction methods such as helicopters may reduce the impacts to this large significant resource. See Section 8.1.2 regarding the potential impacts of this project on the Aldo Leopold Pine Island IBA Partnership. See Chapter 2, Section 2.1.2 for more detailed information on conventional and alternate construction techniques.

This segment also crosses the Wisconsin River twice and the Baraboo River once. The use of light helicopters to assist with stringing operations may be considered. If so, the siting of landing pads and staging areas would need to be evaluated for potential impacts or concerns with respect to wetlands, waterways, natural features, grading and clearing requirements, threatened and endangered resources, and cultural or archaeological concerns.

8.2.2. Electric distribution lines

Along Segments J, H, and I, there are distribution lines owned by WP&L that would require relocation if the proposed project is approved along these proposed routes. The existing distribution lines may be located in areas that pose physical conflicts with the proposed 345 kV line or their proximity to the transmission line might result in stray voltage concerns, also known as NEV. No distribution lines are proposed to be underbuilt on the new 345 kV structures.

There is a general consensus that distribution lines located less than 150 feet from and parallel to a transmission line for a continuous distance greater than 1,000 feet can cause impacts on farms with confined animals. In Chapter 4, Section 4.5.15 of this EIS, the cause, impact, and mitigation of NEV issues are discussed in detail. In addition, the Commission may require the applicant to conduct pre-construction and post-construction testing of potentially impacted farms and lines.

All distribution modifications required as a result of this project would be made by the distribution owners including distribution line design, relocation, and associated permitting. For cost estimation purposes (see Section 2.4 of this EIS), all modified distribution lines were assumed to be relocated underground and the related costs are factored into the total costs presented.

Table 8.2-2 Distribution lines that would be relocated

Segment Combinations	Number of Locations	Miles of Distribution Line
J and H	2	0.5
J and I	8	2.0

Segment J
On Segment J, along the north side of CTH H where it crosses I-90, approximately 300 feet of WP&L two-phase overhead distribution line would be relocated if the proposed line is constructed on Segment J.

Segment H
On Subsegment H2, along the west side of I-90/94, approximately 2,500 feet of WPL three-phase overhead distribution line would be relocated if the proposed line is constructed along Segment H.

Segment I
A total of approximately 1.95 miles of distribution lines have been identified by the applicants as potentially interfering with the proposed Segment I. If the proposed line is constructed along Segment I, the following WP&L distribution lines would be relocated:

- On Subsegment I1 along the north side of CTH H, 300 feet of distribution line would be relocated.
- On Subsegment I2, a WP&L distribution line is underbuilt on the existing ATC 69 kV transmission line (Y-101). If the project is approved using Segment I, the existing lower-voltage transmission line would be underbuilt on the new 345 kV line and the 1,200 feet of two-phase overhead distribution line would be relocated.
- On Subsegment I5, a WP&L distribution line is underbuilt on a portion of the existing ATC 138 kV transmission line (X-68). If the project is approved using Segment I, the existing lower-voltage transmission line would be double-circuited on the new 345 kV line. The distribution line located where the route crosses Bowman Road and for a distance of 6,100 feet south, would require relocation
- On Subsegment I10 on the east side of the Trienda Substation, 300 feet of three-phase underground distribution line presents a physical conflict and would be relocated.
- On Subsegment I11, three different sections of distribution lines would need to be removed and relocated.
  - Two sections (800 feet and 400 feet lengths) of underground distribution line below the existing ATC 138 kV line (X-19) presents a physical conflict and would be relocated underground elsewhere.
  - 1,200 feet of single-phase overhead distribution line along the north side of railroad tracks west of Boeck Road would be relocated.

8.3. NATURAL RESOURCES

8.3.1. Agriculture

The continuing presence of a high-voltage transmission can adversely affect farm operations and field productivity. Refer to Chapter 4, Section 4.5.2, for a discussion of potential impacts associated with transmission line construction and operation in agricultural fields. DATCP will present its analyses of the potential impacts of the proposed project to farmed fields in the AIS it is preparing. See Chapter 1, Section 1.4.2 for a discussion of the role of DATCP in this project. The table of contents of the AIS is included in Appendix D. The acreage figures used below were obtained from DATCP, and may differ from those supplied by the applicants due to the possible exclusion in the application of cropped wetlands from the cropland totals.

Most of the agricultural land on Segments J, H, and I is active cropland. Farmland classified as prime or of statewide importance is concentrated on Segment J and the western portions of Segments H and I. The majority of the crops are corn and soybeans; however, wheat and alfalfa/hay fields also occur. A relatively small area is devoted to pasture and the remainder is in old (fallow) fields. No specialty crops, such as ginseng, orchards, or cranberry bogs, are grown within the proposed ROW along these segments.

According to the application, no clear evidence of drain tile lines along the segments was apparent from either aerial photography interpretation or field investigation. However, there are areas of farmland along each segment that contain hydric soils and are in close proximity to ditches, which suggests that drain tiles may exist in these locations. During the final design process, the applicants would work with landowners to place structures so that impacts to drain tiles are minimized, to the extent practicable.

Segment J

A total of 3.7 acres of agricultural land lies within the proposed ROW, all of which is active cropland. Agricultural land represents 11.2 percent of the total ROW and all of the agricultural acreage would be affected by new transmission line ROW. No temporary, off-ROW access routes crossing agricultural lands would be needed.

One dairy operation (10 or more animals confined in a facility) is located within a half mile of the proposed centerline, but it is not within 300 feet and no non-residential agricultural buildings are present within 300 feet of the centerline. Concerns associated with the presence of dairy operations and nearby agricultural buildings include the potential for stray voltage and induced currents. For a detailed discussion of this issue see Sections 4.5.14 and 4.5.15 in Chapter 4.

Windbreaks or tree lines would be cleared along 0.42 mile of the segment, increasing the potential for wind erosion in neighboring fields or drift of agricultural chemicals.

No known organic farm operations are located along this route.

Segment H

A total of 65.3 acres of agricultural land are within the proposed ROW, including 58 acres of actively cropped land and 2.7 acres of pasture—the remainder is old field. Agricultural land represents 20.6 percent of the total ROW and nearly all of this would be new electric transmission line ROW. An additional 0.85 acre would be crossed by temporary off-ROW access routes.

Two dairy operations (ten or more animals confined in a facility) are located within 0.5 mile of the proposed centerline, but they are not within 300 feet. There are also four non-residential agricultural buildings within 300 feet of the centerline. Concerns associated with the presence of dairy operations and nearby agricultural buildings include the potential for stray voltage and induced currents. For a detailed discussion of this issue see Sections 4.5.14 and 4.5.15 in Chapter 4. There are a few additional types of confined animal operations along this segment.

A landowner indicated plans to add a new irrigation system along Subsegment H5. Because this segment closely parallels I-90/94, interference with the system should be minimal. Impacts to this system could be minimized by working with agricultural landowners prior to the start of construction, and providing appropriate compensation for damage or required modifications to the system.

Limited aerial applications of herbicides, fungicides, and pesticides may occur along the route, though no specific information is known. The applicants should work with landowners whose aerial spraying would be affected by transmission line placement to minimize potential impacts.

Windbreaks or tree lines would be cleared along 1.7 miles of the segment, increasing the potential for wind erosion in neighboring fields or drift of agricultural chemicals.

No known organic farm operations are located along this route. Segment H crosses 12 parcels enrolled in the Farmland Preservation Program (FPP), all in Sauk County. Electric transmission lines are permitted on FPP lands and are considered compatible with agricultural use.

Segment I

Approximately 30.0 acres of agricultural land are within the proposed ROW, with about 83.8 percent of it (25.1 acres) active cropland and 10.7 percent (3.2 acres) pasture—the remainder is old field. Agricultural land represents 9.4 percent of the total required ROW. Of this, 22.0 acres would be new ROW, not overlapping any existing utility or road ROW. An additional 0.45 acre would be crossed by temporary, off-ROW access routes.

One dairy operation (10 or more animals confined in a facility) is located within 0.5 mile of the proposed segment centerline, but it is not within 300 feet. There are no non-residential agricultural buildings within 300 feet of the centerline. Concerns associated with the presence of dairy operations and nearby agricultural buildings include the potential for stray voltage and induced currents. For a detailed discussion of this issue see Sections 4.5.14 and 4.5.15 in Chapter 4. There are some additional types of confined animal operations along this segment.

Limited aerial applications of herbicides, fungicides, and pesticides may occur along the route, though no specific information is known. The applicants should work with landowners whose aerial spraying would be affected by transmission line placement to minimize potential impacts.

Windbreaks or tree lines would be cleared along 0.1 mile of Segment I increasing the potential for wind erosion in neighboring fields or drift of agricultural chemicals.

No known organic farm operations are located along this route.

Table 8.3-1 Potential Agricultural Impacts on Segments J, H, and I

Segment Combinations	Total ROW (acres)	Agricultural Land (acres)	Percentage of ROW in Agriculture	Dairy Operations within 0.5 Mile
J and H	350.2	69.0	19.7	3
J and I	352.2	33.7	9.6	2

8.3.2. Natural resource properties

This section discusses the properties in this part of the project area that are managed primarily for protecting natural resource habitat. These properties may include publicly-owned lands and also private lands covered by a conservation easement or agreement. There may be some overlap in this section with properties discussed in Section 8.4.4 Public lands and Recreation because some properties serve multiple functions or have multiple designated uses.

Segment J

Segment J passes near the Hulburt Creek Woods SNA and is directly across the I-90/94 corridor from Rocky Arbor State Park, but construction of the new high-voltage line on this subsegment should not adversely affect the management or use of either of these properties.

Segment H

Subsegment H2 crosses the northeastern edge of Mirror Lake State Park directly adjacent to the interstate corridor for a distance of approximately 2,500 feet. This state park, managed by DNR, is a very popular destination due to its recreational opportunities and its accessibility to Mirror Lake and Dell Creek. Although the park's primary use is recreation (see Section 8.4.4.), Mirror Lake State Park provides quality wildlife habitat due to its unique geology and topography, its heavy forest cover and adjacent water resources in contrast to the relatively urbanized setting to the north. Because Land and Water Conservation (LAWCON) funds were received for use at Mirror Lake State Park, the applicants are consulting with DNR and the NPS.

Subsegments H7, H5, and H6-North run adjacent to I-90/94 through the state-owned Pine Island State Wildlife Area (SWA) and other associated DNR-managed lands. This SWA forms a part of the larger Leopold-Pine Island IBA, and impacts and controversy regarding this route are described in detail in Section 8.1.2 of this EIS.

Subsegment H6 crosses through the northern edge of the Fairfield Marsh WPA, owned by USFWS. However, the USFWS has stated that the line would not be allowed to cross this property.

Subsegment H7 passes through a small undeveloped parcel owned by WisDOT adjacent to the Baraboo River (north side) and west of I-90/94 at STH 33 intersection. Nearly half of this wooded parcel, which is classified as mature floodplain forest, would be cleared for the additional ROW needed. Floodplain forest is an important and uncommon habitat type in Wisconsin and the loss of this habitat should be taken into account when determining mitigation requirements, if this segment is approved.

Subsegment H7 and the northern end of H8 pass through a small parcel of land owned by USFWS on the southwest side of I-90/94, across from the Baraboo River WPA (also federally owned and managed). This small parcel is grassland adjacent to an agricultural field, and although impacts to the parcel itself may be limited, a discussion on the impacts of the proposed high-voltage line in proximity to the Leopold-Pine Island IBA and the Baraboo River WPA can be found in Section 8.1.2 of this EIS.

Segment I

Subsegment I5 crosses land that is privately owned but enrolled in the WRP operated and managed by the USDA NRCS. This subsegment follows an existing 138 kV transmission line ROW and a rail corridor. The ROW likely would need to be expanded for some width (0 to 75 feet) across approximately 1,428 feet of grassy wetland areas. NRCS would need to determine whether expansion of the ROW was a compatible use on this property. Subsegment I5 also crosses part of the northern edge of Dells of the Wisconsin SNA, owned by the state of Wisconsin and managed by DNR. The same 138 kV transmission line and rail corridor mentioned above also traverses this area, but the new345/138 kV double-circuit line still would require increasing the ROW width across this property. Because LAWCON funds were spent on this property, the applicants are consulting DNR regarding any necessary mitigation.

Subsegment I8 passes through a portion of the Pine Island SWA. The proposed double-circuit 345/138 kV transmission line would follow the northern edge of the property, running along the south side of an existing railroad corridor near STH 16. The land cover consists of shrub/scrub wetlands and areas of wetland dominated by reed canary grass with a potential for some sedge meadow. See Section 8.3.4 for more discussion on potential impacts to wetlands in this SWA and Section 8.1.2 for discussion on the larger Leopold-Pine Island IBA.

The northern end of Subsegment I13 passes through one parcel owned by the city of Portage, and one owned by the town of Lewiston. These parcels are part of an area of wetland, both forested and scrub, south of a housing development. They comprise the northern edge of a larger floodplain forest complex that extends south to the Wisconsin River. New ROW would be needed in this area and could range from 0 to 185 feet. More discussion on the impacts to wetlands in this area and the rest of Subsegment I13 can be found in Section 8.3.4.

Subsegment I13 also traverses part of the Pine Island SWA, just south of the Wisconsin River. This property is managed by DNR. Land cover here is a mix of floodplain forest and areas of open or scrub wetland. The potential loss of habitat and impacts of the new ROW and transmission line are more fully described in Section 8.1.2 which covers the impacts and controversy regarding the larger Leopold Pine Island IBA.

Subsegment I13 crosses several publicly-owned parcels, and some land that is privately-owned that is covered by an NRCS floodplain easement. These easements are acquired and managed by NRCS as part of the Emergency Watershed Protection Program. The property with the easement is within the Baraboo River Floodplain, and is predominantly open grassland with a small pond. In this area the width of the ROW would need to be expanded 68 feet, on average, and new land rights acquired.

8.3.3. Forested lands

8.3.3.1. Existing environment

Segments J, H, and I run along the western edge of the Central Sand Hills Ecological Landscapes, as described in Chapter 2, Section 2.3. The Central Sand Plains is characterized by large expanses of lacustrine and outwash sands on flat to gently sloping topography that include scattered sandstone buttes. The potential natural vegetation is jack pine and scrub oak forests and barrens, and sedge meadow and conifer swamp wetlands. The Central Sand Hills landscape is characterized by glacial outwash with extensive eskers and drumlins, ice contact deposits, rolling ground moraines, and steep end moraines. The potential natural vegetation of this region is primarily oak savanna with areas of sedge meadow.

Woodlands in this area tend to be larger, more contiguous blocks of forest (over 10 acres on average) than in the agricultural areas further south. The deciduous forests along these segments are dominated by pole and saw timber-sized oaks, hickory, and maples, while the mixed deciduous-coniferous forests are dominated by pole and saw timber-sized oaks, pines, and quaking aspen. Minor species include quaking aspen, black locust, ash, and black cherry. Coniferous stands include white and red pines. The understory commonly includes sumac, buckthorn, and honeysuckle.

Wooded wetlands, primarily hardwood swamps, are common on Segment I. Dominant species include red maple, American elm, green and black ash, quaking aspen, and river birch. Segment I crosses two forested portions of the Pine Island SWA, a floodplain forest complex south of the Wisconsin River (Subsegment I13) and a forest north of the river (Subsegment I6). The floodplain forest complex contains hardwood swamps dominated by river birch, silver maple, green ash, quaking aspen, cottonwood, and swamp white oak in the overstory, with glossy buckthorn and honeysuckle in the understory. The wildlife area north of the river is a sedge meadow–shrub-carr–hardwood swamp complex, where the hardwood swamp is dominated by quaking aspen, with grey dogwood and common winterberry in the understory. Segment I also crosses Wisconsin River floodplain forest in other areas, where silver maple, green ash, red oak, shagbark hickory, red maple, and river birch are dominant in the overstory.

Forest use is primarily recreational. Forested wetlands along waterways are considered to be riparian habitat. Forested lands are privately-owned, except for small areas owned by the city of Wisconsin Dells and the city of Portage, the Pine Island SWA and Mirror Lake State Park owned by the state of Wisconsin, and the Fairfield Marsh owned by USFWS.[155] Other publicly-owned forested areas exist where woodlands are within the WisDOT ROW.

8.3.3.2. Potential impacts

Segment J
A total of 21.3 acres of upland woodland would be permanently cleared. The clearing would result from widening the existing I-90/94 corridor to accommodate the new transmission line. No clearing would be required for off-ROW access routes.

Segment H
A total of 82.5 acres of upland woods and 20.1 acres of wooded wetland would be cleared, for a total permanent forest loss of 102.5 acres. Off-ROW access roads would require an additional 1.02 acres of upland woodland clearing. Most clearing would result from widening the existing I-90/94 corridor.

Subsegment H5 passes through an area of MFL land near I-90/94. It is possible that ROW clearing would impact forested land enrolled in the program in this area.

Segment H has eight pine plantations or forests along its ROW. Removing pine trees creates the possibility of introducing annosum root rot.

Mirror Lake State Park is crossed by Segment H, where it lies adjacent to the interstate. The park contains a large, deciduous forest dominated by pole and saw timber-sized oak, maple, and hickory, with sumac and common buckthorn commonly found in the understory.

Several forested areas on Segment H are part of the Pine Island SWA. This area is actively managed by DNR to restore a continuum of habitats, from prairie to savanna to oak woodlands. Forests along the segment in the wildlife area include a hardwood swamp dominated by river birch, silver maple, American elm, and black willow.

Subsegment H4 would require clearing an entirely new corridor through two woodlands east of USH 12 to avoid land owned by the Ho-Chunk Nation.

Substituting Subsegment H6-north for H6 avoids clearing 2.2 acres of USFWS-owned upland woods adjacent to I-90/94. This woodland is a mature, closed canopy deciduous forest dominated by pole and saw size oak, with aspen and hickory scattered throughout. The subcanopy is dominated by sumac and honeysuckle near the edges. Using Subsegment H6-north requires clearing 0.33 acre of DNR-owned upland woods on the edge of the northeast side of I-90/94.

Segment I
A total of 29.9 acres of upland woodland and 16.9 acres of wooded wetland would be cleared, for a total permanent loss of 46.8 acres of forest. Most clearing would result from widening the existing highway and

[155] The applicants originally proposed Subsegment H6 across Fairfield Marsh, owned by USFWS. Because USFWS denied the crossing of Fairfield Marsh, the applicants created Subsegment H6-north, which avoids this property by crossing to the north side of I-90/94 for approximately 0.34 miles.

railroad corridors. Off-ROW access routes would require an additional 0.26 acre of upland woodland clearing.

Subsegment I11 passes through an area of land that is in the MFL program along the railroad tracks just west of the city of Portage. It is possible that ROW clearing at that location could impact forested areas enrolled in the program.

Where Segment I crosses forested areas of the Pine Island SWA, clearing would be associated with widening existing corridors near the edge of the wildlife area.

Table 8.3-2 Summary of woodland loss on Segments J, H, and I

Segment Combinations	Upland Woods Cleared (acres)	Forested Wetland Cleared (acres)	Total Acres Cleared
J and H	103.8	20.1	123.9
J and I	51.2	16.9	68.1

8.3.4. Wetlands

Construction in wetlands could alter wetland hydrology, vegetative character, and function. More specifically, forested wetlands would be permanently lost and converted to shrub wetlands or sedge meadow and the likelihood of invasive species being introduced to the site would be greater. Furthermore, minimizing impacts is necessary and might be achieved by restricting construction to winter or periods of low flow, implementing requirements of Wis. Admin. Code ch. NR 40 for invasive species, and using matting or other low ground pressure equipment. After completing construction of the transmission line, the applicants would conduct site restoration and compensatory mitigation activities as required. General information about wetland resources and the potential short- and long-term potential impacts of constructing transmission line through and across wetlands can be found in Section 4.5.17.

The applicants intend to provide compensatory mitigation for permanent and conversion wetland impacts by using either existing mitigation banks, Wisconsin's In-Lieu Fee Program or, if no other option exists, permittee-responsible mitigation. As part of the permitting process, DNR and USACE will review any mitigation proposal for this project prior to the start of construction.

8.3.4.1. Segment J

Segment J (2.3 miles) crosses one non-forested wetland. The wetland is located at the toe of the road bank slope along I-90/94. It is composed of sedge meadow in the interstate ROW, grading into forested wetland off the ROW. No structures are proposed to be constructed in or near this wetland.

8.3.4.2. Segment H

Field surveys were conducted for almost all of this segment, with the exception of Subsegment H4, a short cross-country subsegment.

Segment H crosses 5 miles of wetlands for a total of 60 acres of potential wetland impacts (20 acres forested wetland and 40 acres of non-forested wetland). The western half of Segment H contains few wetlands, all of which are relative small. Starting east of Schepp Road, Subsegments H5-H9 cross large floodplain wetlands that are associated with the Wisconsin and Baraboo Rivers. This portion of the segment also crosses through or near Leopold-Pine Island IBA, the Baraboo River WPA, and the Pine Island SWA. These natural areas and their wetland complexes are some of the largest wetlands found on any segment of the Badger-Coulee routes. In the town of Fairfield, the route crosses 1.6 miles of a wetland complex and ten transmission structures would be constructed within this complex. Farther east, in the town of Caledonia, Segment H crosses 1.9 miles of another complex and nine structures would be located within this wetland. Both of these complexes are composed of several wetland types, including sedge meadow, shrub-carr, shallow marsh, and hardwood swamp. Both contain mature floodplain forest and areas of sedge meadow with a diverse mix of native species. In addition, they are both part of the Pine Island SWA and part of the Wisconsin River and the Baraboo River floodplains. In total, Segment H crosses 21 wetlands and 33 structures would be constructed within these wetlands.

At the east end of Segment H, the route intersects the Baraboo River and crosses 1,083 feet of a mature floodplain forest and wet meadow. One structure is proposed to be built in this complex.

Many of the wetlands that are crossed by the eastern half of Segment H contain significant high-quality wetlands associated with ASNRI waterways that are designated as Priority Navigable Waterways (PNW). Constructing structures in these wetlands could greatly alter the composition and function of these wetland complexes. All of the floodplain forest (20 acres) present in the ROW would be converted to herbaceous wetland or shrub-carr. If Segment H is part of an approved route, it is essential that BMPs, winter construction, and the use of wetland matting be used to minimize impacts.

8.3.4.3. Segment I

Segment I crosses 53 wetlands totaling 99 acres of potential wetland impacts (17 acres forested wetlands and 82 acres non-forested). The segment would require the construction of 67 structures in wetlands. For much of its length, Segment I follows an existing transmission line ROW, though up to 120 feet of new ROW width would still be required in some locations.

Similar to Segment H, Segment I crosses large floodplain wetland complexes associated with the Wisconsin and Baraboo Rivers. The applicants field-surveyed most of this segment (approximately 90 percent), with the exception of a few short cross-country subsegments (Subsegments I7, I11, and I12). Segment I, between the Wisconsin Dells and Portage contains significant and varied high-quality wetlands along the Wisconsin River, the Dells of the Wisconsin River SNA, and the Pine Island SWA.

The western portion of Segment I crosses wetlands within the Dells of the Wisconsin SNA, though some are dominated by invasive species. One structure is proposed to be constructed just outside of the SNA. If the structure must be located in the wetland, BMPs should be implemented to minimize impacts to the wetland and the SNA.

Continuing southeast, Segment I runs parallel to and north of the Wisconsin River and its associated wetlands. The route crosses 4,537 feet of floodplain forest located between the railroad embankment and the river. The ROW crosses only the edge of these wetlands with most of the actual wetland located south of the proposed ROW. Three structures would be constructed in or near these floodplain forest wetlands.

Much of the eastern end of Subsegment I5 again crosses significant acreage of large complexes of wetlands. The subsegment would first cross 1.4 miles of a wetland complex and then another 3,075 feet of a second wetland complex. In total, 12 structures would be built within these two wetland complexes. Though they are primarily composed of reed canary grass, these wetlands still serve an ecological purpose, such as for flood attenuation and water filtration. Due to the large size of these complexes and their location in the floodplain of the Wisconsin River, impacts should be minimized. All of these floodplain complexes provide wildlife habitat, and value for floodwater storage and water filtration.

Farther east, Subsegment I8 crosses another major length of floodplain wetlands. The total length of the entire wetland crossing is 2.5 miles. This subsegment crosses the Pine Island SWA and 15 are proposed to be constructed in this complex. Again, while much of these wetlands are dominated by reed-canary grass, they also contain large amounts of sedge meadow.

Once the line turns south and parallels I-39, it crosses the Wisconsin River and another large floodplain wetland complex composed of mature floodplain forest and sedge meadow, providing vital wildlife habitat and other ecological values such as flood attenuation and water filtration. More specifically, the wetlands are part of the Pine Island SWA and Leopold Pines IBA. Due to the size, location, and composition of this complex, construction impacts should be minimized. Limiting the spread of invasive species and reducing ground impacts in these locations is imperative. Most of these wetlands are listed as ASNRIs due to their connectivity with the Wisconsin River floodplain complex.

South of STH 33, 1.3 miles of floodplain forest wetlands are associated with the Baraboo River and the Leopold-Pine Island IBA. Eight structures are proposed to be constructed in these wetlands. Some of the wetlands within this complex are listed as ASNRI's due to their presence on both sides of the Baraboo River. A major characteristic of these wetlands are oxbow lakes and floodplain forest. Due to the multiple areas of open water within this area and generally wet conditions, environmental impacts could be reduced by constructing during frozen conditions and through the use of extensive matting.

8.3.4.4. Summary of wetland impacts of Combined Segments J-H and J-I

Both combined Segments J-H and J-I impact large, contiguous significant high-quality wetland complexes associated with the Wisconsin River floodplain and more specifically the Leopold-Pine Island IBA, Pine Island SWA, and the Baraboo River WPA. Both segments cross the Baraboo River and its floodplain on the eastern end of the combined segments. Segment H requires significant impacts to approximately three more acres of forested wetland than Segment I. Most of the forested wetland impacts along Segment H would occur on Subsegments H5 and H7. Subsegments H5 and H7 are composed of mature floodplain forest wetlands associated with the Wisconsin River and are part of the Pine Island SWA. Due to their size, location, and composition, these are significant wetlands for the ecology of the region. Construction impacts should be minimized as much as possible in these areas. Limiting the spread of invasive species and reducing ground impact in these locations is imperative.

Even though Segment I would require slightly less clear-cutting of forested wetlands than Segment H, the tree removal on Segment I would be of mature, forested wetlands. Segment I would require almost 12 acres of forested wetlands adjacent to the Wisconsin and Baraboo Rivers to be removed. These forested wetlands play a significant role in the landscape in that they trap runoff that would otherwise flow to the river and act as habitat for a variety of terrestrial and aquatic species.

Table 8.3-3 Summary of potential wetland impacts on Segment Combinations J-H and J-I

Segment Combinations	Forested Wetland				Non-Forested Wetland			Total Wetland Impact (acres)	Significant /High-quality Wetlands
	Existing Shared ROW Not Cleared* (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Forested Wetland Impact (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Non-Forested Wetland Impact (acres)		
J and H	1.9	1.9	18.2	20.1	6.3	34.4	40.6	60.7	8
J and I	2.6	2.7	14.3	17.0	54.6	28.3	82.9	98.9	21

* This column is a subset of the Existing Shared ROW.

8.3.5. Lakes, rivers, and streams

Some of the waterways that would be crossed by this project have significant scientific value, and are identified by DNR as ASNRI for their protection under Wis. Admin. Code § NR 1.05. ASNRI designations are given to water bodies that meet one of a number of criteria representing high ecological value such as outstanding resource waters (ORW), exceptional resource waters (ERW), and trout streams (Class I, II, and III). See Figure Vol. 2-4.02 for a map depicting the region's waterways.

Some waterways crossed during construction would require a TCSB or a bridge requiring support below the OHWM. These waterways could be adversely affected by removal of stream bank vegetation, excavation, potential soil erosion and sedimentation, and temporary closure to users of the river. Impacts may be minimized by implementing requirements of Wis. Admin. Code ch. NR 40 for invasive species, completing site restoration and revegetation activities as required, as well as following BMPs and Erosion Control Plan specifications. General information about lakes, rivers, and streams, and the potential impacts to this resource from transmission line construction can be found in this EIS in Section 4.5.16.

The applicants identified navigable waterways intersected by the proposed routes based on a review of desktop information and DNR-supplied data, and aerial photographs; field observations were made along accessible routes. DNR has final jurisdictional authority over navigability determinations. Some non-navigable and intermittent streams may also be present along the routes. These resources would be identified during a pre-construction engineering survey if the proposed project is approved.

Segment J

Segment J is a very short segment (approximately 2.3 miles) consisting of only one subsegment that follows I-90/94 along the western edge of the Wisconsin Dells. All of Segment J has been field surveyed. Segment J intersects an unnamed tributary to the Wisconsin River, where the waterway is estimated to be one-foot wide and one-foot deep. A TCSB is proposed to cross the waterway at this location. Following TCSB installation standards and using appropriate erosion control measures would assist in minimizing impacts to this waterway.

Segment H

Segment H follows I-90/94 from the Wisconsin Dells to Portage, paralleling the southern edge of the Wisconsin River for over 16 miles. The majority of Segment H has been field surveyed. Segment H crosses eleven waterways and requires installation of seven TCSBs. Three of these waterways (Hulbert Creek, Dell Creek, and the Baraboo River) are ASNRI-designated waters because they support state-listed threatened and/or endangered species. Subsegment H1 crosses Hulbert Creek, a Class II trout stream, and further south it crosses Dell Creek where it enters Mirror Lake State Park. Dell Creek is an exceptional resource water (ERW) that connects the Wisconsin River, Lake Delton, and Mirror Lake (Refer to Figure Vol. 2-4.02). Before reaching Dell Creek, Subsegment H1 would require a temporary structure below the OHWM of Blass Lake to facilitate construction access. The placement and removal of this structure could increase the suspension of sediments, disturb habitat, and disrupt flow. In addition, Subsegment H7 crosses the Baraboo River which contains a naturally-reproducing sturgeon population. All of these resources are of high-quality and impacts should be minimized by implementing appropriate erosion control and avoidance measures.

Segment I

Segment I also runs between Wisconsin Dells and Portage; however, it travels cross-country, loosely following STH 16 and paralleling the northern edge of the Wisconsin River. The majority of Segment I has been field surveyed. Segment I crosses the Wisconsin River twice, as well as 16 additional waterways, and requires installation of five TCSBs, all of which are associated with the Wisconsin River system. The

Wisconsin River is a vital waterway in Wisconsin, draining much of the state and providing numerous ecosystem functions such as wildlife habitat, flood storage, and water quality enhancement.

Segment I first crosses the Wisconsin River (ASNRI) immediately below the Kilbourn Dam on Subsegment I3. Here the wire would be pulled across approximately 610 feet of the Wisconsin River by boat, helicopter, or person. Two areas of grading would be required along the banks of the Wisconsin River, both exceeding 10,000 square feet. It is important that grading be minimized because exposed soil adjacent to waterways can adversely impact waterways. In general, vegetation clearing near the bank should be minimized to limit impacts to waterways. BMPs and appropriate erosion control measures must be utilized. No structures would be located below the OHWM of the river at this crossing.

Continuing southeast, the ROW of Subsegments I4 and I5 is located within an existing transmission line ROW that spans the edge of the Wisconsin River. In addition, Subsegment I5 crosses an unnamed tributary to the Wisconsin River where it enters the Dells of the Wisconsin River SNA; this crossing would require a TCSB. This waterway is not listed as an ASNRI, but impacts should still be minimized.

Segment I crosses the Wisconsin River a second time along I-39, west of Portage on Subsegment I13 and upriver from the Caledonia and Portage Dams. At this location the wires would be pulled across approximately 1,000 feet of the Wisconsin River by boat, helicopter, or person. No structures are proposed to be constructed below the OHWM.

Further south, the line crosses the Baraboo River, another large river system. Here, the Baraboo contains naturally-reproducing populations of sturgeon and other state-listed endangered and/or threatened species. The same protections followed for the Wisconsin River should also be implemented here.

8.3.5.1. Summary of waterway impacts of Combined Segments J-H and J-I

Both routes cross several tributaries to the Wisconsin and Baraboo Rivers. Combined Segments J-H do not cross the Wisconsin River itself while combined Segments J-I cross it twice; once near the city of Wisconsin Dells, and once near the city of Portage. Combined Segments J-H cross fewer waterways than J-I but require more TCSBs. On Segment H one miscellaneous structure is proposed to be located below the OHWM of Blass Lake in the village of Lake Delton. Combined Segments J-I require grading greater than 10,000 square feet at two locations along the banks of the Wisconsin River in the city of Wisconsin Dells. Vegetative clearing on the banks of these waterways and the placement of TCSBs could adversely impact these high-quality streams. TCSB standards and conditions must be followed to minimize impacts, as well as proper erosion control measures.

Table 8.3-4 Summary of waterway impacts on Segments J-H and Segments J-I

Combined Segments	Waterway Crossings	ASNRI Waterway Crossings	TCSBs Required	TCSBs Over ASNRIs
J and H	12	1	8	0
J and I	19	8	6	0

8.3.6. Rare species and natural communities

This section discusses the potential impacts to endangered resources that might be affected by construction or operation of the proposed project along Segments I, H, and J. A general discussion of rare species is presented earlier in this EIS in Chapter 4, Section 4.5.

Endangered resources include rare or declining species, high quality or rare natural communities, and unique or significant natural features. Endangered resources are tracked via the state's NHI database which is maintained by the DNR Bureau of Natural Heritage Conservation. The project area evaluation consists of both the specific route and a buffer of 1.0 mile for terrestrial and wetland species and a 2.0-mile buffer for aquatic species.

The combined presence of natural habitat and man-made disturbances must be taken into consideration to evaluate whether there is a likelihood that rare species are present and the potential for negative impacts to those species. For the purposes of this document, rare species are defined as federal- or state-listed threatened and endangered species, federal candidate and proposed species, and state special concern species. These species are not common which means they are low in numbers or restricted to small geographical areas, *i.e.*, difficult to find. Therefore, while the existing sources of information are important for estimating impacts to rare species, they are incomplete. Additional rare species beyond those identified may actually be present in potentially impacted areas.

Also, the Wisconsin NHI database only has information on rare species for areas that have been previously surveyed for that species or group during the appropriate season and the observation recorded. Not all areas of the state have been surveyed, especially most privately-owned lands. Therefore, potential endangered resource impacts along segments dominated by private properties may be incomplete.

For specific route segments, an incidental take of state threatened or endangered animal species may occur as defined by Wis. Stat. § 29.604. Further consultation under DNR's incidental take process may be needed and an incidental take permit may be required for construction to proceed on those segments. Instances where existing information indicates that additional assessment or consultation for incidental take would be needed are described in this EIS.

This section identifies the endangered resources that could be present, the project's potential impacts on these resources, and the mitigation measures that should be implemented. Rare species are discussed as taxa groups or individually if there is a high level of concern. This list and information are taken from existing sources within DNR, such as the NHI database, as well as some external sources, including landowners and surveys completed by the applicants.

8.3.6.1. Birds

Almost all native bird species are protected by the MBTA. Under the MBTA, it is unlawful to take, capture, kill, or possess migratory birds, their nests, eggs, and young. This may apply to birds nesting in or adjacent to the ROW if construction disturbance results in nest abandonment. Avoiding impacts to nesting birds can be achieved if construction activities can be scheduled in habitat areas outside the breeding and nesting season from approximately March through August.

IBAs are designated by the National Audubon Society, Inc. and managed in partnership with DNR and other stakeholders. These sites are of ornithological importance because they provide essential habitat to species of breeding or non-breeding birds of conservation concern. Segment H and I cross the Leopold-Pine Island IBA which is located on both sides of the Wisconsin River (see Figure Vol. 2-7). More detailed information about the IBAs crossed by these segments can be found in Section 8.1.2 of this EIS. Additionally, the USFWS Fairfield Marsh WPA is located along I-90/94 and has been avoided by Subsegment H6-north. The route modification to avoid the federal property is discussed earlier in this chapter in Section 8.1.1.

The applicants did not conduct breeding bird surveys for these segments, but bald eagle and red-shouldered hawk surveys were completed in 2013.

Segment J

The Bell's vireo, a state threatened bird, prefers dense shrubby areas within an open prairie landscape. It is generally absent from intensively cultivated areas, forests, and entirely open grasslands. Habitat for Bell's vireo doesn't appear to be present on Segment J and no avoidance measures would need to be implemented.

Segment H

Three state threatened and one special concern bird species were document within the vicinity of this segment.

Habitat for the Bell's vireo is present adjacent to Segment H in several locations. If the Commission approves Segment H, surveys would need to be conducted to see if suitable habitat is present for this species. If suitable habitat is available then presence/absence surveys need to be conducted.

The Henslow's Sparrow, a bird listed as threatened, prefers old fields, open grasslands, wet meadows, unmowed highway ROWs, undisturbed pastures, timothy hay fields, and fallow land grown up to tall weeds. This species was recorded in the Pine Island SWA. If the Commission approves Segment H, additional bird surveys may be required to avoid impact.

The third threatened species is the red-shouldered hawk which prefers larger stands of medium-aged to mature lowland deciduous forests with small wetland pockets. The NHI database identified this species in Mirror Lake State Park. Because this subsegment is adjacent to I-90, it is unlikely this bird would be present within the ROW. The applicant conducted red-shouldered hawk broadcast call surveys in four areas along Segment H. No red-shoulder responses to the call surveys were recorded.

The bald eagle, which is listed as Special Concern in Wisconsin and federally protected by the Bald and Golden Eagle Protection Act and the MBTA, prefers large trees in isolated areas in proximity to large areas of surface water. In addition to the NHI database, the applicants' nest inventory and monitoring surveys identified many active eagle nests along the Wisconsin River, just north of Segment H. Mirror Lake State Park and Pine Island SWA provide suitable habitat for this species and are crossed by this segment. Per USFWS guidelines, it is a requirement to maintain a buffer of at least 660 feet between project activities and an active bald eagle nest. Work may be conducted closer if done outside of the nesting season (August through mid-January). If these guidelines cannot be followed, USFWS must be consulted for further assistance, prior to the start of construction.

Segment I

Two state threatened and two special concern bird species may be within the vicinity of this segment.

The yellow-crowned night-heron, a state threatened species, is found in swamps, river bottomlands, and mature floodplain forests. It prefer ponds, wooded swamps, riparian forests, and lowland deciduous forest. This species has very few known occurrences in the state and is of the highest priority for conservation. If the Commission approves a route using this segment, it will be important that surveys be conducted in areas of suitable habitat along the Wisconsin River. Nest abandonment can be avoided by preventing human impact in nesting areas during the breeding season of April through July.

The Bell's vireo, a state threatened species was recorded in the vicinity of Segment I. This grassland species could be present along parts of this segment. Avoidance measures for this species may include surveys to determine if it is present in areas of suitable habitat and if it is present, then avoiding construction activities during its breeding season between May 25 and August 15.

The prothonotary warbler, a special concern species, breeds in floodplain hardwoods. This type of habitat is found along the Wisconsin River where bottomland forests are seasonally or permanently flooded. Because this segment runs mostly along an existing transmission line just north of the river and then cuts down along I-90, suitable habitat would only be in areas where the route crosses or is adjacent to the Wisconsin River. If surveys are conducted in areas of suitable floodplain habitat and this warbler species is present, work should be avoided during the breeding season which is May 8 to September 1.

The bald eagle is also present along Segment I in numerous places along the Wisconsin River. A few nests appear to be adjacent to the segment, while others are located further away and closer to the river. In areas where suitable habitat is adjacent to or crossed by this segment, steps must be taken to minimize impacts. If the Commission approves Segment I, surveys should be re-conducted to determine if there are active nests present close to proposed construction activities. Per USFWS guidelines, it is a requirement to maintain a buffer of at least 660 feet between project activities and an active bald eagle nest. Work may be conducted closer if conducted outside of the nesting season (August through mid-January). If these guidelines cannot be followed, USFWS must be consulted for further assistance, prior to the start of construction.

Red-shouldered hawk broadcast call surveys were conducted in three areas along Segment I. No red-shoulder hawk responses were recorded at the survey stations.

8.3.6.2. Small mammals

Segment J

Segment J had no rare mammals recorded in the NHI database. It is important to note that even though no mammals were documented along this segment, the same species that are present on Segment H and I could also be present here, if suitable habitat is available.

Segment H

One special concern small mammal, the western harvest mouse, may be present along Segment H in areas of suitable habitat. This species prefers dry and dry-mesic prairies, more or less open grassy places and neglected fields overgrown with grasses or sedges. Surveys for this species are not considered very effective. Therefore, if the Commission approves Segment H, minimization measures could include limiting construction activities to the period when the species is active (April through October) so that it has the ability to move away from the construction area.

Segment I

The eastern pipistrelle, a state threatened bat, has been documented within the vicinity of this segment. All impacts to this state-listed species must be avoided. This bat typically roosts in caves during hibernation, therefore, construction activities conducted during the winter hibernating months is preferable to prevent impacts to this species. While little is known about their daytime and summer roosts, they have been found in trees and tree foliage. Where suitable habitat occurs, avoidance measures for this species may include presence/absence surveys and/or no tree removal during the bat's maternity period (June 1 through August 15). If the Commission approves Segment I, further consultation with DNR would be required to determine appropriate avoidance measures.

Similar to Segment H, the state special concern species the western harvest mouse may also be present in suitable habitat along this segment. If the Commission approves Segment I, further review would be recommended to determine where along the segment this species may be found. Possible minimization measures may include conducting the work during their active season.

8.3.6.3. Herptiles – amphibians and reptiles

Segment J

The cricket frog, a state endangered species, was recorded as occurring within the vicinity of this segment. It is an open-canopy habitat generalist and inhabits both semi-permanent and permanent water bodies. This type of habitat is not present along Segment J, therefore, it is unlikely that this species would be impacted by the proposed project.

Also, one special concern turtle and one endangered lizard were recorded in the NHI database. Both of these species were associated with Hulbert Creek which is not crossed by Segment J.

Segment H

One amphibian and seven reptiles were recorded within the vicinity of Segment H.

The cricket frog, a state endangered species, was recorded within the vicinity of this segment. Cricket frog habitat is crossed by Segment H. If this segment is approved, surveys must be conducted to determine if suitable habitat is available where waterbodies and wetlands are impacted by the proposed project. If suitable habitat would be impacted, the applicants would need to secure an Incidental Take Permit prior to the start of construction.

The state endangered slender glass lizard prefers sandy oak savannas, sand prairies, old fields with sandy soils, and woodland edges around and within all of these habitats. These kinds of habitats appear to be present throughout Segment H. Typically presence/absence surveys would be required before proceeding with minimization/avoidance measures; however for this species, no survey method is considered 100 percent effective for determining presence or absence. Therefore, if the Commission approves Segment H, habitat surveys would be required and potentially, an Incidental Take Permit.

The eastern ribbonsnake, an endangered species, prefers vegetation bordering waterways. Since 11 waterways are crossed by Segment H, habitat assessments must be conducted in areas that appear to support this species. All survey methods for this very rare species need prior approval from DNR because species surveys are not considered 100 percent effective for determining presence/absence. If suitable habitat cannot be avoided, time of year restrictions or the installation of snake exclusion fencing would be required.

The eastern massasauga rattlesnake is a state endangered species and a federal candidate species. This snake is strongly associated with floodplain habitats along medium to large rivers. Suitable habitat does not appear to be present along Segment H and no impact to this species is anticipated.

The false map turtle and smooth softshell turtle are both special concern species present in the Wisconsin River. Both of these species are large river species. Suitable habitat does not appear to be present along Segment H and no impact to this species is anticipated.

Suitable habitat for the state threatened wood turtle may be present along this segment where rivers and streams with moderate to fast flows are crossed. If construction activities would occur within 300 meters on either side of suitable wetland and upland habitat, avoidance measures must be implemented. This species overwinters in rivers and streams, typically in shallower areas near the banks. Avoidance measures for this species may include working in uplands or wetlands during its inactive season (November 1 through March 14) and/or fencing areas of suitable habitat outside of the active period. If these measures cannot be implemented, an Incidental Take Permit may be necessary.

Lastly, suitable habitat for the Blanding's turtle, a special concern species, may be impacted by Segment H. This species nests within 900 feet of suitable wetlands and waterways. This segment crosses over 21 wetlands, eight of which are of significant or high quality. Structures would also be constructed within many of the wetlands. This turtle species overwinters in standing water that is typically more than three feet deep and with a deep organic substrate, but will also use both warm and cold-water streams and rivers where it can avoid freezing. There are several areas along this segment where suitable habitat may be impacted. DNR recommends that impacts to these suitable habitats be minimized. Measures may include working in uplands or shallow wetlands during the Blanding's inactive season and/or fencing areas of suitable habitat outside of the turtle's active period.

Segment I

The cricket frog, a state endangered species, was recorded as occurring in the vicinity of this segment. Cricket frogs are commonly found in ponds, lakes, streams, and rivers, and require open canopy or semi-open canopy habitats. Segment I crosses this type of habitat. If the Commission approves Segment I, surveys must be conducted to determine if suitable habitat is available where waterbodies and wetlands are impacted. If suitable habitat would be impacted, then the applicants must acquire an Incidental Take Permit prior to the start of construction.

One snake and four turtle species were recorded as being present in the vicinity of Segment I.

The eastern massasauga rattlesnake is a state endangered species and a federal candidate species. This snake is strongly associated with floodplain habitats along medium to large rivers. Suitable habitat does not appear to be present along Segment I and no impact to this species is anticipated.

The state threatened wood turtle prefers clean rivers and streams with moderate to fast flows and adjacent riparian wetlands and upland deciduous forests. This species overwinters in rivers and streams, typically in shallower areas near the banks. Since work would be occurring within 300 meters of the Wisconsin River in wetland and upland habitat suitable for this species, avoidance measures must be implemented. Avoidance measures for this species may include working in uplands or wetlands during its inactive season (November 1 through March 14) and/or fencing areas of suitable habitat outside of the active period. If these measures cannot be implemented then an Incidental Take Permit may be necessary.

The false map turtle and smooth softshell turtle are both special concern species present in the Wisconsin River. Both of these species are large river species. The area of concern is along Subsegment I13 where structures might be placed along the riverbanks. Minimization measures for these species may include working in uplands during their inactive season and/or fencing areas of suitable habitat outside of the active period.

The other special concern turtle is the Blanding's turtle. This species nests within 900 feet of a suitable wetland. This segment crosses 53 wetlands, of which 21 are of significant or high quality. This turtle species overwinter in standing water that is typically more than three feet deep and with a deep organic substrate but will also use both warm and cold-water streams and rivers where it can avoid freezing. There are several areas along this segment where suitable habitat may be impacted and minimization measures are recommended. Measures may include working in uplands or shallow wetlands during their inactive season and/or fencing areas of suitable habitat outside of the active period.

8.3.6.4. Terrestrial invertebrates

Segment J
The NHI database did not document any terrestrial invertebrates for this segment.

Segment H
Seven butterfly species may occur in the vicinity of this segment. Of these, one is endangered and the rest are special concern (one special concern is also federally protected). Many of these species have been documented in the Lower Mirror Lake Barrens or on the International Crane Foundation Prairie, neither of which are impacted by Segment H.

The regal fritillary, a state endangered butterfly, has been found along Segment H7 in the Pine Island SWA. This species prefers large grassland areas with tall grass prairie remnants or lightly grazed pasture lands containing prairie vegetation. If the Commission approves Segment H, host plant surveys may be needed in suitable habitat areas along the I-90 ROW.

The Karner Blue Butterfly, listed as federally endangered and special concern in Wisconsin, has been found within the vicinity Segment H. This species prefers pine barrens and oak savanna in close association with its larval host plant, lupine. In Wisconsin, it is also found along utility and road ROWs, abandoned agricultural fields, and managed forests. If the Commission approves Segment H, host plant surveys may be needed in suitable habitat areas along the I-90 ROW. Because the segment does not cross the Karner Blue Butterfly Federal High Potential Range, incidental take of the butterfly is not illegal.

Segment I
The NHI database did not have any rare terrestrial invertebrates documented on this segment.

8.3.6.5. Aquatic invertebrates

Segment J
One special concern mayfly, as well as two threatened and two endangered mussels were identified in the NHI database as occurring within or near the project area. The mussel species prefer large rivers. The mayfly prefers large, deep, warm streams where there is strong current and fine sands. It appears unlikely that the mayfly and mussel species would be found in the tributaries crossed by this segment.

Segment H
One endangered and two special concern mayfly species have been identified in the NHI database as occurring within the Wisconsin River and Baraboo River, near this segment. Additionally, two endangered and three threatened mussels, one of which is also federally listed, have also been identified in the same rivers. For Segment H, only one structure would be constructed below the OHWM. This structure is located in Blass Lake which does not provide suitable habitat for any of these species.

Segment I
Three mayfly species (two special concern and one endangered) and three endangered (one of which is federally listed) and three threatened mussels have been identified by the NHI database as occurring within the Wisconsin River. The easiest way to avoid impacting these eight species is to protect water quality and avoid placing structures directly within the river. If any structures would be constructed in the river, then presence/absence surveys must be conducted where construction activities would occur in the river. If the species are found to be present, translocation of the species would be required to be conducted just before start of work so that the mussels don’t move back into the area of potential impact. DNR, as well as USFWS, must approve all survey work plans for the federally protected mussel.

8.3.6.6. Fish

Segment J

Three threatened and four special concern fish species are documented within the NHI database for this segment. These fish species prefer large rivers which would not be impacted by the construction of the proposed transmission line on this segment.

Segment H

Three threatened and five special concern fish species are document within the NHI database for this segment. These eight fish species prefer large rivers (such as the Wisconsin River). None of the 11 waterways Segment H crosses are suitable habitat for these rare fish. One structure would be constructed below the OHWM in Blass Lake along Subsegment H1. Rare fish may be present in this lake, even though they are not documented in the NHI database.

Segment I

Three threatened and six special concern fish are present within the Wisconsin River which is crossed by Segment I. Strict erosion control practices must be followed at locations where construction activities would occur to prevent sediment from reaching the water.

8.3.6.7. Plants

Impacts on natural communities can ultimately change habitat conditions and make it difficult for rare plants to persist. Wisconsin's Endangered Species Law protects only state-listed endangered and threatened plant species on public lands, but utility, agriculture, forestry, and bulk sampling projects are exempted from this protection. Additional surveys and avoidance/minimization measures for rare plant species are encouraged and recommended. Potential avoidance measures may include conducting plant surveys to determine presence/absence and/or avoiding areas where known plants occur. Other measures, such as winter construction, use of mats to limit direct disturbance, or relocation, can minimize losses. DNR also recommends that applicants and landowners with rare species on their property develop a plan to protect these species.

Segment J

Two threatened, two endangered, and nine special concern plants were identified in the NHI database as occurring within or near the project area. Eleven of the plants are terrestrial-dependent, one wetland species, and one aquatic species. Two of the special concern species may be present in the mixed coniferous-hardwood forests crossed by this segment. Only one wetland is crossed by Segment J and the sedge/wet meadow habitat it contains is not suitable for the wetland plant identified in the database.

Segment H

A total of 23 plants were identified in the NHI database as occurring within or near Segment H. Five are threatened, two endangered, and 15 are special concern. Segment H passes through various types of high quality habitat that can support these species. For example, the Pine Island SWA, the Baraboo River WPA, and the Mirror Lake State Forest. Many of the natural communities listed below also support these species. If the Commission approves Segment H, it is recommended that surveys be conducted during the appropriate time of year to determine the presence of rare plants.

Segment I

A total of 25 plants were identified in the NHI database as occurring within or near Segment I. Four are threatened, three endangered, and 18 are special concern. Sixteen of these plants are terrestrial, six wetland species, and three are aquatic-dependent species. This route passes through various types of high quality habitat that can support these species, such as the Pine Island SWA along Subsegments I8 and I13 and the

Dells of the Wisconsin River SNA along Subsegment I5. Many of the natural communities listed below also support these species. If the Commission approves Segment I, it is recommended that surveys be conducted during the appropriate times of year to determine presence.

8.3.6.8. Natural communities

Most occurrences of high-quality natural communities documented in the NHI database are from surveys conducted on public lands. In areas where there is a predominance of private lands, more diverse, high quality, or rare natural community occurrences likely exist, but remain undocumented and underrepresented in the NHI database. Below is a discussion of those natural communities identified in the NHI database. Natural communities may contain rare or declining species and their protection should be incorporated into the project design as much as possible. Minimizing impacts to and/or incorporating buffers along the edges of these natural communities is recommended.

Segment J
Near and along this segment, there are eight upland, one wetland, and two stream natural communities identified in the NHI database. This segment crosses through a mixed deciduous/coniferous forested (upland forest natural community).

Segment H
Near and along this segment, 13 upland, eight wetland, one waterbody, and four stream natural communities were identified in the NHI database. Segment H crosses the Pine Island SWA which contains several natural communities. Minimizing impacts to and/or incorporating buffers along the edges of these natural communities is recommended.

Segment I
Near and along this segment, eight upland, five wetland, and four stream natural communities have been documented in the NHI database. Some communities that would be intersected by the line include the following: the Baraboo River Floodplain Forest SNA, a floodplain forest community; the Pine Island SWA, mesic prairie and moist sand meadow communities; and the Dells of Wisconsin River SNA where Segment I is near dry cliff and moist cliff communities.

8.3.6.9. Summary of endangered resource impacts for Segments J, H, and I

Tables 8.3-5, 8.3-6, and 8.3-7 identify the general types and numbers of rare species, natural communities, and other features that were identified as potentially present along Segments J, H, and I based on information primarily from the NHI database and some other sources.

Table 8.3-5 Summary of endangered resources along Segment J

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidate	Not Applicable
Birds	1				
Amphibians	1				
Reptiles	1	1			
Aquatic Invertebrates	4	1			
Fish	3	4			
Plants	4	9			
Natural Communities					11
Summary	14	15	0	0	11

State Required Actions – 10
State Recommended Actions – 30
Federal Required Actions – 0
Federal Recommended Actions – 0

Table 8.3-6 Summary of endangered resources along Segment H

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidates	Not Applicable
Birds	3	1			
Small Mammals		1			
Amphibians	1				
Reptiles	4	3			
Terrestrial Invertebrates	1	6	1		
Aquatic Invertebrates	6	2	1		
Fish	3	6			
Plants	7	16			
Natural Communities					26
Summary	25	35	2	0	26

State Required Actions – 18
State Recommended Actions – 68
Federal Required Actions – 2
Federal Recommended Actions – 0

Table 8.3-7 Summary of endangered resources along Segment I

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidate	Not Applicable
Birds	3	2			
Small Mammals	1	1			
Amphibians	1				
Reptiles	2	3			
Aquatic Invertebrates	6	2	1		
Fish	3	6			
Plants	7	18			
Natural Communities					18
Summary	23	32	1	0	18

State Required Actions – 16
State Recommended Actions – 57
Federal Required Actions – 1
Federal Recommended Actions – 0

8.3.7. Archaeological and historic resources

No intact above-ground historic structures listed with WHS have been identified within the ROW of Segments J, H, or I.

8.3.7.1. Segment J

No previously recorded archaeological or cemetery/burial sites are identified within the Segment J ROW; thus, no further cultural resource review is recommended for the current alignment of Segment J.

8.3.7.2. Segment H

Seven archaeological sites listed with WHS could be affected by construction in the ROW of Segment H, including one rock shelter, three villages or habitation sites, and two burial sites or mounds. Table 8.3-8 lists the names of the sites occurring on Segment H along with additional information from the WHS inventory of recorded sites. The listing of a site with WHS is an indication that the site is considered eligible for the NRHP.

Table 8.3-8 Reported archeological sites along Segment H

Site # (Site Name)	Artifacts/Materials Present	Recommended WHS Action
SK-0284	Rock shelter that may have been used as a prehistoric habitation site	Archaeological survey
SK-0346 (Mt Pleasant Village Site)	Village or habitation site that contained hearths and lithic debitage	Archaeological survey
SK-0391 (Webster)	Village or habitation site of unknown cultural affiliation	Archaeological survey
SK-0390/BSK-0315 (Beardsley Mound)	Burial site consisting of a single prehistoric conical mound	Consultation with WHS and archeological survey
CO-0204 (Statz Site)	Prehistoric site of unknown cultural affiliation	Archaeological survey
CO-0205/BCO-0174 (De Kau Ray's Village and Burial Ground)	Reported location of a historic village and burial ground	Consultation with WHS and archeological survey
CO-0206 (Hutterli)	Prehistoric site of unknown cultural affiliation	Archaeological survey

If Segment H is part of the approved route for the project, WHS recommends field survey by a qualified archeologist where a WHS-mapped site coincides with the ROW. The survey would assess potential effects to the sites and would be intended to ensure the Commission's compliance with the state historic preservation law. At the burial sites, archeological survey must be conducted under the requirements of Wis. Stat. § 157.70, the state burial preservation law to determine if there are human remains. Under Wis. Stat. § 157.70, the applicants must apply directly to WHS for authorization before any ground disturbance at the site may begin, including an archeological survey.

Aldo Leopold Shack

If the transmission line is constructed on Segment H, the line may be visible from the Aldo Leopold Shack, a WHS-listed NRHP National Historic Landmark. The Shack and neighboring farm, owned and managed by the Aldo Leopold Foundation, is of ecological and cultural significance and provides extraordinary and unique environmental education and outreach opportunities for the public. The Shack served as the basis for some of Leopold's major writings, most notably, *The Sand County Almanac*. The site is located between Subsegment H5 and the Wisconsin River, in the Leopold-Pine Island IBA (see Figure Vol. 2-7), and it has been preserved at the original location where Aldo Leopold and his family spent time in the 1930s. The approximately 150-acre site is buffered by the larger 1,500-acre Leopold Memorial Reserve.

The potential impact of the project on the viewshed from the Leopold Shack property is a concern. To minimize or eliminate impacts, lower profile structures (*e.g.*, structures in a horizontal configuration such as H-frame structures) could potentially be used in areas where transmission lines are likely to be seen from the property. The applicants have stated that they do not believe the structures would be visible from the Shack. Their conclusion is based on their consideration of the distance of 4.1 miles between the Shack and the applicants' preliminary structure locations plus the ground elevation at the Shack relative to the ground elevation of the proposed Badger-Coulee transmission structures, and the topography of the terrain between the Shack and the proposed structures. On the other hand, whether the proposed structures would be visible from other important locations on the Leopold Shack property may still be in question. [156]

8.3.7.3. Segment I

Seven archeological sites listed with WHS could be affected by construction in the ROW of Segment I. Four sites contain campsites or villages, two are burial sites, and one is a prehistoric enclosure. The campsites/villages primarily contain scattered lithics and ceramics. The two burial sites contain effigy mounds. The prehistoric enclosure contains earthwork of an unknown cultural affiliation. Site CO-0058, the Halverson Site, is a composite listing that includes four other sites: CO-0057, CO-0059, CO-0060, and CO-0061/BCO-0151 (the Crossing Group).

Table 8.3-9 lists the names of the sites occurring on Segment I along with additional information from the WHS inventory of recorded sites. The listing of a site with WHS is an indication that the site is considered eligible for the NRHP.

[156] In order to gauge the extent of impact to the Leopold Shack's viewshed, a visual simulation was requested from the applicants (PSC REF#: 193819). The applicants responded (PSC REF#: 199733), but the simulation work has not been received at the Commission at the time of preparation of this draft EIS.

Table 8.3-9 Reported archeological sites along Segment

Site # (Site Name)	Artifacts/Materials Present	Recommended WHS Action
CO-0340 (Newport Enclosure)	Prehistoric enclosure/earthwork of an unknown cultural affiliation	Archaeological survey
CO-0056/BC-O0148 (Slough Mounds)	Uncatalogued burial site consisting of a Prehistoric conical mound and a prehistoric linear mound	Consultation with WHS and archeological survey
CO-0058 (Halverson Village; composite record that includes CO-0057, CO-0059, CO-0060, and CO-0061)	Prehistoric village	Archeological survey and Consultation with WHS and Ho- Chunk Nation Tribal Historic Preservation Office
CO-0061/BCO0151 (Crossing Group; located within C0-0058)	Burial site consisting of effigy, linear, and conical mounds	Archeological survey and Consultation with WHS and Ho-Chunk Nation Tribal Historic Preservation Office (THPO)
CO-0221	Prehistoric campsite or village of unknown cultural affiliation, contains lithic debitage and fire-cracked rock	Archaeological survey
CO-0207 (Mootz Site)	Prehistoric Woodland tradition campsite or village, contains scattered prehistoric cultural materials including lithics and ceramics	Archaeological survey
CO-0109 (Johnson)	Multi-component prehistoric campsite or village, contains lithics and ceramics	Archaeological survey

If Segment I is part of an approved route for the project, WHS recommends field survey by a qualified archeologist where a WHS-mapped site coincides with the ROW. The survey would assess potential effects to the sites and would be intended to ensure the Commission's compliance with the state historic preservation law. At the burial sites, archeological survey must be conducted under the requirements of Wis. Stat. § 157.70, the state burial preservation law to determine if there are human remains. Under Wis. Stat. § 157.70, the applicants must apply directly to WHS for authorization before any ground disturbance at the site may begin, including an archeological survey.

8.4. COMMUNITY RESOURCES

8.4.1. Land use

In general, residential uses are considered to be more sensitive to impacts from electric transmission lines than commercial or industrial land uses, primarily because of potential adverse aesthetic effects. Greater potential for conflict with land use plans exists in areas of urban development, where existing and planned residential and commercial uses are more common. The potential for conflict is also present in areas undergoing land use change, such as where rural land is being converted to residential use. Corridor-sharing with different types of infrastructure (for example, transmission lines and multi-lane highways) can mitigate impacts by causing incremental impacts instead of the entirely new impacts associated with a new ROW corridor. Not all corridors that can be shared with a transmission line serve to lessen potential impacts, though. Places with narrow, canopy-covered, local roads, winding rural roads, and areas crowded with small lots may experience greater impacts from a new high-voltage transmission line.

Most areas along these segments are rural in nature, with the exception of the portion of Segment I that passes through the city of Wisconsin Dells. Land use along these segments varies considerably; there are agricultural areas, some industry adjacent to the interstate, urban and rural residential, and a substantial amount of land managed specifically for the protection and enhancement of natural resources habitat and recreation.

These uses are expected to continue into the future. An electric transmission line is generally compatible with some of these uses, but is not necessarily a compatible or permittable use on some of the natural resource properties. In addition, the use of LAWCON funds for purchasing and improving recreational and natural resource habitat properties raises a number of compatibility issues and concerns. The potential for conflicts also exists near the developed areas of Wisconsin Dells and Lake Delton, and Portage, where residential and commercial development, existing and planned, is more common. These potential land use issues are discussed below.

Segments J

Segment J follows the southwest side of I-90/94, beginning near the northern city limits of Wisconsin Dells. The city's plan shows commercial development for the northeast, northwest, and southwest quadrants of the I-90/94 and USH 12 interchange. Rocky Arbor State Park is located in the southeast quadrant. Future residential use is planned for the area further south from the interchange, on the west side of the freeway. At the southern end of Segment J, recreation is the planned use for the land on both sides of the freeway, at CTH H. A golf course is located on the east side of the freeway. All of Segment J shares existing corridors.

Segment H

Segment H is adjacent to or near I-90/94 for the entire length of the segment. It starts on the east side of I-90/94, crossing first planned residential and then recreational land uses in the city of Wisconsin Dells. After leaving the city and entering the town of Delton in Sauk County, the future use designation changes to residential on lands that are currently wooded or in agricultural use. On the west side of the freeway, south of Trout Road is a combination golf course/residential development. In the village of Lake Delton, the planned use is residential north of Blass Lake Road and institutional south of the road. This institutional-designated land is a wooded summer camp.

On the west side of the freeway, across from the proposed route, existing single-family and multi-family residential developments are present. South of STH 23, existing commercial areas lie on both sides of the freeway and the proposed centerline passes over two commercial buildings. Further south, north of Mirror Lake, another existing residential area is encountered on the east side of the freeway and a campground is present on the opposite side of I-90/94.

Soon after crossing Mirror Lake, Subsegment H2 crosses to the west side of the freeway to avoid another campground, however, the proposed ROW overlaps Mirror Lake State Park and would require removal of a number of trees on park property. This intrusion presents a serious conflict as LAWCON funds have been used to purchase or improve this property. A separate state and federal review process would be necessary to determine whether the proposed transmission line is compatible with the recreational use of the property.

After Segment H exits the state park, the lands abutting the freeway are primarily commercial properties or areas designated by the village of Lake Delton's land use plan for future commercial development. These lands extend east to CTH A. Undeveloped parcels are currently either cropland or woodland. The segment continues to follow the south side of I-90/94 eastward until it encounters an area designated by the town of Fairfield's comprehensive plan for residential development. This future residential development is an approximately 0.75-mile-wide area surrounding Schepp Road. In the town of Caledonia, Segment H follows the south side of I-90/94, passing the base of Cascade Mountain Ski Area.

An area of current and future commercial land use is located on the west side of the I-90/94 and I-39 interchange, where the segment would be double-circuited with an existing ATC 69 kV line.

About 96 percent of the route using Segments H and J shares existing corridors. This corridor sharing with an existing multi-lane highway and 69 kV transmission line mitigates the impacts associated with a high-voltage transmission line to some extent. Considering the current and future land uses along the route, residential properties and some recreational/natural resource properties would be most impacted by the aesthetics of the new line.

Segment I

Segment I begins in the city of Wisconsin Dells, on the east side of I-90/94 and follows the north side of CTH H. Motels and restaurants are located on the south side of the highway and a golf course on the north side. The segment centerline passes over a small commercial building near the freeway. As the segment proceeds eastward, it crosses over the back lots (the north edge) of several commercial buildings that front on STH 13. Land north of this strip, east of Fitzgerald Road is designated for residential development. North of the segment, on the west side of USH 12, commercial development is shown in the city's land use plan as the future use for the currently undeveloped land. The segment then continues east crossing near the busy intersection of USH 12 and STH 13, from northwest to southeast. It then parallels the south side of STH 13 for a short distance, crossing near a tall flagpole located on a hilltop next to a parking area/overlook of Kilbourn Dam. It would be necessary to remove the flagpole if this route is selected.

The segment then turns southeast, crossing the Wisconsin River south of the Kilbourn Dam. After reaching the eastern bank of the river, the segment passes south of the Kilbourn Substation and joins the ROW of an existing ATC 138 kV transmission line that follows a railroad corridor southeast through the city. The proposed line would be double-circuited with this existing line. A city park and existing residential neighborhoods lie north of the segment, adjacent to the railroad tracks. A future commercial area is shown in the city's plan southwest of the segment, between the Wisconsin River and Bowman Road. The town of Newport's future land use plan shows single-family residential development on the north side of the railroad track between the Wisconsin Dells city limits and Newport Drive, with an environmental corridor to the south. The segment then enters a rural area between Wisconsin Dells and Portage.

In the town of Lewiston, just west of the city of Portage, the segment follows the railroad corridor through an area with industry to the north and residences south of the track. Once past an industrial plant, the segment switches from the south to the north side of the tracks, and is adjacent to land designated for future industrial expansion in the town's land use plan. The segment follows the southern border of an industrial parcel in the city for a short distance before leaving the railroad corridor and heading south in order to avoid a residential subdivision on the west side of I-39. Vacant land surrounding this subdivision is designated for future residential development. After turning eastward, the segment briefly continues eastward and crosses I-39 to follow the freeway south, along its east side. A residential subdivision is immediately adjacent and to the northeast of this turning point. Further south, the segment encounters commercial and industrial lands, both existing and planned, near the interchange of I-39 and I-90/94. Segment H connects to Segment G on south side of the interchange.

About 90 percent of the route using Segments J and I shares existing corridors. This corridor sharing with an existing multi-lane highway and 138 kV transmission line somewhat mitigates its impact. Considering the current and future land uses along the route, residential properties would be the most likely to be impacted by the aesthetics of the new line.

8.4.2. Proximity to residences and potentially sensitive populations

This section discusses the proposed project's proximity to homes, schools, daycares, hospitals, and other places where people frequently gather. Information for this section came from the tables submitted as part of the project application that categorize the number of residences within specified distances of the proposed centerline of the new 345 kV line and the estimated magnetic fields associated with the different proposed transmission line configurations. Additionally, Commission staff reviewed comments submitted by the public and conducted numerous site visits along the routes.

The proximity of properties to a high-voltage transmission line is important because of real and perceived concerns about local aesthetics, changes to valued viewsheds, personal enjoyment and use of one's property, potential impacts to property values, and personal and public safety.

Commission staff recognizes that individuals and families have substantial financial, physical and emotional investments in their homes and properties and that the generalized discussions in this document will most likely not adequately address all the issues felt by many individuals owning property along the proposed routes.

A generalized discussion of some of these issues is contained in Chapter 4 including: aesthetics (Section 4.5.1); magnetic fields (Section 4.5.6); noise and corona effects (Section 4.5.10); property values (Section 4.5.11); safety (Section 4.5.14); and stray voltage (Section 4.5.15). Appendix B contains a slightly more in-depth review of the health issues associated with the electric and magnetic fields generated by transmission lines. Additionally, the topic of aesthetics is discussed in the following section (Section 8.4.3) for several specific areas or properties along the proposed route that are recognized regionally or state-wide for their natural beauty.

Finally, the personal sense of loss and unfairness related to burdening individuals and specific communities with the long-term presence of this high-voltage transmission line cannot be adequately addressed in this document, but a discussion of some special concerns that have been raised follows in the sections below.

8.4.2.1. Residential impacts

Segment J

Segment J is common to all routes; there are no alternatives to Segment J. No homes are present within 300 feet of the proposed centerline on Segment J.

Segment H

On Subsegment H1, there is a subdivision on the west side of the I-90/94 corridor, north of Spring Brook. The closest cluster of homes appears to be in the range of 300 feet from the proposed centerline; however, the south and northbound lanes of I-90/94 traffic are between them and the proposed transmission line. Farther south on Subsegment H2, a single-family residence on Ishnala Road is located on the edge of the proposed ROW and approximately 50 feet from the centerline.

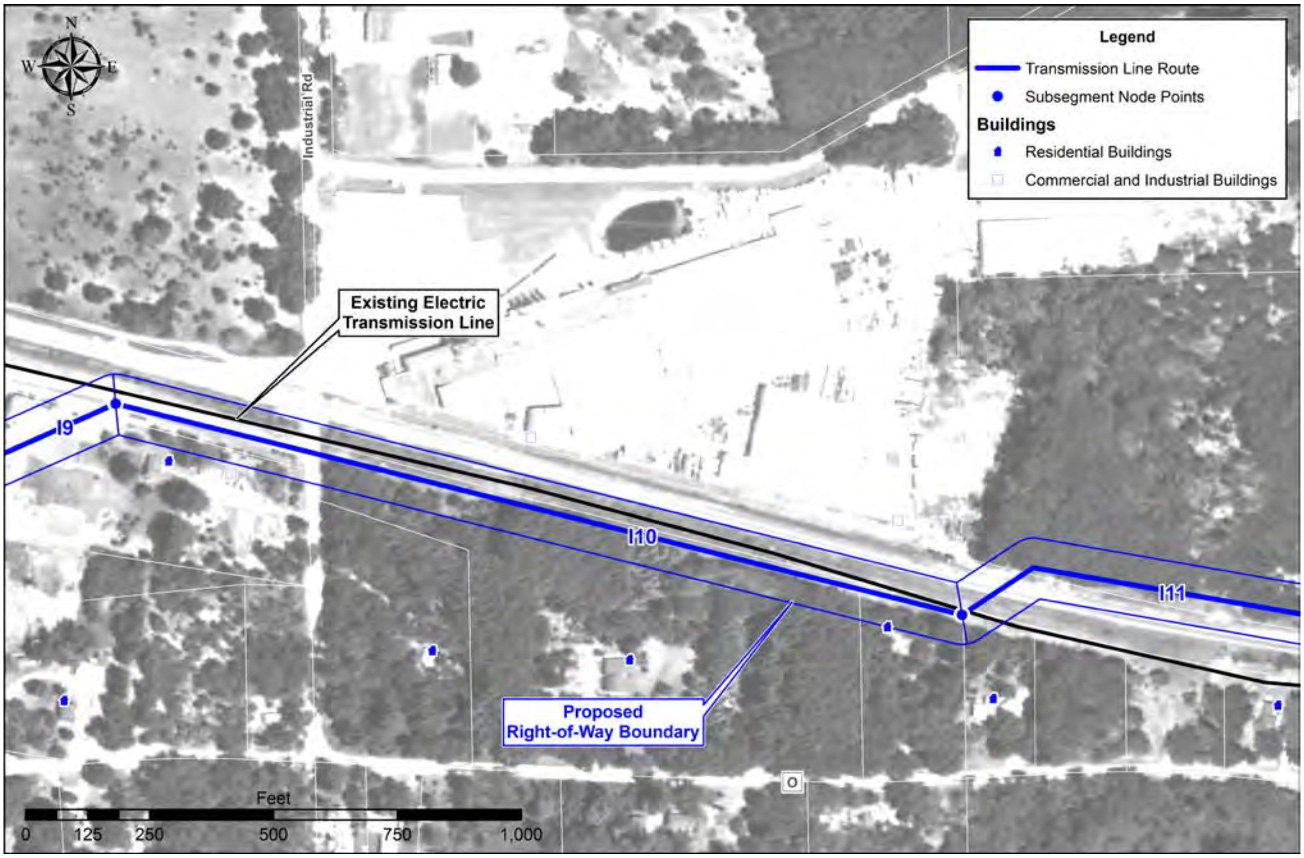
Segment I

Within the city of Wisconsin Dells on Segment I5, approximately 0.7 mile southeast of the proposed crossing of Kilbourne dam, there are a number of residences on the northeast side of the railroad tracks, along Capital Street that would be within 300 feet of the proposed double-circuit 345/138 kV transmission line. The wooded buffer on the southwest side of the railroad corridor that currently screens the residences from the existing 138 kV line would be removed, leaving the residents of these homes an unobstructed view of the new transmission facilities. (See Figure 8.4-1.)

Figure 8.4-1 Impacts on residences adjacent to the railroad corridor on Subsegment I5

Farther south near the Trienda Substation off of CTH O, two residences would be located within 100 feet of the proposed centerline because the new 345 kV line is routed slightly south of the existing 138 kV line ROW to avoid potential conflicts with the active rail facilities. One of these homes is on the edge of the proposed ROW and would be approximately 65 feet from the centerline of the new double-circuit 345/138 kV transmission line. All of the existing woody vegetation would be removed between these homes and a large industrial facility located on the north side of the railroad corridor. (See Figure 8.4-2.) Just a short distance to the south, the new 345 kV line would cross to the north side of the railroad corridor for the length of Subsegment I11. Several homes would be within 300 feet of the line on this segment; however, the existing 138 kV line that is currently very close to a few of these homes would be removed from its current location and installed with the new 345 kV line on single pole structures on the far side of the rail corridor.

Figure 8.4-2 Impacts on residences adjacent to railroad corridor on Subsegment I10



The Parkview Court subdivision off of CTH O near the intersection of Subsegments I12 and I13 has several homes that are within 300 feet of the proposed centerline, but some buffer of woods would remain between the homes and the transmission line.

Table 8.4-1 Number of homes within 300 feet of the proposed centerline

Segment Combinations	Distance to the proposed centerline				
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	Total
J and I		2	3	20	25
J and H	1			4	5

No churches, schools, hospitals or known daycare facilities are located within 300 feet of the proposed centerline on either Segment J, H, or I.

8.4.2.2. MAGNETIC FIELDS

Some background information and a general discussion of EMF is found in Section 4.5.6. of Chapter 4 and in Appendix B of this EIS. Due to questions and concerns from the public, the Commission requires applicants for transmission line projects to provide magnetic field data for locations where there are existing transmission lines along the project routes and the estimated magnetic field levels at varying distances from the centerline of the proposed project, for both normal load and peak load conditions, at one and ten years after the new line is placed in operation.[157] Below are brief summaries of the estimated magnetic field levels for the proposed 345 kV transmission line on Segments J, I, and H. More detailed information can be found in Appendix G of the Badger-Coulee application.[158]

On Segment H where there is a residence within 50 feet of the proposed centerline, the estimated magnetic field levels at 25 feet from the centerline would be 35.0 and 43.8 mG under normal load and peak load conditions, respectively. At 50 feet from the line, the levels would be 19.5 and 24.3 mG. At 200 feet from the proposed centerline, the magnetic fields would decrease to 1.9 and 2.4 mG.

On Segment I, the new 345 kV line would, at times, be double-circuited with an existing 138 kV transmission line. In the city of Wisconsin Dells southeast of Veteran's Memorial Park (Subsegment I5), the existing magnetic field levels produced by the 138 kV line were calculated to be 82.9 and 103.6 mG under normal load and peak load conditions, respectively at a distance of 25 feet from the line. These field levels decrease to 28.0 and 35.0 mG at a distance of 50 feet and are less than 1.0 mG at a distance of 300 feet from the existing line. Magnetic field levels for the proposed double-circuit 345/138 kV line would be substantially lower at 40.5 to 50.8 mG at a distance of 25 feet from the centerline. These values decrease to 19.4 and 24.3 mG at 50 feet and further to 1.3 and 1.6 mG at a distance of 200 feet from the line.

A very similar situation exists east of the city along CTH O on Subsegment I8 regarding existing magnetic field levels and those calculated for a new 345/138 kV line.

On Subsegments I10 and I11 where a number of homes are near the existing 138 kV line, the existing magnetic field levels are higher yet. The reported field levels at 25 feet from the centerline range from 94.0 to 117.5 mG on I10 and 99.4 to 124.2 mG on Subsegment I11. At 50 feet from the existing line, they range from 31.5 to 39.3 mG on both subsegments and decrease to 2.0 to 2.6 mG at a distance of 200 feet from the line.

The application indicates that the 345/138 kV double-circuit configuration at this location would reduce the existing magnetic field levels to 47.8 and 59.8 mG under normal and peak load conditions respectively at 25 feet from the proposed centerline. At 50 feet they would be 25.2 and 31.5 mG and at a distance of 200 feet they would range from 1.7 to 2.1 mG.

Near the Parkview Court development on Subsegments I11 and I12, the estimated maximum magnetic field levels are 33.6 and 42.0 mG at 25 feet from the centerline and at 1.3 to 1.7 mG at a distance of 200 feet from the proposed single-circuit 345 kV line.

8.4.3. Aesthetics and visual impacts

Aesthetics and visual impact are closely related and often used interchangeably. Aesthetics tends to encompass the sights, smells, sounds and perceptions one experiences from the surrounding environment; whereas visual impact is more directly related to views, sightlines and viewsheds.

The following discussion of aesthetic is based on Commission staff's visits to the project area and the following underlying assumptions:

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[157] Peak load is defined as 100 percent of estimated peak, system normal configuration and normal load is defined as 80 percent of peak load. Values provided are for 2018, the anticipated initial year of operation.
[158] PSC REF#: 191904 and 191905.

- Different viewers may have different levels of visual sensitivity.
- The physical setting can influence the degree of visual impact.
- Viewing conditions can influence the degree of visual impact.

In general, aesthetic and visual impacts are difficult to measure and tend to be perceived as greater in natural or scenic settings.

Segments J, H, and I pass through the communities of Wisconsin Dells and extend eastward toward Portage. Segments J and H closely parallel the I-90/94 corridor, while Segment I passes directly through Wisconsin Dells and traverses the rural area east of the city and north of the Wisconsin River. Each of these segments affects different types of visual resources.

Segment J

Segment J is adjacent to the southwest side of the interstate corridor, passing through both heavily forested areas and agricultural fields. There are no residences present on the segment. Divers and passengers in cars and trucks using the freeway would be the primary viewers of the proposed transmission line and the additional loss of trees required to accommodate the line. I-90/94 is a high-volume transportation corridor and thus, the number of persons that would see the line on a daily basis would be quite high. But the fact that they would be driving at a high rate of speed and mostly intent on reaching a destination beyond Segments J would likely decrease their visual sensitivity to the presence of a high-voltage transmission line.

Segment H

Like Segment J, Segment H also follows the interstate corridor, but over longer distance and through much more varied surroundings. Also, unlike the mostly vacant wooded property adjacent to Segment J, many of the properties, recreation opportunities and attractions along Segment H make it a "destination" area. Drivers and passengers in motor vehicles may be more aware of the presence of the line in this area or alternatively, they may be more focused on looking for directional signs and reaching their nearby destination and pay less attention to the transmission line.

The western portion of Segment H begins on the northeast side of I-90/94 and continues south on that side to avoid several residential developments, a golf course and a vacation community located on the southwest side of the interstate. The viewers and users associated with these resources would not be substantially affected by the presence of the proposed transmission line as they would often have a buffer of trees and the 4-lane interstate corridor separating them from the transmission line.

Shortly after crossing Dell Creek and moving to the south side of I-90/94, the proposed transmission line would traverse the northern edge of Mirror Lake State Park. This is a recreational resource and natural resource property that is regionally recognized for its scenic beauty. Much of this recognition stems from the park's proximity to Dell Creek/Mirror Lake, and the craggy bluffs and majestic pine forests covering the bluffs and most of the adjacent parkland. From a boat on Dell Creek or the water's edge south of the interstate bridge, the conductors of the line would be visible above and behind the bridge, but the transmission structures should be shielded from view due to the dense forest cover directly adjacent to the river. The conductors would be more visible against the sky when traveling south in a boat from the north side of the interstate bridge. It is likely that the transmission poles themselves would still be hidden from view.

The transmission line would enter Mirror Lake Park property south of Dell Creek and the bluffs, in a wooded area that transitions to open grasslands with a narrow, wooded buffer along the interstate.

Incremental impacts would occur along the edge of the forested area, but the removal of the wooded buffer adjacent to the open fields would result in a substantial aesthetic impact to some park users. A popular hiking/skiing trail, the Ishnala Trail, passes through this grassy opening, and users of this resource would be exposed to a clear view of the transmission line, as well as the noise and sight of traffic along the interstate. The applicants have indicated that they are discussing possible mitigation of these impacts with DNR, including relocation of the trail or planting low-growing woody vegetation within the transmission line ROW, in the event that Segment H is part of an approved route.

Farther south, Segment H deviates from the interstate corridor and wraps around the USH 12 interchange, crossing agricultural land that could be developed as commercial or residential properties in the future. Continuing south along the interstate, the proposed transmission line would leave the busy area surrounding Wisconsin Dells and cross several miles of agricultural land that is mostly cropped. The visual impact of the project would be primarily limited to motor vehicle drivers and passengers in this area.

On the western end of Subsegment H5, the transmission line would begin to cross natural resource properties owned and managed by DNR, USFWS and private landowners, for the purpose of preserving or enhancing avian and wildlife habitat and protecting endangered and threatened species. This large expanse of natural forest, shrub and wetland communities could be viewed as aesthetically incompatible with the presence of a high-voltage transmission line by the occasional users of these properties and the drivers and passengers in vehicles on the interstate. It is unknown whether the new 345 kV line in this area, especially along Segment H6-north, would be visible from the Aldo Leopold Shack, which is a designated National Historic Landmark. Such an intrusion would have to be mitigated either through line design or route adjustments. See Figure Vol. 2-7 a map of the landmark and Section 8.3.7 of this EIS for a discussion of the Leopold Shack.

Segment H7 crosses the base of the Cascade Mountain Ski Area on the north edge of the parking lot. The transmission line would detract from the views from the top of the ski hill and the slopes that look out across the broad expanse of marshland comprising a portion of the Leopold Pines IBA.

Segment I

Within the city of Wisconsin Dells, the proposed transmission line would follow a busy street past the edge of a golf course and across the busy intersection of USH 12 and STH 13 and parallel the street before reaching an overlook along the Wisconsin River south of the Kilbourn Dam and crossing the river. From the parking lot/overlook, the single-circuit 345 kV transmission line would be in the foreground, while a double-circuit 69/138 kV transmission line crosses the river behind the dam structure. Because of the existing transmission lines, the new crossing would be an incremental visual impact, but not substantial.

Similarly, after crossing the river, the new 345 kV line joins a single-circuit 138 kV line exiting the Kilbourn Substation and becomes a double-circuit line following the existing transmission line corridor. Additional trees would need to be cleared for a wider ROW and the new line would be taller, but the overall visual effect of the new double-circuit line on local residents, nearby homeowners and tourists in the area would be an incremental impact, rather than a new impact. For boaters or paddlers on the river, the new line on tall oxidized steel structures would likely be visible at two, or possibly three, locations south of the dam where the transmission line and cleared ROW closely parallel the riverbank.

Farther south, in the rural area near CTH O where more residences are present, the double-circuit 345/138 kV line would have a larger presence and a wider ROW than the existing transmission line and for some, it would open the views to a large industrial facility located on the north side of the railroad corridor near STH 16. Additionally, where the new transmission line deviates to the south and skirts the edge of the Trienda Substation, it is slightly closer to the Aldo Leopold Shack which is located across the Wisconsin River to the south. (See Figure Vol. 2-7.) It is unknown whether the new 345 kV line along Segment I would be visible from this National Historic Landmark property, but clearly such an intrusion would not be allowed and would have to be mitigated through line design or route adjustments.

After leaving the railroad corridor, the new single-circuit 345 kV line would cross the Wisconsin River as it traverses the surrounding floodplain forest adjacent to I-39. The visual impact of this new line could be substantial as the surrounding environment and viewshed primarily consists of natural communities. Similarly, views of the new transmission line from boaters or paddlers on the river at this location would be a new impact, although the interstate bridge and traffic noise already present some adverse aesthetic impacts for river users at this location.

8.4.4. Public lands and recreation

This section primarily describes the recreational properties and resources that could be directly affected by the construction and presence of the proposed Badger-Coulee 345 kV transmission line between the Wisconsin Dells and the town of Caledonia. Areas such as IBAs or properties managed primarily for the purpose of providing fish or wildlife habitat, are discussed earlier in this chapter in Section 8.3.2 (Natural Resource Properties). Also, the overall effect of the proposed transmission line on aesthetics and tourism-related business is covered in Section 8.4.3 (Aesthetics and Visual Impacts) of this chapter.

Although the potential adverse impacts of this project on hunting and some passive recreational activities such as hiking, bird watching, and leisure enjoyment of natural resources are not discussed with respect to individual private properties in this EIS, Commission staff acknowledges the numerous comments that have been received from owners of rural, undeveloped properties supporting woods, meadows, waterways, and wetlands.

Segment J
Rocky Arbor State Park is located adjacent to the interstate corridor between USH 12 and I-90/94 and would not be affected by the proposed transmission line which is sited on the opposite (southwest) side of the freeway.

Segment H
Near CTH H, the proposed route crosses to the north/east side of I-90/94 and Segment H continues south adjacent to the interstate corridor. It crosses Spring Brook and farther south it traverses the major waterway connecting Lake Delton and Mirror Lake as it hugs the northeast side of the interstate. Boating is popular in the upper reaches of Mirror Lake (located south and west of I-90/94) and the presence of the line could have an impact on the experience of boaters and tourists heading upstream to view the "Dells" of the Wisconsin River. A number of trees would have to be cleared to accommodate the transmission line along the interstate corridor.

Shortly after crossing this major waterway, Segment H shifts to the south/west side of the I-90/94 corridor and passes along the northeastern edge of Mirror Lake State Park adjacent to the I-90/94 corridor. This state park is a very popular destination, with campsites, access to Mirror Lake and Dell Creek, and popular trails for hiking, snowshoeing, cross-country skiing, and biking. Many areas of the park are also open for hunting and trapping during specified seasons.

The requirements for additional ROW vary along Subsegment H2 from 0 feet to 55 feet in width. The amount of additional ROW needed where this subsegment parallels the park for roughly 2,500 feet is not known at this time, but it is clear that some trees along the park boundary that help to screen views of

I-90/94 traffic would have to be removed. The Ishnala Trail, used for cross-country skiing in winter and hiking at other times of the year, is relatively close to the northeast park boundary and the loss of these trees could substantially impact the experience of trail users. The area in the northeast corner of the park (>than 100 yards from trails) is also open for trapping and at certain times of the year. In addition, the new line would cross Ishnala Road, which is a main route into the park.

LAWCON funds were used to purchase property for this park and thus, a separate review process involving both the U.S. Department of the Interior NPS and DNR is necessary to determine if the project impacts constitute a "conversion of recreational use" on the property. The applicants are working and consulting with NPS and DNR to complete this review process and determine appropriate mitigation if the easement is allowed.

The application states that "short-term impacts may be addressed by implementing mitigation efforts such as relocating existing trails to maintain or improve their recreational value and performing construction during the season(s) of lowest public use in each area. Long-term impacts would be addressed by replanting vegetative screens and with compensatory land purchases to be made by DNR and paid for by the applicants."

Subsegment H5 crosses about 1.5 miles of state-owned and managed wildlife property which is part of the larger Leopold-Pine Island IBA, an area that has been restored and managed to provide avian habitat. Recreational uses of the area include bird watching and hiking. Within this IBA is the Aldo Leopold Shack, a National Historic Landmark which attracts many visitors who wish to understand the history of environmental conservatism. Even though the site may be more than a mile from the route, the tops of the proposed transmission structures may be visible from the trail that leads to the shack. This may interfere with visitors' enjoyment of the history and the environment that surrounds landmark. The applicants state that lower H-frames could be used to avoid impacts to the Leopold Shack. A more complete discussion of this is included in Section 8.3.7.

Subsegment H6 was intended to cross the USFWS-owned Fairfield Marsh which is managed for wildlife habitat. Because USFWS denied the crossing of this federal property, the applicants created Subsegment H6-north which avoids it by crossing to the north side of I-90/94 for approximately 0.34 miles. Subsegment H7 continues across a large area of state-owned property, Pine Island SWA, managed for the same purpose. These parcels are discussed in greater detail in Section 8.3.2.

Segment I

The portion of Segment that passes through the city of Wisconsin Dells I (Subsegments I1 through I5) may have an aesthetic impact on visitors to the area, as well as permanent residents. At three locations, the new transmission line would parallel the banks of the Wisconsin River. In these locations, it would be double-circuited with an existing 138 kV line that is currently on much lower, wooden transmission structures. The new poles would be up to 150 feet tall and could be visible to paddlers and boaters on the river. On the east end of the city, Subsegment I5 borders a portion of the DNR-owned Dells of the Wisconsin River SNA. As this route parallels an existing overhead transmission line and a railroad corridor, it is unlikely that the new line would adversely affect recreational use in this area.

Subsegment I8 crosses approximately 2,200 feet of the northern edge of a state-owned wildlife area. No long-term recreational impacts on this property are expected.

Subsegment I13 parallels I-39 as it crosses the Wisconsin River. On the south side of the river, this subsegment crosses through state, federal and privately-owned properties that are managed for bird habitat. In total, this and other areas to the west are known as the Leopold-Pine Island Important Bird

Area. Subsegment I13 crosses a portion of this area from the Wisconsin River south to the interchange of I-39 and I-90/94. This segment first crosses the DNR-owned Pine Island SWA. At the southern end of Segment I, it runs parallel to but on the opposite side of the freeway from the DNR-owned Baraboo River Floodplain SNA and the USFWS-owned Baraboo River WPA. Recreational uses of these areas include, bird watching, hiking, hunting, and other wildlife viewing opportunities. As the transmission line route closely parallels the interstate highway corridor, it is unlikely that the proposed project would directly impact recreational use. However, views of the proposed transmission line could affect the use and enjoyment on other areas of the property and the new line could pose a risk to migrating waterfowl. This property is discussed in greater detail in Sections 8.3.2 and 8.4.3.

Table 8.4-2 Potentially affected recreational resources on Segments J, H, and I

Segment H
Mirror Lake
Pine Island Wildlife Area
Leopold-Pine Island IBA
Aldo Leopold Shack
Segment I
Dells of the Wisconsin River SNA
Pine Island Wildlife Area
Leopold Pine Island IBA
Baraboo River WPA

8.4.5. Airports and airstrips

Two helipads associated with Divine Savior Hospital and Divine Savior Healthcare Center are located near the southern portion of Segment I, but no potential issues related to the proposed transmission line should arise for flights related to those facilities. Portage Municipal Airport, a publicly-owned and operated airport is approximately 1.0 mile from Subsegment I12. FAA would require either that the height of the line be lowered or that individual structures be lighted if this portion of the transmission line project is approved. The potential problem is with respect to the instrument flight altitude within the terminal area.

In addition, closer to Wisconsin Dells, there are three heliports near Segment I: J.B. Helipad, Badgerland Heliport, and Holiday Inn Heliport, as well as the Medos sea plane base on Lake Delton. The heliports are all reported to be closed at this time, and approach and take-off flights from the seaplane base are not expected to be adversely affected if the proposed transmission line were built along Segment I.

Table 8-4-3 Potentially affected airports and airstrips

Segments J and H	Segments J and I
	Portage Municipal Airport

CHAPTER

9

9. Environmental Analysis: Town of Caledonia to North Madison Substation (Segments G-F and G-E)

9.1. SEGMENT COMPARISONS

Segments H and I connect to common Segment G in the town of Caledonia, Columbia County. The entire 4.2 miles of Segment G is routed along the east side of I-39/90/94 and at its southern end, it connects to Segment E or F, in the town of Dekorra. There are no alternatives to Segment G; it is common to all route options. Segment E is east of Segment F. The segments cross through the towns of Dekorra, Arlington, Lodi, and the town of Vienna in Dane County. Segment E is routed along the interstate, whereas Segment F is primarily new cross-country ROW. Segment E is shorter than Segment F by approximately 2.0 miles. Both of these segments end at the North Madison Substation.

9.1.1. Detailed descriptions of Segments G, E, and F

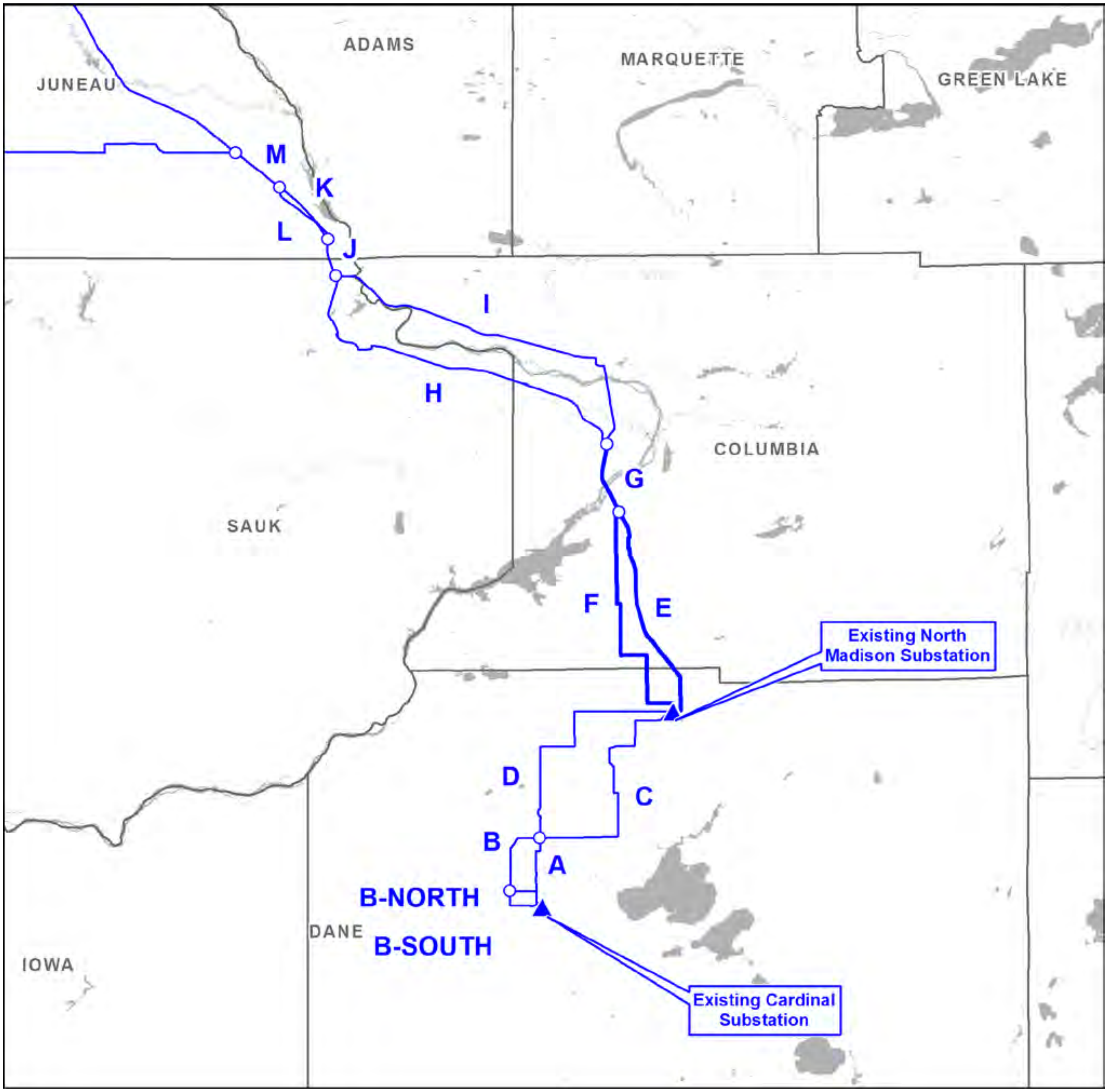
Segment G

Segment G continues south along the west side of the I-39. It is 4.2 miles long, starts in Columbia County and ends in Dane County at a WisDOT rest area. It crosses CTH U, the Wisconsin River, and CTH V. Subsegments G1 and G3 would be constructed as a single-circuit transmission line in a delta configuration with a 120-foot wide ROW. Portions of the ROW would overlap the WisDOT ROW, requiring, on average, approximately 50 feet of additional ROW width from private properties along the interstate.

At its midsection, Subsegment G2 would be constructed on H-frames in order to span the Wisconsin River. The ROW width on this part of Segment G2 would be substantially wider, as much as 275 feet wide. From CTH U to CTH V, the alignment of the proposed transmission line would be offset about 200 feet or more east of the Wisconsin River bridge and the paved portion of the interstate. Transmission structures for all three segments would range from 100 to 180 feet tall with the tallest structures necessary for the Wisconsin River crossing.

North of the Wisconsin River, the area crossed is mostly farm land. Where Subsegment G2 crosses the Wisconsin River, the hillsides are wooded with small residential riverfront properties. Directly south of the river, the proposed line passes through a residential area. The remainder of Segment G crosses wetlands and farmland interspersed with woodlots.

Figure 9.1-1 Badger-Coulee Segments G, E, and F



Subsegment E

Segment E is 13.1 miles long and starts at a WisDOT rest area. This segment requires a ROW width of 120 feet. The new transmission line would be a single-circuit line in a delta configuration. Subsegment E1, which is 10.7 miles in length, continues south, primarily along the east side of I-39/90/94. It briefly crosses to the opposite side of the interstate for approximately 3,000 feet to avoid a cluster of residences between the interstate and CTH J. Subsegment E1 crosses CTH CS, STH 60, CTH K, and the Columbia/Dane county line. On average, an additional 54 feet of ROW width would be required from private property owners, and the remainder would overlap WisDOT ROW. In some places, though, the full 120-foot wide ROW width would be on private property. Subsegment E1 primarily crosses farmland with a few small woodlots. At several locations, local roads closely parallel the interstate and residences or farmsteads are located very close to the proposed ROW.

Subsegment E2 leaves the interstate corridor and parallels (without overlapping) an existing ATC double-circuit 345 kV transmission line (L-COL21 and W-7) south and west for a distance of 2.3 miles into the North Madison Substation. The new ROW would require 33.9 acres of new ROW across agricultural fields and when combined with the existing transmission line ROWs would create a transmission corridor approximately 300 feet wide.

Segment F

Segment F is 15 miles long and requires, for the most part, a new 120-foot wide transmission ROW through a mix of farmland and forests. In addition to the farmsteads scattered along the rural roads, there are a number of residential properties within some of the larger wooded tracts. Where it crosses large areas of upland woods and wooded wetlands, the full width of the ROW would be cleared of all vegetation, greatly modifying some residential lots that were previously secluded. The segment starts in the town of Dekorra, Columbia County and crosses the township border of Arlington and Lodi before entering Dane County and the town of Vienna and ending at the North Madison Substation. Segment F begins at the WisDOT rest area and travels primarily south but repeatedly jogs east in a stair-step fashion. The line would be single-circuit and constructed in a delta configuration.

Segment F leaves the WisDOT rest area and travels southwest for 1,000 feet, across I-39/90/94 before turning south for about 5.25 miles. Located along parcel boundaries, it crosses a large wooded wetland, CTH CS, parallels a narrow local road (Thunder Hills Road), then jogs briefly east at Richards Road, before continuing south again for a distance of 3.0 miles. It crosses STH 60 and CTH K before jogging east near a residence and then once again heads south for 2.75 miles crossing CTH DM. Subsegment F4 travels east, paralleling the south side of Hahn Road for a distance of 1.5 miles. Subsegments F5 and F0 turn south one last time for 0.5 mile and enter the North Madison Substation from the west.

Table 9.1-1 Comparison of ROW characteristics for Segments G, E, and F

Segment Combination	Length (miles)	Total ROW Required (acres)	Existing ROW shared (acres)	New ROW (acres)	Percentage of ROW Shared
G and E	17.3	265.3	120.6	144.7	45.5
G and F	19.2	292.9	44.8 (9.8 acres are from local roads)	248.1	15.3

* Segment F only shares ROW with narrow local roads.

9.1.2. WisDOT issues

As it follows the I-39/90/94 corridor, Subsegments G3 and E1 cross Rest Area #12 partially within the interstate ROW. There likely would be some impact on the use of this rest area (which, according to WisDOT, is the busiest in Wisconsin along with Rest Area #11 across the interstate) during the construction phase of this project. Construction activities in this area would need to be carefully planned and managed to avoid disruption and maintain safe entry and exit ramps.

Similarly, Subsegment F1 crosses a small area of WisDOT property on the west side of I-39/90/94 at the very south edge of Rest Area #11, where traffic from the rest area merges into freeway traffic. Again, construction activities would need to be carefully planned and managed to avoid disruption to the extent possible and maintain a safe exit ramp if this subsegment is approved.

9.1.3. Construction issues

Off-ROW access roads become necessary where there are natural constraints such as steep hills, large high-quality natural resources, or other limitations where direct access from public roads is not possible. A brief discussion of the role of off-ROW access roads for this project is included in Section 2.1.4. If the proposed transmission line is built, all necessary access roads will be 16 feet wide and constructed with the ability to support the movement of heavy construction equipment. If the project is approved, the applicants will re-evaluate the proposed access routes. After construction is completed, off-ROW access roads may be restored to pre-construction conditions or, depending on negotiations with the property owner, access roads constructed in upland areas may be left in place.

Additionally, there are locations where alternate foundations or construction techniques would be useful or necessary to avoid significant impacts on natural resources. More information about these construction techniques can be found in Chapter 2, Section 2.1.2. In addition, Chapter 4, Section 4.4 discusses the phases of construction in detail.

Table 9.1-2 Off-ROW access roads impacts by segment combinations*

Segment Combinations	Number of Roads	Length (miles)	Wetlands (acres)	Upland Forest (acres)
G and E	7	1.2	0.3	0.8
G and F	1	< 0.1	0.1	0

* Data compiled from Application, Appendix B, Table 10.

Segment G
GIS data supplied with the application indicates that two off-ROW access roads are proposed for construction of Segment G. Both would be located south of the Wisconsin River just south of CTH V, and would total approximately 0.43 miles in length. The application provides details for only one of these roads. It appears that both of the proposed access roads cross areas of agricultural land and upland forest. One road appears to cross a portion of a wetland. Where agricultural land is crossed by the access roads, soil compaction is anticipated. Upland forest would be cleared to accommodate construction of the roads. A DNR permit would be needed to place fill in a wetland for road construction purposes.

At the location where Segment G crosses the Wisconsin River alternative construction techniques, such as the use of helicopters when stringing wires, could be considered to reduce some of the adverse impacts. Consultation with WisDOT for the purpose of avoiding undue distraction to drivers would be necessary due to the proximity of Segment G to the interstate highway.

Segment F
Subsegment F1 is a cross-country route that crosses a large expanse of wooded wetlands associated with Rowan Creek. It would require a number of structures to be constructed within wetlands. No off-ROW access roads are proposed for these segments. To reduce impacts to this segment, the use of helicopters when stringing wires may be appropriate.

GIS data supplied with the application, indicates that there is one potential 920-foot long access road proposed for the construction of Subsegment F3. However, detailed information for this construction access is missing from the application impact tables. The road appears to be located through a farmstead and on the edge of an upland wooded area. Impacts that would be associated with this access road appear to be minimal.

Segment E

There are six off-ROW access roads proposed for the construction of Segment E, totaling 1.2 miles in length. All are located for the purpose of accessing Subsegment E1. This segment parallel I-39/90/94. The access is required in some locations due to road crossings or ramps, steep embankments, and WisDOT access limitations. These off-ROW access roads would provide safer construction access. Similar to Segment F, at the crossing of Rowan Creek Segment E crosses a large area of wetlands. At this location, off-ROW access roads would serve to reduce the potential impacts to the creek and its associated wetlands. However, the access roads would impact approximately 0.2 acres of wetlands in this area. Any use of temporary fill or matting would be subject to the appropriate permitting process through DNR.

9.1.4. Electric distribution lines

Along Segments G, E, and F, there are distribution lines owned by WP&L that would require relocation if the proposed project is approved along these routes. The existing distribution lines may be located in areas that pose physical conflicts with the proposed 345 kV line or their proximity to the transmission line might result in stray voltage concerns, also known as NEV. No distribution lines are proposed to be underbuilt on the new 345 kV structures.

There is a general consensus that distribution lines located less than 150 feet from and parallel to a transmission line for a continuous distance greater than 1,000 feet can cause impacts on farms with confined animals. In Chapter 4, Section 4.5.15 of this EIS, the cause, impact, and mitigation of NEV issues are discussed in detail. In addition, the Commission may require the applicant to conduct pre-construction and post-construction testing of potentially impacted farms and lines.

All distribution modifications required as a result of this project would be made by the distribution owners including distribution line design, relocation, and associated permitting. For cost estimation purposes (see Section 2.4 of this EIS), all modified distribution lines were assumed to be relocated underground and the related costs are factored into the total costs presented.

Table 9.1-3 Distribution lines that would be relocated

Segment Combinations	Number of Locations	Miles of Distribution Line
G and F	4	1.3
G and E	1	0.1

Segment G

No distribution lines on Segment G would require relocation.

Segment F

A total of approximately 1.3 miles of distribution lines have been identified by the applicants as potentially interfering with proposed Segment F. If the proposed line is constructed along Segment F, the following WPL distribution lines would be relocated:

- On Subsegment F2 along the east side of Thunder Hills Road, 1,400 feet of single-phase overhead distribution line would require relocation.
- On Subsegment F3, two different segments of underground and overhead distribution lines would require relocation.
  - 400 feet of underground distribution line located approximately one-quarter section west of Thunder Hills Road.

  - 500 feet of single-phase overhead distribution line along the west and south east sides of a private driveway, south of CTH K.
- On Subsegment F4 along the south side of Hahn Road, 4,300 feet of single-phase overhead distribution line would require relocation.

Segment E
On Subsegment E1, along the east side of I-39/90/94 and the west side of Patton Road, a total of approximately 500 feet of WP&L distribution line, would be relocated if the proposed line would be constructed along Segment E.

9.2. NATURAL RESOURCES

9.2.1. Agriculture

The continuing presence of a high-voltage transmission can adversely affect farm operations and field productivity. Refer to Chapter 4, Section 4.5.2, for a discussion of potential impacts associated with transmission line construction and operation in agricultural fields. The DATCP will present its analyses of the potential impacts of the proposed project to farmed fields in the AIS it is preparing. See Chapter 1, Section 1.4.2 for a discussion of the role of the DATCP in this project. The table of contents of the AIS is included in Appendix D. The acreage figures used below were obtained from the DATCP, and may differ from those supplied by the applicants due to the possible exclusion in the application of cropped wetlands from the cropland totals.

The segments in this area pass through a primarily agricultural landscape. Most of the agricultural land is active cropland. Prime farmland soils are prevalent on the southern parts of Segments E and F and the northern part of Segment G. The majority of the crops are corn and soybeans; however, wheat and alfalfa/hay fields also occur. A relatively small area is devoted to pasture. No other specialty crops, such as ginseng, orchards, or cranberry bogs are grown within the proposed ROW on these segments.

No clear evidence of drain tile lines along the segments was apparent from either aerial photography interpretation or field investigation. However, there are areas of farmland along each segment that contain hydric soils and are in close proximity to ditches, which suggests that drain tiles may exist in these locations. During the final design process, the applicants would work with landowners to place structures so that impacts to drain tiles are minimized, to the extent practicable.

Farms that practice organic farming would require specific protection measures during construction to avoid the spread of farm pests and diseases or to protect organic certifications. Additional issues for organic farms might be caused by the removal of tree buffers for new ROWs or the enlargement of existing ROWs. The removal of buffers might threaten a crop's organic status by increasing the potential for herbicide drift from adjacent fields. Biosecurity and organic farm impacts can be minimized by the applicants working with agricultural landowners well in advance of construction, giving advance notice of construction activities, and following through with agreed to protective measures. See Section 4.5.2 in Chapter 4 for discussions about potential impacts and mitigation.

Segment G
A total of 14.4 acres of agricultural land lies within the proposed ROW, all of which is active cropland. Agricultural land represents 19.3 percent of the total required ROW; new ROW (not overlapping any existing utility or road ROW) encompasses 14.4 acres of farm land. No confined animal feeding operations are located within one half mile of the segment centerline, although three non-residential

agricultural buildings are within 300 feet of the centerline. Concerns associated with the presence of dairy operations and nearby agricultural buildings include the potential for stray voltage and induced currents. For a detailed discussion of this issue see Sections 4.5.14 and 4.5.15 in Chapter 4.

Limited aerial applications of herbicides, fungicides, and pesticides may occur along the route, though no specific information is known. The applicants should work with landowners whose aerial spraying would be affected by transmission line placement to minimize potential impacts.

Windbreaks or tree lines would be cleared along 0.1 mile of the route increasing the potential for wind erosion in neighboring fields or drift of agricultural chemicals.

No known organic farm operations are located along this route.

Segment F
A total of 125.9 acres of agricultural land lie within the proposed ROW, about 95.3 percent of which is active cropland and 4.8 percent is pasture. Agricultural land represents 57.8 percent of the total required ROW and new ROW (not overlapping any existing utility or road ROW) encompasses 124.9 acres of farm land.

A pivot irrigation system is located on Subsegment F1, but because the segment follows an existing tree line, interference with the current system should be minimal. Future expansion of the system onto an adjoining parcel, should the landowner desire to do so, could be affected, however. Impacts to this system could be minimized by working with agricultural landowners prior to the start of construction and providing appropriate compensation for damage or required modifications to the system.

Five dairy operations (ten or more animals confined in a facility) are located within 0.5 mile of the proposed segment centerline; none are within 300 feet. There are no non-residential agricultural buildings within 300 feet of the centerline. Concerns associated with the presence of dairy operations and nearby agricultural buildings include the potential for stray voltage and induced currents. For a detailed discussion of this issue see Sections 4.5.14 and 4.5.15 in Chapter 4.

The applicants propose to locate transmission structures, to the extent practicable, outside of cultivated fields and offset from field edges. However, the proposed segment centerline does cross some fields at mid-field, potentially resulting in poles being placed in cropland away from field edges, thereby creating obstacles for farm machinery working in the fields. In eight locations on this segment, these mid-field crossings exceed 1,000 feet and would most likely require construction of a transmission structure within a field.

Aerial applications of herbicides, fungicides, and/or pesticides takes place on numerous parcels along Subsegment F3. The subsegment passes between parcels that receive aerial applications, potentially impacting the ability of the farm operators to use aerial spraying. The applicants should work with landowners whose aerial spraying would be affected by transmission line placement to minimize potential impacts.

Windbreaks or tree lines would be cleared along 0.75 mile of the segment increasing the potential for wind erosion in neighboring fields or drift of agricultural chemicals.

Segment E
A total of 72.95 acres of agricultural land lie within the proposed ROW, about 96.0 percent of which is active cropland and 4.0 percent is pasture. Agricultural land represents 38.3 percent of the total required

ROW; new ROW (not overlapping any existing utility or road ROW) encompasses 72.4 acres of farm land. An additional 0.5 acre of farm land would be crossed by temporary off-ROW access routes.

Three dairy operations (10 or more animals confined in a facility) are located within 0.5 mile of the proposed segment centerline; none are within 300 feet. Eleven non-residential agricultural buildings are within 300 feet of the centerline. Concerns associated with the presence of dairy operations and nearby agricultural buildings include the potential for stray voltage and induced currents. For a detailed discussion of this issue see Sections 4.5.14 and 4.5.15 in Chapter 4.

The applicants propose to locate transmission structures, to the extent practicable, outside of cultivated fields and offset from field edges. However, the proposed segment centerline does cross some fields at mid-field, potentially resulting in poles being placed in cropland away from field edges, creating obstacles for farm machinery working in the fields. Between I-90/94 and the North Madison Substation the new line would closely parallel, on new ROW, an existing ATC double-circuit 345 kV line for a distance of 10,000 feet. Although the line would follow an existing corridor, the new poles would create additional obstacles to farm equipment operation in the cropland that is crossed.

A center pivot irrigation system is located along Subsegment E1, where it follows the I-39/90/94 ROW. Because the segment follows I-39/90/94, interference with the system should be minimal. Impacts to this system could be minimized by working with agricultural landowners prior to the start of construction and providing appropriate compensation for damage or required modifications to the system.

Aerial applications of herbicides, fungicides, and/or pesticides takes place on a parcel 900 feet from Subsegment E1. Numerous fields that receive aerial applications are located along Subsegment E1 near STH 60, primarily west of I-39/90/94. Some of these fields extend to Subsegment F1. The applicants should work with landowners whose aerial spraying would be affected by transmission line placement to minimize potential impacts.

Windbreaks or tree lines would be cleared along 0.2 mile of the segment increasing the potential for wind erosion in neighboring fields or drift of agricultural chemicals.

Table 9.2-1 Potential Agricultural Impacts on Segments G, E, and F

Segment Combinations	Total ROW (acres)	Agricultural Land (acres)	Percentage of ROW in Agriculture	Dairy Operations within 0.5 Mile
G and E	265.3	87.4	32.9	3
G and F	292.9	140.3	47.9	5

9.2.2. Natural resource properties

This section discusses the properties in this part of the project area that are managed primarily for protecting natural resource habitat. These properties may include publicly-owned lands and also private lands covered by a conservation easement or agreement. There may be some overlap in this section with properties discussed in Section 9.4.4 Public lands and Recreation because some properties serve multiple functions or have multiple designated uses.

Segments G and E
No properties managed specifically for natural resources habitat were identified on Segments G or E.

Segment F
On Subsegment F1, the proposed transmission line ROW would cross the edge of the nearby Dekorra Hunting Grounds which is managed by DNR. This ROW impact would likely be limited to the very southern edge of this property and not result in site fragmentation.

9.2.3. Forested lands

9.2.3.1. Existing environment

Segment G lies within a narrow finger of the Central Sand Hills Ecological Landscape that separates the Southeast Glacial Plains from the Western Coulees and Ridges. The rounded hills are covered in glacial outwash and support forests dominated by white and red pine and various oaks, including white, red and black oak. Segments E and F traverse the Central Sand Hills landscape and transition to the Southeastern Glacial Plains as they proceed southward away from the Wisconsin River. The historical natural vegetation along these segments is oak savanna, prairie, and sedge meadow and forests dominated by white, black, and bur oaks.

Most of the original vegetation has been cleared, but smaller tracts of forests remain, especially closer to the Wisconsin River, on steeper end moraines, low rocky hills, and in wetlands. The northern portion of Segment F borders the Driftless area and contains several forested slopes. Forests are larger and less fragmented on Segment F (especially the north half) than in the agricultural areas surrounding the southern two-thirds of Segment E. Woodlands are uncommon in the agricultural landscape of the southern parts of both Segments E and F.

The forested areas along these segments are predominantly small upland deciduous stands of pole and saw timber, surrounded by agricultural fields. Dominant overstory species typically include a variety of oaks, basswood, black walnut, black cherry, shagbark hickory, ashes, and eastern cottonwood. Understory shrubs include sumac, prickly ash, European bush honeysuckle, black locust, and common buckthorn. Mixed deciduous-coniferous and coniferous stands were less frequently observed by the applicants and are dominated by pole-size white and red pine with understories of honeysuckle and common buckthorn. Segment F contains occasional small plantations of white and red pine.

Forested wetlands are typically found along waterways, and are dominated by deciduous species such as basswood, American elm, green ash, and box-elder. Other forested wetlands are hardwood swamps dominated by silver maple, black willow, quaking aspen, and cottonwood.

Forested land ownership is mostly private, with the exception of the WisDOT I-90/94 ROW and a state-owned area of forested land along the Wisconsin River on Segment G. Land use on the forested lands is primarily classified as recreational; forested wetlands are classified as riparian habitat. The few pine plantations present are classified as timber.

9.2.3.2. Potential impacts

Segment G
A total of 8.3 acres of upland woodland and 6.0 acres of wooded wetland would be cleared, for a total permanent woodland loss of 14.3 acres. The clearing would result from widening the existing I-39/90/94 corridor. Most clearing would occur in the woods near the Wisconsin River. Off-ROW access routes would require an additional 0.06 acres of wooded wetland clearing.

Segment G has one pine plantation or forest along the proposed ROW. Removing pine trees creates the possibility of introducing annosum root rot.

Segment F
A total of 56.2 acres of upland woods and 7.0 acres of wooded wetland would be cleared, for a total permanent loss of 63.2 acres of woodlands. Off-ROW access routes would require an additional 0.06 acres of wooded wetland clearing. Most of the clearing is needed for new ROW that bisects several large forest blocks. Additional clearing would occur along the edge of other wooded tracts.

Segment F has four pine plantations or forests along the ROW. Removing pine trees creates the possibility of introducing annosum root rot.

Subsegment F1 requires a new ROW corridor through a red pine plantation north of Heintz Road in the town of Dekorra. Subsegment F3 fragments a wooded corridor surrounding an unnamed stream in the town of Arlington and a large forest block on the Lodi-Arlington town line. Properties enrolled in the MFL program would likely be impacted at each of these three locations.

Segment E
A total of 10.5 acres of upland woods and 3.7 acres of wooded wetland would be cleared, for a total permanent forest loss of 14.2 acres. Most clearing would result from widening the existing I-39/90/94 corridor. Off-ROW access routes would require clearing an additional 0.8 acres of upland woods and less than 0.1 acres of wooded wetlands.

This segment bisects one small woodland in the southeast quadrant of the I-39/90/94 and CTH CS interchange.

Table 9.2-2 Summary of woodland loss on Segments G, E, and F

Segment Combinations	Upland Woods Cleared (acres)	Forested Wetland Cleared (acres)	Total Acres Cleared
G and E	18.8	9.7	28.5
G and F	64.5	13.0	77.5

9.2.4. Wetlands

Construction in wetlands could alter wetland hydrology, vegetative character, and function. More specifically, forested wetlands would be permanently lost and converted to shrub wetlands or sedge meadow and the likelihood of invasive species being introduced to the site would be greater. Furthermore, minimizing impacts is necessary and might be achieved by restricting construction to winter or periods of low flow, implementing requirements of Wis. Admin. Code ch. NR 40 for invasive species, and using matting or other low ground pressure equipment. After completing construction of the transmission line, the applicants would conduct site restoration and compensatory mitigation activities as required. General information about wetland resources and the potential short- and long-term potential impacts of constructing transmission line through and across wetlands can be found in Section 4.5.17.

Segments G, E, and F cross a number of wetlands. The applicants conducted field analyses of the wetlands crossed by proposed project routes only where the wetlands were accessible along existing electric transmission and public ROWs. Thus, Segments G and E were fully field surveyed, but on Segment F, approximately 87 percent of the segment length was not field surveyed. The applicants evaluated wetlands on private properties along Segment F using available desktop resources, such as the WWI, soil maps, and recent aerial photographs.

The applicants intend to compensate for permanent and conversion wetland impacts by using either existing mitigation banks, Wisconsin's In-Lieu Fee Program or, if no other option exists, permittee-responsible mitigation. As part of the permitting process, DNR and USACE would review any mitigation proposals for this project prior to the start of construction.

Segment G
Segment G shares ROW with the interstate. This segment crosses four wetlands and impacts a total of 9.8 acres; of which 6.0 acres are forested and 3.8 acres are non-forested. Three transmission structures would be constructed in wetlands of this segment. Many of the wetlands along Segment G are associated with the Wisconsin River floodplain and therefore, work should be completed during frozen or stable conditions with the use of matting to avoid disturbance to the wetlands. The wetlands along this segment are primarily composed of hardwood swamps and sedge meadows.

Segment E
Segment E shares ROW with the interstate. It crosses 25 wetlands impacting a total of 14 acres; of which 3.7 acres are forested and the remaining 10.5 are non-forested. A total of 14 structures would be placed in wetlands along this segment. Although the majority of these wetlands have at least some degree of disturbance, several, particularly along Rowan Creek (a Class II trout stream), are of high-quality and have been designated as ASNRI wetlands. Although some of the smaller wetlands along the interstate corridor contain invasive species, a high percentage of the wetlands in this area also support hardwood swamp.

Segment F
Segment F crosses ten wetlands impacting a totaling 17 acres of wetlands. This segment is almost entirely cross-country between the town of Dekorra and the North Madison Substation. There is a large, mostly forested, contiguous wetland complex crossed by the northern portion of the segment (Subsegment F1) and a few smaller isolated wetlands at the southern end. The large wetland complex is associated with Rowan Creek and is composed of a variety of wetland types including floodplain forest, wet meadow, and shrub-carr. The new ROW would require clearing wooded wetland for the full width of the ROW; five transmission structures would be constructed within the wetland complex. The remaining smaller wetlands at the southern end of the segment have a high degree of disturbance and are typified by wet meadow, riparian, and farmed wetland.

9.2.4.1. Summary of wetland impacts on Segments G-E and G-F

With the exception of the wetlands complexes adjacent to the Rowan Creek Fishery Area along Segment F, both combined Segments G-E and G-F are primarily composed of relatively small, highly-disturbed wetlands.

Combined Segments G and E are located next to the interstate and mostly cross disturbed roadside wetlands often dominated by invasive species.

Segments G-F would impact more forested wetland, including a large, unfragmented forested wetland near Poynette that is present on both sides of Rowan Creek. It is the only large, contiguous wooded wetland on these segments. If crossed, impacts would be significant due to its variety of habitats, and its size and location.

Table 9.2-3 Summary of wetland impacts on Segments G-E and G-F

Segment Combinations	Forested Wetland				Non-Forested Wetland			Total Wetland Impact (acres)	Significant/ High-quality Wetlands
	Existing Shared ROW Not Cleared* (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Forested Wetland Impact (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Non-Forested Wetland Impact (acres)		
G and E	0.9	0.9	8.7	9.6	4.2	10.1	14.3	23.9	7
G and F	0.6	0.6	12.3	12.9	1.2	12.8	14.0	26.9	4

* This column is a subset of the Existing Shared ROW.

9.2.5. Lakes, rivers, and streams

Some of the waterways crossed by the proposed project have significant scientific value, and are identified by DNR as Areas of Special Natural Resource Interest (ASNRI) for their protection under Wis. Admin. Code § NR 1.05. ASNRI designations are given to water bodies that meet one of a number of criteria representing high ecological value such as outstanding resource waters (ORW), exceptional resource waters (ERW), and trout streams (Class I, II, and III). See Figure Vol. 2-4.02 for a map depicting the region's waterways.

Some waterways crossed during construction would require a temporary clear span bridge (TCSB) or a bridge requiring support below the ordinary high water mark (OHWM). These waterways could be adversely affected by removal of stream bank vegetation, excavation, potential soil erosion and sedimentation, and temporary closure to users of the river. Impacts may be minimized by implementing requirements of Wis. Admin. Code ch. NR 40 for invasive species, completing site restoration and revegetation activities as required, as well as following BMPs and Erosion Control Plan specifications. General information about lakes, rivers, and streams, and the potential impacts to this resource from transmission line construction can be found in this EIS in Section 4.5.16.

The applicants identified navigable waterways intersected by the proposed routes based on a review of desktop information and DNR-supplied data, and aerial photographs; field observations were made along accessible routes. All of Segments G and E, have been accessed by a field technician, whereas the vast majority of Segment F crossed private properties and was inaccessible for field reviews. DNR has final jurisdictional authority over navigability determinations. Some non-navigable and intermittent streams may also be present along the routes. These resources would be identified during a pre-construction engineering survey if the proposed project is approved.

Segment G

The transmission line ROW on Segment G would intersect five waterways, of which three are the Wisconsin River or side channels of the Wisconsin River. The other two waterways crossed by Segment G are unnamed tributaries to the Wisconsin River. The Wisconsin River is designated as a PNW as sturgeon are present. This stretch of the river, along with the two associated side channels, have been designated as ASNRI waterways because this portion of the river contains state-listed endangered and threatened species. TCSBs are proposed to be placed across the two unnamed tributaries to the Wisconsin. Three miscellaneous structures, consisting of construction matting or bridges with in-stream supports, would be located below the OHWM of the Wisconsin River on this segment. The preferred method of crossing the Wisconsin River includes the use of a barge, and would require the construction of landing areas along the Wisconsin River. Because grading in excess of 10,000 square feet would be required for creation of the landing areas, approval under Wis. Stat. § 30.19 would be required. Following

BMPs and TCSB installation standards and using proper erosion control measures would assist in minimizing impacts to these waterways.

Segment E

Segment E crosses six waterways. Four of the waterways, all tributaries to Rowan Creek, would be crossed by a TSCB. Rowan Creek itself, an ASNRI (Class II trout stream), would be crossed during wire stringing. No other activities in waterways are proposed. No structures are proposed below the OHWM of any waterways along Segment E. Following BMPs and TCSB installation standards and using proper erosion control measures would assist in minimizing impacts to these waterways.

Segment F

Segment F intersects five waterways, three of which are proposed to be crossed by TCSBs. The waterways that would require the construction of TCSBs include two unnamed tributaries to Rowan Creek and an unnamed tributary to Spring Creek. The only listed waterways are Rowan Creek and the unnamed tributary to Spring Creek; both are ANSRIs (Class II trout streams). No structures are proposed below the OHWM of any waterways along Segment F. Following BMPs and TCSB installation standards and using proper erosion control measures would assist in minimizing impacts to these waterways.

9.2.5.1. Summary of waterway impacts of Combined Segments G-E and G-F

Table 9.3-3 shows that 11 waterways would be crossed by combined Segment G-E, whereas combined Segment G-F crosses 10 waterways. Segment G-E would require TCSBs to cross six of these waterways; however, none of these streams are designated as an ASNRI. On combined Segment G-F, five TCSBs are proposed; several of these are over ASNRIs associated with Rowan Creek and Spring Creek, both designated as Class II trout streams. On Segment G, three miscellaneous structures, consisting of construction matting, are proposed below the OHWM of the Wisconsin River. These structures would be placed to facilitate access to islands in the Wisconsin River. In addition, there would be three locations along Segment G that would require an area of grading over 10,000 square feet.

Table 9.2-4 Summary of waterway impacts for Segments G-E and G-F

Segment Combinations	Waterway Crossings	ASNRI Waterway Crossings	TCSBs required	TCSBs over ASNRIs
G and E	11	4	6	0
G and F	10	5	5	1

9.2.6. Rare species and natural communities

This section discusses the potential impacts to endangered resources that might be affected by construction or operation of the proposed project along Segments G, E, and F. A general discussion of rare species is presented earlier in this EIS in Chapter 4, Section 4.5.

Endangered resources include rare or declining species, high quality or rare natural communities, and unique or significant natural features. Endangered resources are tracked via the state's NHI database which is maintained by the DNR Bureau of Natural Heritage Conservation. The project area evaluation consists of both the specific route and a buffer of 1.0 mile for terrestrial and wetland species and a 2.0-mile buffer for aquatic species.

The combined presence of natural habitat and man-made disturbances must be taken into consideration to evaluate whether there is a likelihood that rare species are present and the potential for negative impacts on those species. For the purposes of this document, rare species are defined as federal- or state-listed threatened and endangered species, federal candidate and proposed species, and state special concern species. These species are not common which means they are low in numbers or restricted to small geographical areas, *i.e.*, difficult to find. Therefore, while the existing sources of information are important for estimating impacts to rare species, they are incomplete. Additional rare species beyond those identified may actually be present in potentially impacted areas.

Also, the Wisconsin NHI database only has information on rare species for areas that have been previously surveyed for that species or group during the appropriate season and the observation recorded. Not all areas of the state have been surveyed, especially most privately-owned lands. Therefore, potential endangered resource impacts along segments dominated by private properties may be incomplete.

For specific route segments, an incidental take of state threatened or endangered animal species may occur as defined by Wis. Stat. § 29.604. Further consultation under DNR's incidental take process may be needed and an incidental take permit may be required for construction to proceed on those segments. Instances where existing information indicates that additional assessment or consultation for incidental take would be needed are described in this EIS.

This section identifies the endangered resources that could be present, the project's potential impacts on these resources, and the mitigation measures that should be implemented. Rare species are discussed as taxa groups or individually if there is a high level of concern. This list and information are taken from existing sources within DNR, such as the NHI database, as well as some external sources, including landowners and surveys completed by the applicants.

9.2.6.1. Birds

Almost all bird species are protected by the MBTA. Under the MBTA, it is unlawful to take, capture, kill, or possess migratory birds, their nests, eggs, and young. This may apply to birds nesting in or adjacent to the ROW if construction disturbance results in nest abandonment. Avoiding impacts to nesting birds can be achieved if construction activities are scheduled in habitat areas outside the breeding and nesting season, from approximately March through August.

Segments E and F cross the southern portion of the Northern Empire Prairie IBA (see Figure Vol. 2-6). This IBA consists primarily of diverse wetland complexes made up of sedge meadows, shrub-carr, shallow and deep-water marshes, and wet prairie habitat. It is also home to upland communities such as oak savanna, oak forest, and native prairie remnants. This area is heavily used by resident and migratory waterbirds, as well as short-eared owls in winter. However, in this area, these segments mostly cross agricultural fields and it is unlikely that the proposed transmission line would have a significant effect on the IBA.

In 2013, the applicants conducted bald eagle nest inventory and monitoring surveys, as well as red-shouldered hawk broadcast call surveys.

No bald eagle nests were reported to be within 0.75 mile of Segments G, E, or F. One active nest was recorded along the Wisconsin River at a distance of more than 2.0 miles from any segment. The general public reported two potential bald eagle nests along Segment E. Because suitable habitat for bald eagles, such as large trees in isolated areas in proximity to large areas of surface water is present along Segments G, E, and F, surveys should be re-conducted prior to the start of construction to verify where eagles have started nesting in proximity to the chosen route. Per USFWS guidelines, it is a requirement to maintain a buffer of at least 660 feet between project activities and an active bald eagle nest. Work may be performed closer to the nest outside of the nesting season (August through mid-January). If these guidelines cannot be followed, USFWS must be consulted for further assistance, prior to the start of construction.

One red-shouldered hawk nest was observed within 0.25 mile of Subsegment G2. This species prefers larger stands of medium-aged to mature lowland deciduous forests, dry-mesic, and mesic forest with small wetland pockets. Avoidance can generally be attained by scheduling construction activities outside of the breeding season (March 15 through July 31 in southern Wisconsin). Because the exact location of this nest location is known, the occupied nest tree area (NTA) should be assumed to be a circular area approximately 37 acres in size. Activities such as cutting trees within the NTA can cause the adults to leave the nest. If work cannot be scheduled outside the breeding season or outside of the NTA, an incidental take permit would be required.

9.2.6.2. Herptiles – amphibians and reptiles

No amphibians were document in the NHI database on Segments G, E, or F.

Segment G

One state threatened turtle and two state special concern turtles have been documented in the vicinity of Segment G. Furthermore, there is suitable habitat for rare turtles in and adjacent to the Wisconsin River which is crossed by the proposed project.

The state threatened wood turtle prefers clean rivers and streams with moderate to fast flows and adjacent riparian wetlands and upland deciduous forests. This species overwinters in rivers and streams, typically in shallower areas near the banks. There is a potential for three transmission structures to be constructed within the Wisconsin River, which is a suitable waterway for this species. Also, because construction activities would occur within 300 feet of the Wisconsin River in areas with suitable wetland and upland habitat, avoidance measures for this species must be implemented. Avoidance measures may include working in uplands or wetlands during the species' inactive season (November 1 through March 14) and/or fencing areas of suitable habitat outside of the active period. If these measures cannot be implemented, an Incidental Take Permit may be necessary.

The Blanding's turtle, one of the special concern turtles, utilizes a wide variety of aquatic and wetland habitats along with their associated uplands. Segment G crosses four wetlands, three of which may have transmission structures constructed in them. The Wisconsin River would also be crossed, with three structures constructed below the OHWM. Where suitable habitat would be impacted, voluntary avoidance/minimization measures would include: avoiding any construction activities occurring in occupied habitat areas during specific times of the year, installing exclusion fencing separating construction areas from areas of suitable habitat before the species becomes active and could potentially travel into the active construction area, and/or scheduling construction activities outside of hibernation areas during winter. When access to private lands or wet conditions precludes timely and effective installation of exclusion fencing, monitoring and removal can be effective if the ground surface is visible and the space to be cleared is relatively small.

The other special concern turtle is the smooth softshell turtle which is exclusively a large river species and has a preference for clean water and sandy substrates. This species is active from April through September and overwinters by burrowing in sandy substrate in flowing water where freezing can be avoided. This species breeds in spring or fall and nests from early June to early July. Nesting often occurs close to the riverbank but individuals will move up to 100 meters from water on large exposed sandy areas to lay eggs. In areas along the Wisconsin River where suitable habitat would be impacted, presence/absence surveys should be conducted and voluntary avoidance/minimization measures implemented.

Segment E

One endangered, one threatened, and two special concern turtle species may occur within the vicinity of Segment E. Also, the state endangered slender glass lizard and the special concern timber rattlesnake may be present in the vicinity of this segment.

This segment crosses the Rowan Creek (an ASNRI waterway), five other waterways, and 25 wetlands where species habitat may be impacted.

The state endangered ornate box turtle prefers sandy soils, dry prairies, and oak savanna habitats. These kinds of habitats do not appear to be present along Segment E.

The state threatened turtle is the wood turtle which prefers clean rivers and streams with moderate to fast flows and adjacent riparian wetlands and upland deciduous forests. This turtle was observed in a wetland near Rowan Creek. In areas of suitable habitat along Segment E, steps must be taken to avoid impacts on this species. The discussion above for Segment G provides habitat preferences and avoidance/minimization measures for this species.

The special concern Blanding's turtle is known to be present in the nearby Rowan Creek and Hinkson Creek Fishery Areas. Where suitable habitat would be impacted, voluntary measures for minimization should be taken. The discussion above for Segment G provides habitat preferences and avoidance/minimization measures for this species.

The other special concern turtle species is the smooth softshell which is exclusively a large river species and has a preference for clean water and sandy substrates. These kinds of habitat are not present on Segment E.

The timber rattlesnake is a special concern species and a Protected Wild Animal with declining populations in the state. The snake is legally protected from intentional killing; however, it is not protected from take that occurs as a result of normal project activities. It prefers deciduous forests and woodland edges in an agricultural setting during the summer. Gravid females and juvenile timbers prefer to remain in open-canopy bluff prairies during the summer where additional structures like brush, trees, or rock shelves provide shade. This species may occur along portions of Subsegment E1 where the route passes through deciduous forest and woodland edges adjacent to agricultural land. Impacts to the species can be minimized by performing construction activities between October 16 and April 15, avoiding the active season for the timber rattlesnake. If construction activities cannot be conducted outside of the species' active season, exclusion fencing installed prior to April 15 is an option.

The state endangered slender glass lizard prefers sandy oak savannas, sand prairies, old fields with sandy soils, and woodland edges around and within all of these habitats. These habitats appear to be present throughout Segment E. Typically presence/absence surveys would be required before proceeding with minimization/avoidance measures; however, no survey method is considered 100 percent effective for determining presence or absence for this species. Therefore, habitat surveys would be required if Segment E were chosen and if suitable habitat is present, an Incidental Take Permit would be required.

Segment F

The NHI database documents the observation of six reptile species along and near Segment F. There is one endangered turtle, one threatened turtle, and one endangered lizard. Two turtles and one snake are special concern species. These same species are documented as occurring along Segment E.

The state endangered turtle is the ornate box turtle, a terrestrial species. The threatened wood turtle and the two special concern turtles (Blanding's and smooth softshell) depend on waterways and could be present in the five waterways crossed by Segment F.

The state endangered slender glass lizard prefers sandy oak savannas, sand prairies, old fields with sandy soils, and woodland edges around and within all of these habitats. These kinds of habitats appear to be present along Segment F. Survey and guidance for this species is provided above in the discussion of Segment E.

The timber rattlesnake is a special concern species and may occur along portions of Segment F that crosses through deciduous forest and woodland edges adjacent to agricultural land. Impacts on this species can be minimized by performing construction activities between October 16 and April 15, avoiding the active season for the timber rattlesnake. If construction activities cannot be conducted outside of the species' active season, exclusion fencing installed prior to April 15 is an option.

9.2.6.3. Terrestrial invertebrates

The tiger beetle, a state special concern species, has been documented near Segments G, E, and F. This species is found on sandbars in larger rivers. It does not appear that any sandbars would be impacted by structure placement within the Wisconsin River on Segment G. Sandbar habitat is not present on Segments E or F. Impacts on this species in these locations are not anticipated.

9.2.6.4. Aquatic invertebrates

Segment G

Three mussels are known to occur along Segment G within the Wisconsin River. Two of the mussels are listed as state threatened and one is state endangered as well as federally protected. All of these species prefer fast-flowing large rivers. If the project were approved, three structures would be constructed below the OHWM in the Wisconsin River. Protection of the species requires presence/absence surveys to be completed at the location where construction activities would occur, as well as where barge anchors may be placed. If present, translocations of the species would be required to be conducted just before start of work so that the mussels don't move back into the area of potential impact. DNR, as well as USFWS, must approve all survey work plans for the federally protected mussel.

One state endangered and one special concern mayfly are known to occur within the Wisconsin River. The state endangered mayfly prefers large, fast-flowing rivers where nymphs live among wood or other solid substrates over sand in deep water. The state special concern mayfly has been found in large, deep, warm streams where there is strong current and fine sands. Surveys for these species may not be effective because there is a very narrow window of time during hatching when the surveys would be effective. Even though there would be a transmission structure constructed in the Wisconsin River where these species may be present, the impact would likely be very small.

Segment E

One special concern mayfly was recorded in the NHI database for this segment. This species prefers large, deep, warm streams where there is a strong current and fine sand. Habitat for this mayfly does not exist along Segment E.

Segment F

The same special concern mayfly that was identified in the NHI database along Segment E has also been recorded near Segment F. Habitat for this mayfly does not exist along Segment F.

9.2.6.5. Fish

Segment G
Two state threatened and six special concern fish species have been documented within the Wisconsin River crossed by Segment G. Since construction activities would occur below the OHWM, avoidance measures for the two state-listed fish may include avoiding impacts during the spawning period, late April through June, and sporadically in August. If time of year restrictions can't be implemented, then a presence/absence survey would be required. Also, the applicants should implement strict erosion control practices to prevent sediment or contaminants from reaching the waterway.

Segment E
Two state threatened and five special concern fish species have been documented as occurring within 2.0 miles of this segment. All the species are associated with the Wisconsin River and similar large river habitat. This segment does not cross the any large river habitat. It does cross Rowan Creek, a cold-water Class II trout stream which is in an ASNRI-designated waterway. Other fish species are likely to be present in Rowan Creek and strict erosion control practices should be implemented.

Segment F
Three state threatened and six special concern fish species have been documented as occurring within 2.0 miles of this segment. All of these species prefer strong currents in large rivers. None of the waterways crossed by Segment F are large rivers with strong currents.

This segment also crosses an unnamed tributary to Spring Creek and multiple tributaries to Rowan Creek. The applicants should implement strict erosion control practices to protect water quality for other rare species which may be present in these waterways.

9.2.6.6. Plants

Impacts on natural communities can ultimately change habitat conditions and make it difficult for rare plants to persist. Wisconsin's Endangered Species Law protects only state-listed endangered and threatened plant species on public lands, but utility, agriculture, forestry, and bulk sampling projects are exempted from this protection. Additional surveys and avoidance/minimization measures for rare plant species are encouraged and recommended. Potential avoidance measures may include conducting plant surveys to determine presence/absence and/or avoiding areas where known plants occur. Other measures, such as winter construction, use of mats to limit direct disturbance, or relocation can minimize losses. DNR also recommends that applicants and landowners with rare species on their property develop a plan to protect these species.

Segment G
One state endangered, one state threatened, and eight special concern plants may occur in the vicinity of Segment G. These species could occur within the floodplain forest, emergent marsh, or dry forest natural communities. It is recommended that presence/absence surveys be completed prior to beginning construction activities to confirm the presence or absence of these species.

Segment E
One state threatened and four special concern plants occur in the vicinity of Segment E. These species depend on prairies, coniferous-hardwood forests, cliffs, bluffs, and margins of ponds and marshes. No suitable habitat for these species is present along this segment.

Segment F
One state threatened and four special concern plants occur within the vicinity of Segment F. These species depend on sand prairies, mixed coniferous-hardwood forests, shaded cliffs in hardwood forests, gravelly hillsides, and drying muddy flats.

One of the special concern species, the Hooker's orchid, is found in a variety of dry to moist, mostly mixed coniferous-hardwood forest habitats. This habitat is found in several locations along Segment F. There is mixed deciduous/coniferous forest in several locations, including just south of STH 60, near McGowan Road and around Thunder Hills Road. Coniferous forest is also found just south of CTH K.

9.2.6.7. Natural communities

Most occurrences of high-quality natural communities documented in the NHI database are from surveys conducted on public lands. In areas where there is a predominance of private lands, more diverse, high quality, or rare natural community occurrences likely exist, but remain undocumented and underrepresented in the NHI database. Below is a discussion of those natural communities identified in the NHI database. Natural communities may contain rare or declining species and their protection should be incorporated into the project design as much as possible. Minimizing impacts to and/or incorporating buffers along the edges of these natural communities is recommended.

Segment G
Segment G crosses no natural communities documented in the NHI database, although, there are two upland, four wetland, one waterbody, and two stream natural communities located near Segment G. This crosses the Wisconsin River and four wetlands; transmission structures would be constructed within three of the wetlands. Thus, habitat and rare plant surveys should be conducted in areas of high quality habitat that would be impacted by construction of this project.

Segment E
Segment E crosses no natural communities documented in the NHI database, although two natural communities, one associated with a wetland and one with a stream, are near Segment E. This segment crosses 25 wetlands and six waterways, including Rowan Creek. Construction impacts should be minimized in these areas for the protection of potential rare species.

Segment F
No natural communities have been documented along Segment F.

9.2.6.8. Summary of endangered resource impacts for Common Segments G and Segment E or F

Tables 9.2-5, 9.2-6, and 9.2-7 identify the general types and numbers of rare species, natural communities, and other features that were identified as potentially present along Segments G, E, and F based on information primarily from the NHI database and other sources.

Table 9.2-5 Summary of endangered resources along Segment G

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidate	Not Applicable
Reptiles	1	2			
Terrestrial Invertebrates		1			
Aquatic Invertebrates	4	1	1		
Fish	2	6			
Plants	2	8			
Natural Communities					9
Summary	9	18	1	0	9

State Required Actions – 7
State Recommended Actions – 29
Federal Required Actions – 1
Federal Recommended Actions – 0

Table 9.2-6 Summary of endangered resources along Segment E

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidate	Not Applicable
Reptiles	3	3			
Terrestrial Invertebrates		1			
Aquatic Invertebrates	1	1			
Fish	2	5			
Plants	1	4			
Natural Communities					2
Summary	7	14	0	0	2

State Required Actions – 6
State Recommended Actions – 17
Federal Required Actions – 0
Federal Recommended Actions – 0

Table 9.2-7 Summary of endangered resources along Segment F

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidate	Not Applicable
Reptiles	3	3			
Terrestrial Invertebrates		1			
Aquatic Invertebrates	1	1			
Fish	3	6			
Plants	1	4			
Natural Communities					
Summary	8	15	0	0	0

State Required Actions – 7
State Recommended Actions – 16
Federal Required Actions – 0
Federal Recommended Actions – 0

9.2.7. Archaeological and historic resources

No intact above-ground historic structures listed with WHS were identified by the applicants for Segments G, F, or E.

Segment G
Three archeological sites listed with the WHS could be affected by construction in the ROW of Segment G. All three are prehistoric sites of unknown cultural affiliation. Site C0-0193 (Harvey I) contains projectile points and shell fragments.

Table 9.2-8 lists the names of the sites occurring on Segment G along with additional information from the WHS inventory of recorded sites. The listing of a site with WHS is an indication that the site is considered eligible for the NRHP.

Table 9.2-8 Reported Archeological Sites along Segment G

Site # (Site Name)	Artifacts/Materials Present	Recommended WHS Action
CO-0193 (Harvey I)	Prehistoric site of unknown cultural affiliation, contains projectile points and shell fragments	Archaeological survey
CO-0195 (Radewan Site)	Prehistoric site of unknown cultural affiliation	Archaeological survey
CO-0196 (Young Site)	Prehistoric site of unknown cultural affiliation	Archaeological survey

Segment G is common to all proposed routes for the Badger –Coulee Project. If the proposed project is approved, WHS recommends field surveys by a qualified archeologist where a WHS-mapped site coincides with the proposed ROW. The survey would assess potential effects on the sites and would be intended to ensure the Commission's compliance with the state historic preservation law.

Segment F
One archeological site, a Woodland Tradition Campsite/Village, could be affected by construction in the ROW of Segment F.

Table 9.2-9 describes the site along with additional information from the WHS inventory of recorded sites. The listing of a site with WHS is an indication that the site is considered eligible for the NRHP.

Table 9.2-9 Reported archeological sites along Segment F

Site # (Site Name)	Artifacts/Materials Present	Recommended WHS Action
CO-0017 (Basin Lake Village)	Woodland tradition campsite or village, contains hearthstones, lithic debitage, groundstone tools, and cordmarked ceramics	Archaeological survey

If Segment F is part of an approved route for the project, WHS recommends field survey by a qualified archeologist where a WHS-mapped site coincides with the proposed ROW. The survey would assess potential effects on the sites and would be intended to ensure the Commission's compliance with the state historic preservation law. Village sites have the potential for associated burials. Under Wis. Stat. § 157.70, the applicants must apply directly to WHS for authorization before any ground disturbance at a burial site may begin, including an archeological survey.

Segment E
Four archeological sites listed with WHS could be affected by construction in the ROW of Segment E. One site is an Archaic tradition campsite/village, one is a prehistoric lithic workshop which contains lithic debitage, one is a multi-component prehistoric and historic site containing lithic scatter, and the final site is a prehistoric site of unknown cultural affiliation containing chert projectile points and a copper spear point.

Table 9.2-10 lists the names of the sites occurring on Segment E along with additional information from the WHS inventory of reported sites. The listing of a site with WHS is an indication that the site is considered eligible for the NRHP.

Table 9.2-10 Reported archeological sites along Segment E

Site # (Site Name)	Artifacts/Materials Present	Recommended WHS Action
CO-0197 (Delfosee Village)	Archaic tradition campsite or village	Archaeological survey
CO-0199 (Bilkie II)	Prehistoric lithic workshop containing lithic debitage	Archaeological survey
CO-0200 (Sloggy)	Multi-component prehistoric and historic site containing lithic scatter	Archaeological survey
CO-0202 (Richards Site)	Prehistoric site of unknown cultural affiliation containing chert projectile points and a copper spear point	Archaeological survey

If Segment E is part of an approved route for the project, WHS recommends field survey by a qualified archeologist where a WHS-mapped site coincides with the ROW. The survey would assess potential effects on the sites and would be intended to ensure the Commission's compliance with the state historic preservation law. Village sites have the potential for associated burials. Under Wis. Stat. § 157.70, the applicants must apply directly to WHS for authorization before any ground disturbance at the site may begin, including an archeological survey.

9.3. COMMUNITY RESOURCES

9.3.1. Land use

In general, residential uses are considered to be more sensitive to impacts from electric transmission lines than commercial or industrial land uses, primarily because of potential adverse aesthetic effects. Greater potential for conflict with land use plans exists in areas of urban development, where existing and planned residential and commercial uses are more common. The potential for conflict is also present in areas undergoing land use change, such as where rural land is being converted to residential use. Corridor-sharing with different types of infrastructure (for example, transmission lines and multi-lane highways) can mitigate impacts by causing incremental impacts instead of the entirely new impacts associated with a new ROW corridor. Not all corridors that can be shared with a transmission line serve to lessen potential impacts, though. Places with narrow, canopy-covered, local roads, winding rural roads, and areas crowded with small lots may experience greater impacts from a new high-voltage transmission line.

Most areas along these segment are rural in nature and are currently in agricultural or other undeveloped uses, such as forestry. These uses are expected to continue into the future. In general, an electric transmission line is usually compatible with these land uses. The lands crossed by the routes in this area vary to some extent between the area near the Wisconsin River and the area closer to the North Madison Substation. Along the southern half of Segments E and F land use is predominantly agricultural with scattered residences and farmsteads. The area surrounding the northern half of these segments, as well as Segment G, supports much more woodland with fewer and small agricultural fields. Most land in the towns of Caledonia, Dekorra, Lodi, Arlington, and Vienna is located in agricultural preservation districts, where continued agricultural use is designated in the towns' land use plans.

Segment G

Segment G starts at the I-90/94 and I-39 interchange and follows the east side of the freeway south. The town of Caledonia's land use plan designates the southeast quadrant of the interchange for future commercial development. Farther south, this segment passes through a residential development (on St. Lawrence Bluff Road) located along the south bank of the Wisconsin River in the town of Dekorra. The segment ends near two I-39/90/94 Rest Areas located on both sides of the freeway.

Segment G partially shares existing WisDOT ROW for its entire length.

Segment F

Segment F proceeds south, cross-country, on new ROW, crossing an approximately 0.75-mile wide environmental corridor surrounding Rowan Creek. Farther south, where this segment follows the boundary between the towns of Lodi and Arlington, it is primarily located on lands designated as environmental corridors; much of this area is heavily wooded. The proposed transmission line ROW is close to several homes on wooded lots near McGowan and Richards Road in this area.

Combined, about 33 percent Segments G and F share existing ROW corridors. Corridor sharing with a multi-lane freeway on Segment G mitigates the project's impact to some extent in that area; however, little or no corridor sharing occurs on Segment F. Considering the current and future land uses along the route, residential properties would likely be impacted by the aesthetics of the new line. Clearing new ROW through some of the heavily wooded tracts between McGowan and Richards Roads could adversely impact the quality of the areas designated as environmental corridors.

Segment E

Segment E follows the eastern side of the freeway south; switching briefly to the west to avoid an existing commercial strip. The town of Dekorra's development plan map shows future commercial development in all quadrants of the I-39/90/94 and CTH CS interchange. Farther south, in the town of Arlington, this segment enters a commercial development zone along I-39/90/94 at STH 60. An existing residential subdivision is located across the freeway, in the southwest quadrant of the interchange. The town's plan shows future commercial development in the southeast quadrant, in addition to the existing development in the other quadrants.

Between I-39/90/94 and the North Madison Substation the new line would closely parallel, on new ROW, an existing ATC double-circuit 345 kV line across 2.3 miles of agricultural fields. Although the line would follow an existing corridor, the new poles would create additional obstacles for farm equipment operation and result in a combined transmission line easement nearly 300 feet in width.

All of Segments G and E share existing ROW corridors. Corridor sharing with a multi-lane freeway and an existing double-circuit 345 kV transmission line ROW mitigates the project's impacts to some extent. Considering the current and future land uses along the route, residential properties are the most likely to be impacted by the aesthetics of the new line.

9.3.2. Proximity to residences and potentially sensitive populations

This section discusses the proposed project's proximity to homes, schools, daycares, hospitals, and other places where people frequently gather. Information for this section came from the tables submitted as part of the project application that categorize the number of residences within specified distances of the proposed centerline of the new 345 kV line and the estimated magnetic fields associated with the different proposed transmission line configurations. Additionally, Commission staff reviewed comments submitted by the public and conducted numerous site visits along the routes.

The proximity of properties to a high-voltage transmission line is important because of real and perceived concerns about local aesthetics, changes to valued viewsheds, personal enjoyment and use of one's property, potential impacts to property values, and personal and public safety.

Commission staff recognizes that individuals and families have substantial financial, physical and emotional investments in their homes and properties and that the generalized discussions in this document will most likely not adequately address all the issues felt by many individuals owning property along the proposed routes.

A generalized discussion of some of these issues is contained in Chapter 4 including: aesthetics (Section 4.5.1); magnetic fields (Section 4.5.6); noise and corona effects (Section 4.5.10); property values (Section 4.5.11); safety (Section 4.5.14); and stray voltage (Section 4.5.15). Appendix B contains a slightly more in-depth review of the health issues associated with the electric and magnetic fields generated by transmission lines. Additionally, the topic of aesthetics is discussed in the following section (Section 9.4.3) for several specific areas or properties along the proposed route that are recognized regionally or state-wide for their natural beauty.

Finally, the personal sense of loss and unfairness related to burdening individuals and specific communities with the long-term presence of this high-voltage transmission line cannot be adequately addressed in this document, but a discussion of some special concerns that have been raised follows in the sections below.

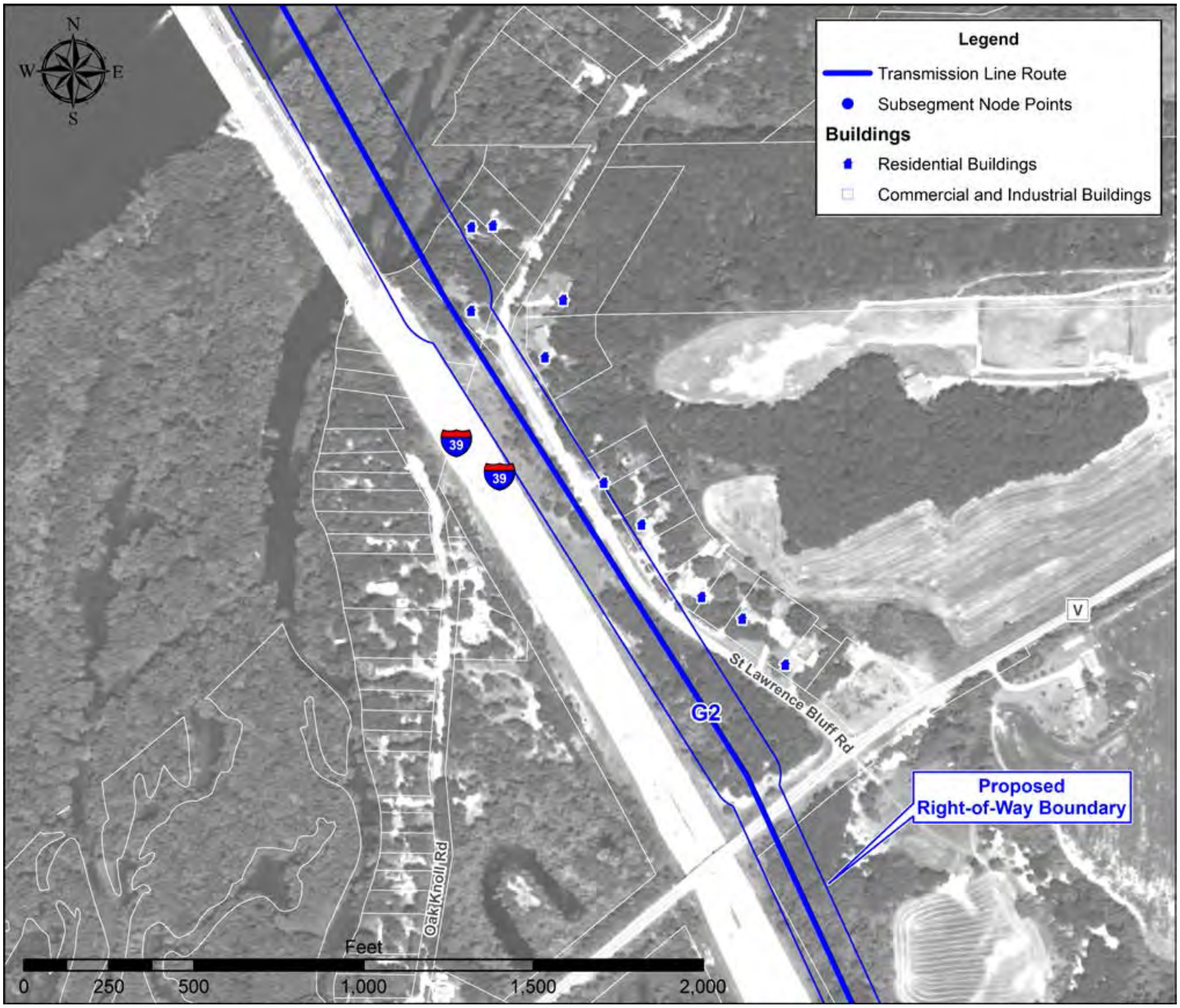
9.3.2.1. Residential impacts

Segment G

On Segment G, a segment with no alternatives, ten well-kept residences within 300 feet of the proposed centerline are concentrated on St. Lawrence Bluff Road directly south of the Wisconsin River and east of the I-94 corridor on Subsegment G2 (see Figure 9.3-1). Two homes are less than 100 feet from the proposed centerline, with one home located entirely within the ROW (and likely within the wire zone) and another partially within the ROW. Most of these homes are on heavily wooded lots that, at least partially, screen traffic views and noise from the interstate roadway. The applicants have proposed a wider, 275-foot ROW for the actual crossing of the Wisconsin River at this location to accommodate the massive H-frame structures needed to provide maximum span lengths and road clearance.[159] A slightly narrower, permanent ROW width of 200 feet is planned from the top of St. Lawrence Bluff Road near the river south to CTH V. The resulting impacts of this wider ROW would be substantial on all ten of these properties, as most if not all of the existing trees would be removed between these residences and the interstate (I-39/90/94) corridor, leaving them totally exposed to the traffic and noise, as well as the new 345 kV transmission line.

[159] The proposed H-frame structures could be as tall as 180 feet with two steel poles approximately 27 feet apart on center.

Figure 9.3-1 Impacts on residences and wooded buffers on St. Lawrence Bluff Road



Segment E

South of CTH CS along Subsegment E1, several residences located along Smoky Hollow Road are proximal to the proposed transmission line; one home would be located at the edge of the proposed ROW approximately 60 feet from the centerline. The entire wooded buffer between these homes and the interstate corridor would be removed.

Segment F

The northern portion of Segment F (Subsegments F1, F2, and F3 south to STH 60) would require new cross-country ROW through a substantial amount of woods and wetlands. The residences located within 300 feet of the proposed centerline are mostly isolated from one another and currently quite secluded. The new transmission line and its cleared ROW would change the landscape and aesthetics significantly in this part of the project area.

Comments and photos were received from a landowner who has built a home on Subsegment F2 within the past two years that is not shown on the aerial photos provided in the application. After crossing

McGowan Road, Subsegment F2 is routed south along a narrow, one-lane asphalt drive leading into several heavily-wooded and secluded properties supporting homes. The new residence is approximately100 feet from the proposed centerline and many of the mature trees in the yard bordering the narrow road (recently named Thunder Hills Road) would be removed (see Figure 9.3-2). After proceeding past this house, Subsegment F2 leaves the winding private road and travels cross-country up and over a wooded hill within 300 feet of another secluded home.

Figure 9.3-2 Impacts on residences in a heavily wooded area of Subsegment F2

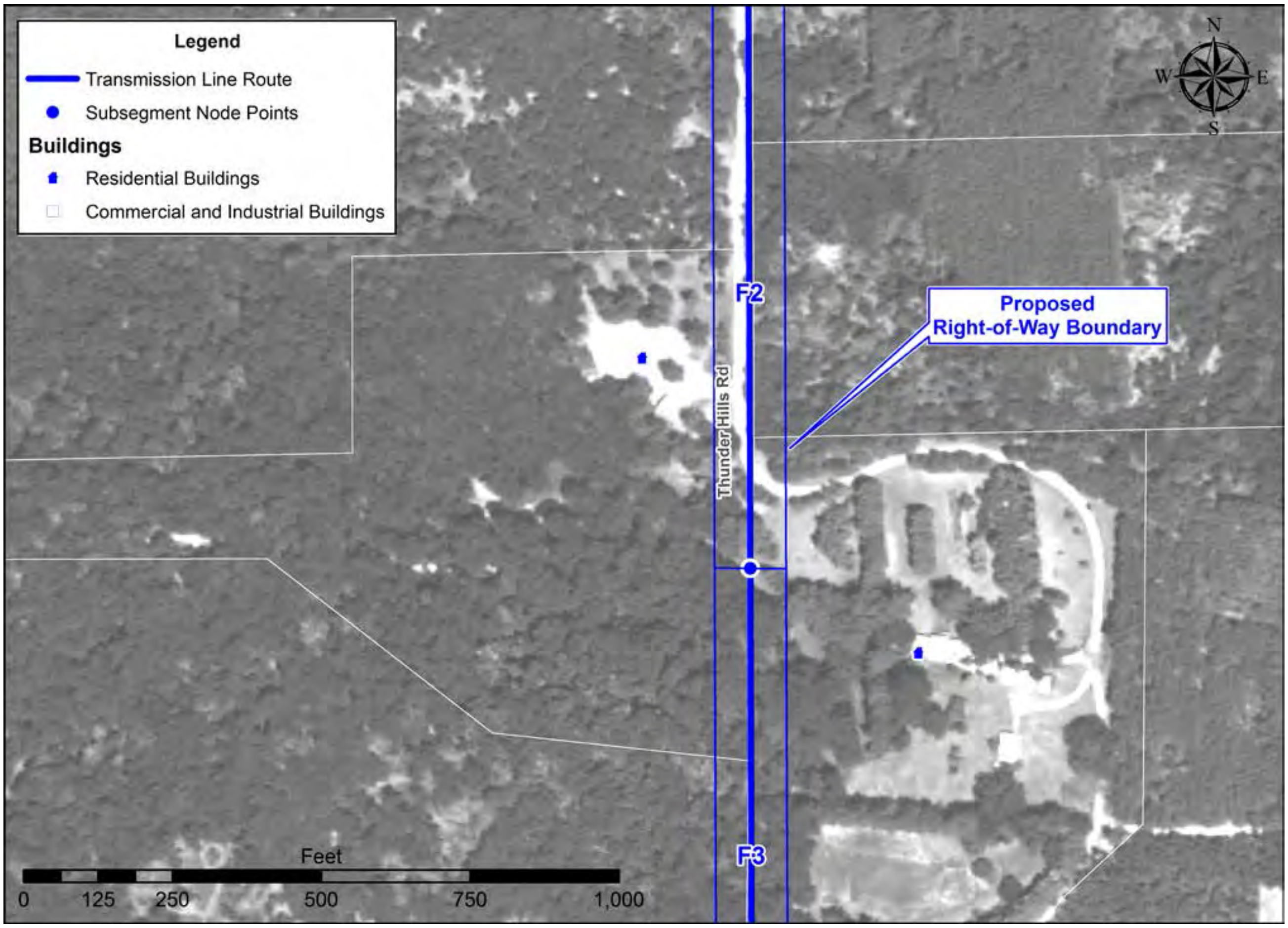


Table 9.3-1 Number of homes within 300 feet of the proposed centerline

Segment Combinations	Distance to Proposed Centerline				
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	Total
G and E	1	2	4	10	17
G and F	1	4	4	11	20

No churches, schools, hospitals or known daycare facilities are located within 300 feet of the proposed centerline on either Segment G, E, or F.

9.3.2.2. MAGNETIC FIELDS

Some background information and a general discussion of EMF is found in Section 4.5.6 of Chapter 4 and in Appendix B of this EIS. Due to questions and concerns from the public, the Commission requires applicants for transmission line projects to provide magnetic field data for locations where there are existing transmission lines along the project routes and the estimated magnetic field levels at varying distances from the centerline of the proposed project, for both normal load and peak load conditions, at one and ten years after the new line is placed in operation.[160] Below are brief summaries of the estimated magnetic field levels for the proposed 345 kV transmission line on Segments G, E, and F. More detailed information can be found in Appendix G of the Badger-Coulee application.[161]

The estimated magnetic field levels for Subsegment G2 are higher than on other route segment due to the line design/configuration proposed for the approaches and crossing of the Wisconsin River. On this subsegment, the 345 kV line would be on two-pole H-frame structures capable of supporting the high voltage conductors over longer span lengths. The anticipated magnetic field levels at 25 feet from the centerline would range from 54 to 67.6 mG under normal load and peak load conditions, respectively. At 50 feet from the centerline, field levels would be 27.6 and 34.5 mG and at a distance of 200 feet from the proposed centerline, the estimated magnetic field levels are 1.8 and 2.3 mG.

On Subsegments G1 and G3, the expected magnetic field levels are slightly lower, ranging from 34.7 to 43.4 mG at 25 feet from the centerline, 17.7 to 22.2 mG at 50 feet and decreasing to 1.5 to 1.9 mG at a distance of 200 feet from the proposed centerline.

Along Segment E which is mostly new ROW adjacent to the interstate corridor, the estimated magnetic fields are very similar to those calculated for Subsegments G1 and G3.

For Segment F, they are also similar to those estimated for Segment G and range from 32.0 to 42.2 mG at 25 feet, 17.1 to 21.4 mG at 50 feet from the centerline, and decreasing to 1.6 to 2.0 mG at 200 feet from the proposed centerline.

9.3.3. Aesthetics and visual impacts

Aesthetics and visual impact are closely related and often used interchangeably. Aesthetics tends to encompass the sights, smells, sounds and perceptions one experiences from the surrounding environment; whereas visual impact is more directly related to views, sightlines and viewsheds. The following discussion of aesthetics is based on Commission staff's visits to the project area and the following underlying assumptions:

- Different viewers may have different levels of visual sensitivity.
- The physical setting can influence the degree of visual impact.
- Viewing conditions can influence the degree of visual impact.

In general, aesthetic and visual impacts are difficult to measure and tend to be perceived as greater in natural or scenic settings.

The portion of the project area encompassing Segments G, E, and F transitions from an environment supporting large areas of forest and wetland near the Wisconsin River to a landscape where agricultural land use is dominant in southern Columbia and northern Dane Counties. Segments G and E primarily follow the I-90/94/39 corridor, while Segment F follows a cross-country path with no nearby major road

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160 Peak load is defined as 100 percent of estimated peak, system normal configuration and normal load is defined as 80 percent of peak load. Values provided are for 2018, the anticipated initial year of operation.
161 PSC REF#: 191904 and 191905.

or utility corridors. These factors influence the potential aesthetic and visual impact of the proposed 345 kV transmission line.

Segment G

Subsegments G1 and G3 primarily cross an open agricultural landscape adjacent to the interstate with few, if any, residential properties. A small acreage of trees and some shrub/scrub wetland vegetation would likely be removed on Segment G3. The associated visual impacts of the proposed transmission line in these areas would be fairly negligible.

Segment G2 approaches and crosses the Wisconsin River. On the south side of the river, it is in very close proximity to a residential development tucked into a wooded environment on St. Lawrence Bluff Road. One residence appears to be completely within the proposed transmission line ROW and several others are partially within or directly adjacent to the ROW. Construction of the transmission line in this area would have a significant adverse aesthetic impact on at least 10 residential properties here, as all of the woody vegetation screening these homes from the interstate and the new high-voltage transmission line would be removed. The sights and sounds of the interstate traffic and the presence of the massive H-frame transmission structures (up to 180 feet tall) would completely alter the existing wooded setting of this neighborhood.

In addition, this portion of the Wisconsin River is popular with boaters and paddlers due to the number of islands and sandbars just below the I-39/90/94 bridge at this location. The large H-frame structures that would be used to span the river may be visible to river users and would add to the adverse visual impacts presented by the bridge itself and the traffic noise above.

Segment E

On Segment E, the new transmission line would follow the interstate for approximately 10.6 miles before turning west and paralleling an existing double-circuit 345/345 kV transmission line to the North Madison Substation. The aesthetic and visual impact of the proposed project along this segment would be relatively minor, except for several residences located along Smoky Hollow Road south of CTH CS and on Meek Road. A few of these homes are very close to the proposed centerline and would have a substantial number of trees and landscaping removed within the ROW, directly exposing them to the sights and noise of the interstate and the presence of the high-voltage line.

On the portion of Segment E where the new 345 kV line would parallel the existing double-circuit line, the surrounding landscape is agricultural fields with no nearby residences.

Segment F

The northern portion of Segment F contains more forested land and fewer and smaller agricultural fields. The topography is also quite hilly and the ridgetops often offer some outstanding views of the surrounding countryside. The new high-voltage transmission line and the wide cleared ROW would be a new visual intrusion in this rural wooded landscape, especially along Subsegments F1, F2, and the northern half of F3. In addition, several homes that were built in relatively secluded settings in this area would be in close proximity to the line, creating a major visual impact that would be experienced on a daily basis.

Farther south on Segment F, the 345 kV transmission line would cross primarily agricultural land on new cross-country ROW. Although few major roads and no existing utility infrastructure are present in this area, the visual impact of the line would not be as great because of the presence of many farm buildings and silos and fewer natural communities.

9.3.4. Public lands and recreation

This section primarily describes the recreational properties and resources that could be directly affected by the construction and presence of the proposed Badger-Coulee 345 kV transmission line between the town of Caledonia and the North Madison Substation. Areas such as IBAs or properties managed primarily for the purpose of providing fish or wildlife habitat, are discussed earlier in this chapter in Section 9.3.2 (Natural Resource Properties). Also, the overall effect of the proposed transmission line on aesthetics and tourism-related business is covered in Section 9.4.3 (Aesthetics and Visual Impacts) of this chapter.

Although the potential adverse impacts of this project on hunting and some passive recreational activities such as hiking, bird watching, and leisure enjoyment of natural resources are not discussed with respect to individual private properties in this EIS, Commission staff acknowledges the numerous comments that have been received from owners of rural, undeveloped properties supporting woods, meadows, waterways, and wetlands.

Segment G crosses the Wisconsin River at a popular location for boating and paddling on the river. There are multiple islands and sandbars in the river at this crossing location and it is possible that the area gets substantial use. The proposed transmission line would cross the river adjacent to the I-39 bridge on massive, steel H-frame structures and would be visible to those on the water and it is unlikely that the presence of the line would adversely affect boating use on the river.

South of the river, a state-owned property managed as wildlife habitat is present on the east side of the I-39 corridor. No impacts on this property would be anticipated.

No known recreational resources were identified along Segments E or F.

In summary, Segment G, which crosses the Wisconsin River, is common to both segments. No recreational resources other than this major river were identified in this portion of the project area.

9.3.5. Airports and airstrips

There are several small privately-owned airstrips near Segments E, F, and G, including the Sopha Field and Wanger-In Airports, the Delmonte and Bancroft airstrips, and Morrisonville International Airport. Lodi Lakeland Airport is a publicly-owned airport approximately 2.2 miles from Subsegment F3.

None of these airports or airstrips are close enough to the proposed transmission line or oriented such that the line would pose a potential problem for incoming or outgoing flights.

CHAPTER

10

10. Environmental Analysis: North Madison Substation to Town of Springfield (Segments C and D)

10.1. SEGMENT COMPARISONS

Segments C and D exit the North Madison Substation to the west along a common subsegment (Subsegment C0/D0). Both Segments C and D start in the town of Vienna and end in the town of Springfield, Dane County, just past Riles Road. They are of comparable length; Segment C is 15.3 miles and Segment D is 15.6 miles. Segment C is east of Segment D. Both contain sections of new ROW as well as corridor sharing to varying degrees. The transmission structures would range from 100 to 150 feet tall. Within both segments, the most prevalent land use is agricultural, with some small streams, associated wetlands and woodlands scattered throughout. Neither route passes directly through a town or city.

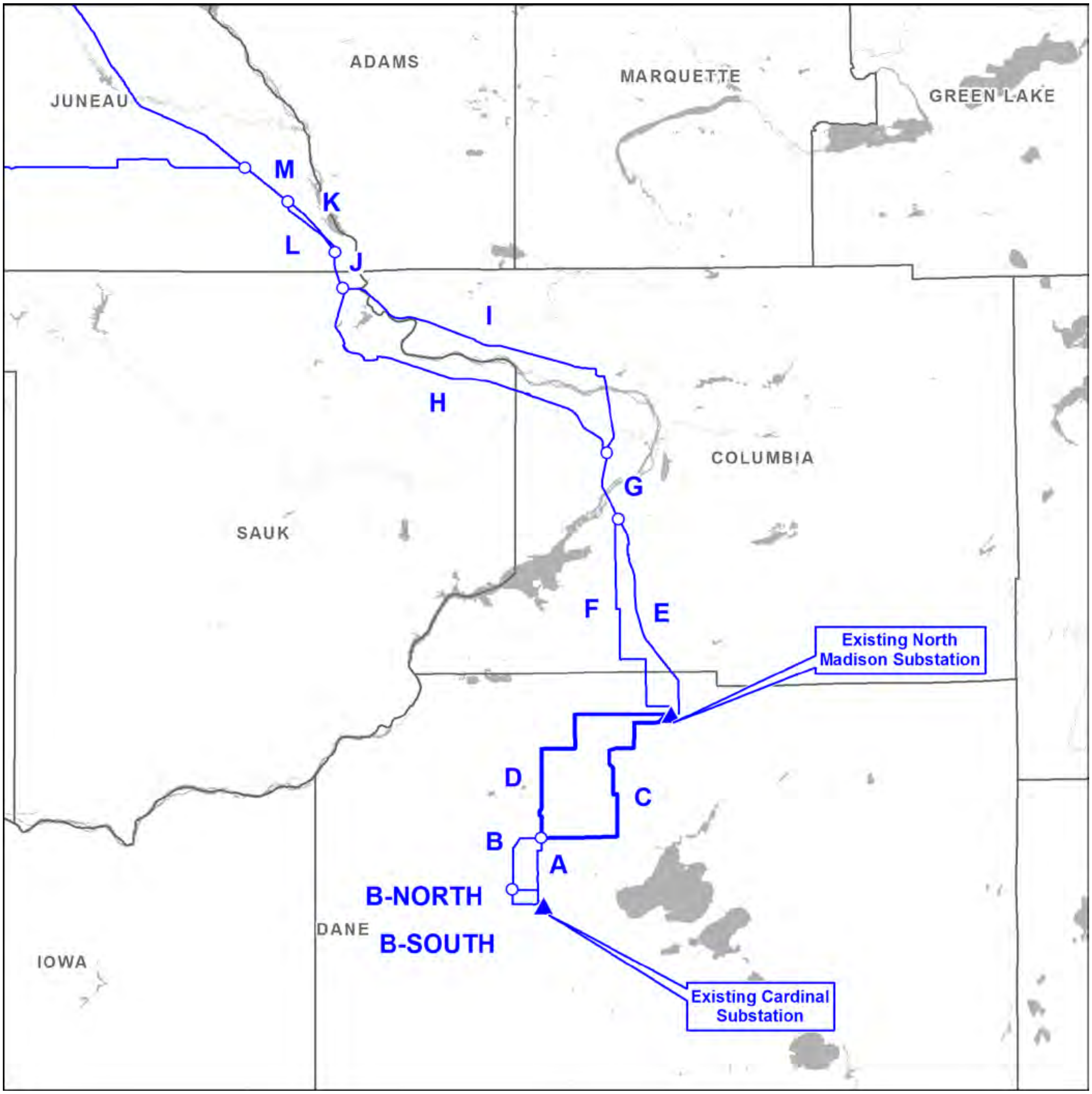
10.1.1. Detailed descriptions of Segments C and D

Segment C

From the North Madison Substation, Subsegment C0 exits the substation and turns south briefly onto Patton Road. Subsegment C1 parallels the west side of Patton Road for a distance of 0.3 mile. The proposed line would require a 120-foot wide ROW that would partially overlap the local road; the line would be single-circuit configuration. The ROW would need to be widened, on average, 67 feet into an agricultural field to accommodate the transmission line. Subsegment C2 is another short subsegment approximately 0.75 mile in length that first turns west and then diagonally southwest on new ROW. The new ROW would be 120 feet wide through agricultural fields. When it intersects CTH V, the route crosses to the south side of the highway and borders along the USFWS-owned Vienna WPA and associated wetlands.

Subsegment C3 continues along CTH V for a distance of 1.3 miles along the existing ATC 69 kV transmission line (Y-85) ROW. The existing transmission line would be underbuilt on the new structures. The existing transmission ROW is 95 feet wide and on average, the ROW would be widened 25 feet into agricultural fields. Turning south along the east side of STH 113 for about one mile, the route crosses to the west side at Hauser Road to avoid a home. Subsegment C4 is 1.5 miles long and would be single-circuited in a delta configuration. Partially overlapping the road, easements, ranging in width from 15 to 89 feet, would be required from adjacent properties. On both sides of STH 113 the land use is agriculture, with a few houses along the road.

Figure 10.1-1 Badger-Coulee Segments C and D



Subsegment C5 is 4.7 miles long and follows a new cross-country route. The line would be constructed in a single-circuit delta configuration. The route takes several turns to avoid existing land uses including a residential area, a shooting range, and a large dairy farm. It crosses a railroad and STH 19. New 120-foot-wide ROW would be required along the length of this subsegment on primarily agricultural land. The subsegment also crosses several small areas of wetland, particularly south of STH 19 where it crosses Six Mile Creek (a designated Exceptional Resource Water).

Subsegment C6 continues south for 2.3 miles. The line would be double-circuited with the existing ATC 69 kV transmission line (Y-131) along the Springfield/Westport town line. This subsegment crosses residential farmland and Dorn Creek. The existing ROW is 100 feet wide and the new line would require a ROW expansion of 20 feet.

Subsegments C7 through C9 travels west, cross-country and would be single-circuited for a distance of 4.5 miles. These subsegments pass primarily through agricultural fields, though Subsegment C8 is adjacent to Fischer Road for 1.7 miles. This portion of Segment C crosses several small unnamed streams, as well as USH 12. The western end of Subsegment C9 would require clearing a block of woodland surrounding the Pheasant Branch River.

Segment D
Subsegment D1 heads west out of the North Madison Substation, double-circuited with the existing ATC 138 kV transmission line (13875). This segment is 13.1 miles long and jogs south, west, and then south again along existing transmission ROW and between parcel boundaries. The existing transmission line ROW is 100 feet wide; the new line would require the ROW width to be expanded an additional 20 feet. Subsegment D1 travels east 5.5 miles, cross-country and crosses CTH DM, a railroad track, and STH 113. Approximately 3,000 feet west of STH 113, it turns south and crosses CTH P. After a short distance, the route turns west again to cross CTH P a second time. The last portion of Subsegment D1 crosses USH 12, CTH P (for the third time), and ends where the existing lower-voltage transmission line leaves its north-south path and turns west. Subsegment D1 passes through mostly agricultural fields or grassland/prairie areas with scattered residences and woodlots.

Subsegment D2 is 1.9 miles long and continues south cross-country on new ROW; it would be double-circuited on the existing ATC 138 kV transmission line (13875). At its northern end, just north of Kick-A-Boo Road, the subsegment deviates to the west briefly to avoid the Galactic (Epic) wind turbines. Most of the land use along this subsegment is agriculture. The new ROW would be 120 feet wide

Table 10.1-1 Comparison of ROW characteristics for the routes from the North Madison Substation to the town of Springfield

Segment	Length (miles)	Total ROW Required (acres)	Existing ROW shared (acres)	New ROW (acres)	Percentage of ROW Shared
C	15.6	227.6	62.6	165.0	27.5
D	15.3	222.7	158.7	64.0	71.3

10.1.2. Construction issues

Off-ROW access roads become necessary where there are natural constraints such as steep hills, large high-quality natural resources, or other limitations where direct access from public roads is not possible. A brief discussion of the role of off-ROW access roads for this project is included in Section 2.1.4.

Due to the level topography and fairly open, agricultural landscape, no off-ROW access roads or special construction techniques would be required to construct the proposed transmission line on Segments C or D.

10.1.3. Electric distribution lines

Along Segments C and D, there are distribution lines owned by multiple entities that would require relocation if the proposed project is approved along these routes. The existing distribution lines may be located in areas that pose physical conflicts with the proposed 345 kV line or their proximity to the transmission line might result in stray voltage concerns, also known as NEV. No distribution lines are proposed to be underbuilt on the new 345 kV structures.

There is a general consensus that distribution lines located less than 150 feet from and parallel to a transmission line for a continuous distance greater than 1,000 feet can cause impacts on farms with confined animals. In Chapter 4, Section 4.5.15 of this EIS, the cause, impact, and mitigation of NEV issues are discussed in detail. In addition, the Commission may require the applicant to conduct pre-construction and post-construction testing of potentially impacted farms and lines.

All distribution modifications required as a result of this project would be made by the distribution owners including distribution line design, relocation, and associated permitting. For cost estimation purposes (see Section 2.4 of this EIS), all modified distribution lines were assumed to be relocated underground and the related costs are factored into the total costs presented.

Table 10.1-2 Distribution lines that would be relocated

Segment	Number of Locations	Miles of Distribution Line
C	6	4.2
D	1	0.8

Segment C
A total of approximately 4.2 miles of WP&L and MGE distribution lines have been identified by the applicants as potentially interfering with proposed Segment C. Unfortunately, at the printing of this draft EIS, the applicants have supplied insufficient information to determine the exact location of distribution lines on Subsegments C4 and C8 that would be relocated. If the proposed line is constructed along Segment C, the following distribution lines would be relocated:

- On Subsegment C1 along the west side of Patton Road, 1,400 feet of WP&L three-phase overhead distribution line would be relocated.
- On Subsegment C3, the current WP&L distribution line is underbuilt on ATC's 69 kV transmission line (Y-85). If the project is approved using Segment C, the new 345 kV line would be double-circuited with the existing lower-voltage transmission line. Approximately 7,000 feet of the three-phase distribution line would be relocated.
- On Subsegment C4, two portions (5,100 feet and 600 feet lengths) along the east side of STH 113 of WP&L's distribution lines would be relocated.
- On Subsegment C5 along the east side of Mulcahy Road, 1,300 feet of WP&L single-phase overhead distribution line would be relocated.
- On Subsegment C8 along the south side of Fisher Road, 6,700 feet of MGE single-phase overhead distribution line would be relocated.

Segment D
On Subsegment D2, the current MGE distribution line is underbuilt on an existing ATC 138 kV transmission line (13875). If the project is approved using Segment D, portions of the existing ATC 138 kV line would be moved from its existing corridor to the new 345 kV corridor. The new 345 kV line would then be double-circuited with the existing lower-voltage transmission line and the 4,300 feet of three-phase distribution line would be relocated.

10.2. NATURAL RESOURCES

10.2.1. Agriculture

The continuing presence of a high-voltage transmission can adversely affect farm operations and field productivity. Refer to Chapter 4, Section 4.5.2, for a discussion of potential impacts associated with transmission line construction and operation in agricultural fields. The DATCP will present its analyses of the potential impacts of the proposed project to farmed fields in the AIS it is preparing. See Chapter 1, Section 1.4.2 for a discussion of the role of the DATCP in this project. The table of contents of the AIS is included in Appendix D. The acreage figures used below were obtained from the DATCP, and may differ from those supplied by the applicants due to the possible exclusion in the application of cropped wetlands from the cropland totals.

Segments C and D run through an agricultural landscape. Most of this agricultural land is active cropland, which is classified as prime or of statewide importance. The majority of the crops are corn and soybeans; however, wheat and alfalfa/hay fields also occur. A very small area is devoted to pasture and old (fallow) fields. No specialty crops, such as ginseng, orchards, or cranberry bogs are grown within the proposed ROW along these segments.

According to the application, no clear evidence of drain tile lines along the segments was apparent from either aerial photography interpretation or field investigation. However, there are areas of farmland along each segment that contain hydric soils and are in close proximity to ditches, which suggests that drain tiles may exist in these locations. During the final design process, the applicants would work with landowners to place structures so that impacts to drain tiles are minimized, to the extent practicable.

Segment C

A total of 167.8 acres of agricultural land lie within the proposed ROW, 99.6 percent of which is active cropland—the remainder is pasture. Agricultural land represents 73.7 percent of the total required ROW; new ROW (not overlapping any existing facility ROW) encompasses 137.0 acres of farm land. No temporary, off-ROW access routes crossing agricultural lands are needed on this segment.

A total of 20 dairy operations (10 or more animals confined in a facility) are within one half mile of the proposed transmission line centerline. None of these dairy operations are within 300 feet of the line. There are about 1,600 milking cows in a relatively small area between Waunakee and Dane, within a half mile of the centerline and 12 non-residential agricultural buildings are within 300 feet of the centerline. Concerns associated with the presence of dairy operations and nearby agricultural buildings include the potential for stray voltage and induced currents. For a detailed discussion of this issue see Sections 4.5.14 and 4.5.15 in Chapter 4.

The applicants propose to locate transmission structures, to the extent practicable, outside of cultivated fields and offset from field edges. However, the proposed segment centerline does cross some fields at mid-field, potentially resulting in poles being placed in cropland away from field edges, thereby creating obstacles for farm machinery working in the fields. In seven locations on this segment, these mid-field crossings exceed 1,000 feet and would most likely require construction of a transmission structure within a field. Where the new line would be double-circuited with existing transmission lines that are currently on H-frame structures, the impacts on field operations would be reduced due to replacing the two-pole structures in farm fields with new single-pole structures.

Limited aerial applications of herbicides, fungicides, and pesticides may occur along the route, though no specific information is known. The applicants should work with landowners whose aerial spraying would be affected by transmission line placement to minimize potential impacts.

Windbreaks or tree lines would be cleared along 0.13 mile of this segment, increasing the potential for wind erosion in neighboring fields or drift of agricultural chemicals.

No known organic farm operations are located along this route.

Segment D

A total of 176.0 acres of agricultural land is within the proposed ROW, about 96.0 percent of which is active cropland, 1.9 percent is pasture, and 2.0 percent is old field. Agricultural land represents 79.0 percent of the total required ROW on Segment D; new ROW (not overlapping any existing facility ROW) encompasses 55.1 acres of farm land. No temporary, off-ROW access routes crossing agricultural lands would be needed.

A total of 26 large dairy operations (10 or more animals confined in a facility) are within one half mile of the proposed centerline – one is within 300 feet. Six non-residential agricultural buildings are located within 300 feet of the centerline. Concerns associated with the presence of dairy operations and nearby agricultural buildings include the potential for stray voltage and induced currents. For a detailed discussion of this issue see Sections 4.5.14 and 4.5.15 in Chapter 4.

The applicants propose to locate transmission structures, to the extent practicable, outside of cultivated fields and offset from field edges. However, the proposed segment centerline does cross some fields at mid-field, potentially resulting in poles being placed in cropland away from field edges, thereby creating obstacles for farm machinery working in the fields. In 12 locations on this segment, these mid-field crossings exceed 1,000 feet and would most likely require construction of a transmission structure within a field.

Limited aerial applications of herbicides, fungicides, and pesticides may occur along the route, though no specific information is known. The applicants should work with landowners whose aerial spraying would be affected by transmission line placement to minimize potential impacts.

Windbreaks or tree lines would be cleared along 0.5 mile of Segment D increasing the potential for wind erosion in neighboring fields or drift of agricultural chemicals.

No known organic farm operations are located along this route.

Segment D crosses a parcel south of USH 12 enrolled in the Farmland Preservation Program (FPP). Electric transmission lines are permitted on FPP lands and are considered compatible with agricultural use.

Table 10.2-1 Summary of agricultural impacts on Segments C and D

Segment	Total ROW (acres)	Agricultural Land (acres)	Percentage of ROW in Agriculture	Dairy Operations within 0.5 Mile
C	227.6	167.8	73.7	20
D	222.7	176.0	79.0	26

10.2.2. Natural resource properties

This section discusses the properties in this part of the project area that are managed primarily for protecting natural resource habitat. These properties may include publicly-owned lands and also private lands covered by a conservation easement or agreement. There may be some overlap in this section with properties discussed in Section 10.4.4 Public lands and Recreation because some properties serve multiple functions or have multiple designated uses.

Segment C

Subsegment C2 passes through the northwest corner of land owned by the town of Vienna, north of CTH V. The new 120-foot wide ROW required for the proposed 345 kV line would extend 108 feet into the northwest corner of this parcel. The south part of this site is comprised of wetlands that are part of the Vienna WPA.

Segment D

Both NPS and the Dane County Land and Water Resources Department expressed concern that a new 345 kV transmission line constructed on sections of Segment D may be visible from the Ice Age National Scenic Trail Corridor. The use of Subsegment D2 would be most likely to result in adverse visual impacts, and efforts to minimize the aesthetic impacts on the surrounding landscape have been requested should this route be selected.

10.2.3. Forested lands

10.2.3.1. Existing environment

Segments C and D are located in the Southeast Glacial Plains Ecological Landscape as described in Chapter 2, Section 2.3. They primarily cross open agricultural areas on flat to gently rolling land. The potential natural vegetation for this area is oak savanna, prairie, and sedge meadows with forest dominated by white, black, and bur oaks. Most of the original vegetation has been cleared and fragments of forests remain in very small, scattered woodlots, on steeper end moraines and in wetlands.

The very few scattered wooded tracts along these segments are predominantly small upland deciduous stands of pole and saw timber, surrounded by agricultural fields. Dominant overstory species typically include a variety of oaks, basswood, black walnut, black cherry, shagbark hickory, ash, and eastern cottonwood. Understory shrubs include sumac, prickly ash, European bush honeysuckle, black locust, and common buckthorn. Mixed deciduous-coniferous and coniferous stands are less frequent and are dominated by pole-size white and red pine with understories of honeysuckle and common buckthorn.

Wooded wetlands are typically found along waterways, and are dominated by deciduous species such as basswood, American elm, green ash, and box-elder. Other wooded wetlands are hardwood swamps dominated by silver maple, black willow, quaking aspen, and cottonwood.

Forested land ownership is mostly private, with the exception of a small publicly-owned parcel in the village of Dane on Segment D. Land use of forested lands is primarily classified as recreational. Wooded wetlands are classified as riparian habitat.

10.2.3.2. Potential impacts

Segment C

A total of 3.5 acres of upland woodland and 0.4 acre of wooded wetland would be cleared, for a total permanent woodland loss of 3.9 acres. Most clearing would result from a new corridor that bisects a relatively narrow woodland near the western end of the segment. No clearing would be required for off-ROW access routes.

Segment D

A total of 2.4 acres of upland woods and no wooded wetland would be cleared, for a total permanent impact of 2.4 acres. The clearing would result from the widening of an existing transmission line corridor, most of which would come from the edge of a single woodland. No clearing would be required for off-ROW access routes.

Segment D has two small stands of pine along the proposed ROW. Removing pine trees creates the possibility of introducing annosum root rot.

Table 10.2-2 Summary of woodland loss on Segments C and D

Segments	Upland Woods Cleared (acres)	Forested Wetland Cleared (acres)	Total Acres Cleared
C	3.5	0.4	3.9
D	2.4	NA	2.4

10.2.4. Wetlands

Construction in wetlands could alter wetland hydrology, vegetative character, and function. More specifically, forested wetlands would be permanently lost and converted to shrub wetlands or sedge meadow and the likelihood of invasive species being introduced to the site would be greater. Furthermore, minimizing impacts is necessary and might be achieved by restricting construction to winter or periods of low flow, implementing requirements of Wis. Admin. Code ch. NR 40 for invasive species, and using matting or other low ground pressure equipment. After completing construction of the transmission line, the applicants would conduct site restoration and compensatory mitigation activities as required. General information about wetland resources and the potential short- and long-term potential impacts of constructing transmission line through and across wetlands can be found in Section 4.5.17.

Segments C and D cross a limited number of wetlands. The applicants conducted field analyses of the wetlands crossed by project routes only where the wetlands were accessible along existing electric transmission and public ROWs. Thus, most of Segment D was field-surveyed but only 50 percent of Segment C was physically surveyed in the field. The applicants evaluated wetlands within private properties using available desktop resources, such as the WWI, soil maps, and recent aerial photographs.

The applicants intend to provide compensatory mitigation for permanent and conversion wetland impacts by using either existing mitigation banks, Wisconsin's In-Lieu Fee Program or, if no other option exists, permittee-responsible mitigation. As part of the permitting process, DNR and USACE will review any mitigation proposal for this project prior to the start of construction.

Segment D

Beginning north of the village of Dane and continuing south through the town of Springfield, Segment D crosses mainly agricultural land. The segment crosses three non-forested wetlands, totaling 2.1 acres. Two are wet meadow wetlands dominated by reed-canary grass and one is a farmed wetland.

Two structures are proposed for construction within these wetlands. There are no significant or high quality wetlands crossed by this segment.

Segment C

Segment C crosses primarily agricultural lands, but it also crosses 16 wetlands, and would impact a total of 23.5 acres, of which 0.5 acre is forested. The majority of the wetlands along Segment C are located west of Waunakee in the proximity of farm fields and roads. Fourteen structures are proposed to be built in these wetlands. The wetland complex adjacent to Six Mile Creek is listed as an ASNRI and is dominated by reed-canary grass, cattail, and giant reed. Another wetland associated is with Dorn Creek, an ASNRI waterway. This wetland consists of a farmed wetland and wet meadow, also dominated by reed-canary grass. There are no significant or high quality wetlands crossed by this segment.

Summary of Wetland Impacts of Segments D and C

Segment D crosses 1,237 feet of wetlands, while Segment C crosses 10,459 feet of wetlands (Table 10.2-3). Segment D does not impact any wetland complexes associated with waterways. Segment C impacts two riparian wetlands, one adjacent to Six Mile Creek and the other next to Dorn Creek. When comparing Segment D and C, all wetland impacts are greater for Segment C.

Table 10.2-3 Summary of wetland impacts of Segments D and C

Segment	Forested Wetland				Non-Forested Wetland			Total Wetland Impact (acres)	Significant/ High-quality Wetlands
	Existing Shared ROW Not Cleared* (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Forested Wetland Impact (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Non-Forested Wetland Impact (acres)		
D	0	0	0	0	1.6	0.6	2.2	2.2	0
C	0	0	0.4	0.4	5.5	17.6	23.1	23.5	0

* This column is a subset of the Existing Shared ROW.

10.2.5. Lakes, rivers, and streams

Some of the waterways crossed by the proposed project have significant scientific value, and are identified by DNR as ASNRI for their protection under Wis. Admin. Code § NR 1.05. ASNRI designations are given to water bodies that meet one of a number of criteria representing high ecological value such as outstanding resource waters (ORW), exceptional resource waters (ERW), and trout streams (Class I, II, and III). See Figure Vol. 2-4.02 for a map depicting the region's waterways.

Some waterways crossed during construction would require a temporary clear span bridge (TCSB) or a bridge requiring support below the ordinary high water mark (OHWM). These waterways could be adversely affected by removal of stream bank vegetation, excavation, potential soil erosion and sedimentation, and temporary closure to users of the river. Impacts may be minimized by implementing requirements of Wis. Admin. Code ch. NR 40 for invasive species, completing site restoration and revegetation activities as required, as well as following BMPs and Erosion Control Plan specifications. General information about lakes, rivers, and streams, and the potential impacts to this resource from transmission line construction can be found in this EIS in Section 4.5.16.

The applicants identified navigable waterways intersected by the proposed routes based on a review of desktop information and data, and aerial photographs; field observations were made along accessible routes. DNR has final jurisdictional authority over navigability determinations. Some non-navigable and intermittent streams may also be present along the routes. These resources would be identified during a pre-construction engineering survey if the proposed project is approved.

Segment C

Segment C crosses six waterways within three different watersheds. The watersheds include Pheasant Branch (northeast of Middleton), Dorn Creek (between Middleton and Waunakee), and Six Mile Creek (west of Waunakee). Although most of the waterway crossings are over smaller intermittent tributaries, the proposed line would cross the main channel of Six Mile Creek near the point where the creek crosses STH 19. Six Mile Creek is designated as an ANSRI waterway at the location where the proposed line would cross it. One TCSB would be installed where an unnamed tributary to Six Mile Creek is crossed north of the intersection with STH 19. Vegetative clearing on the banks of these waterways and the placement of a TCSB could adversely impact these high-quality stream. TCSB standards and conditions must be followed to minimize impacts, as well as proper erosion control measures.

Segment D

Segment D runs south through predominantly agricultural land interspersed with woodlots. It crosses several tributaries of Six Mile Creek, the major watershed impacted by this segment. Many of the tributaries are small intermittent streams, however, two larger permanent unnamed waterways are also crossed; both are located near the intersection with USH 12. The waterway closer to USH 12 would require installation of a TCSB. West of the village of Dane, Segment D also crosses a small unnamed tributary of Lodi Creek. No ANSRI waterways are crossed by Segment D, however, appropriate erosion control measures and limited vegetative clearing would minimize impacts at all of the waterway crossings.

10.2.5.1. Summary of waterway impacts of Segments D and C

The majority of waterways along Segment D and C are located west of Waunakee and are associated with Dorn Creek, Six Mile Creek, and Pheasant Branch. Segment C would have a greater impact to waterways due to the number of crossings and the quality of the waterways crossed. Segment D crosses two waterways and would require one TCSB. On Segment C, three of the six waterways crossed are designated as ASNRI waterways; however, only one crossing would require installation of a TCSB.

Table 10.2-4 Summary of waterway impacts on Segments C and D

Segment	Waterway Crossings (#)	ASNRI Waterway Crossings (#)	TCSBs Required (#)	TCSBs Over ASNRI Waterways
C	6	3	1	1
D	2	0	1	0

10.2.6. Rare species and natural communities

This section discusses the potential impacts to endangered resources that might be affected by construction or operation of the proposed project along Segments C and D. A general discussion of rare species is presented earlier in this EIS in Chapter 4, Section 4.5.

Endangered resources include rare or declining species, high quality or rare natural communities, and unique or significant natural features. Endangered resources are tracked via the state's NHI database which is maintained by the DNR Bureau of Natural Heritage Conservation. The project area evaluation consists of both the specific route and a buffer of 1.0 mile for terrestrial and wetland species and a 2.0-mile buffer for aquatic species.

The combined presence of natural habitat and man-made disturbances must be taken into consideration to evaluate whether there is a likelihood that rare species are present and the potential for negative impacts to those species. For the purposes of this document, rare species are defined as federal- or state-listed threatened and endangered species, federal candidate and proposed species, and state special concern species. These species are not common which means they are low in numbers or restricted to small geographical areas*, i.e.,* difficult to find. Therefore, while the existing sources of information are important for estimating impacts to rare species, they are incomplete. Additional rare species beyond those identified may actually be present in potentially impacted areas.

Also, the Wisconsin NHI database only has information on rare species for areas which have been previously surveyed for that species or group, during the appropriate season and the observation recorded. Not all areas of the state have been surveyed, especially most privately-owned lands. Therefore, potential endangered resource impacts along segments dominated by private properties may be incomplete.

For specific route segments, an incidental take of state threatened or endangered animal species may occur as defined by Wis. Stat. § 29.604. Further consultation under DNR's incidental take process may be needed and an incidental take permit may be required for construction to proceed in those segments. Instances where existing information indicates that additional assessment or consultation for incidental take would be needed are described in this EIS.

This section identifies the endangered resources that could be present, the project's potential impacts to these resources, and the mitigation measures that should be implemented. Rare species are discussed as taxa groups or individually if there is a high level of concern. This list and information are taken from existing sources within DNR, such as the NHI database, as well as some external sources, including landowners and surveys completed by the applicants.

10.2.6.1. Birds

Almost all bird species are protected by the MBTA. Under the MBTA, it is unlawful to take, capture, kill, or possess migratory birds, their nests, eggs, and young. This may apply to birds nesting in or adjacent to the ROW if construction disturbance results in nest abandonment. Avoidance of impacts to nesting birds can be achieved if construction activities are scheduled in habitat areas outside the breeding and nesting season from approximately March through August.

The NHI database identified no rare birds on either Segment C or D. However, this does not mean rare birds are not present. Segment C crosses the Northern Empire Prairie, an IBA. IBAs are designated by the National Audubon Society, Inc. and managed in partnership with DNR and other stakeholders. These sites are of ornithological importance because they provide essential habitat to breeding birds or birds of conservation concern that migrate through the state.

In 2013, the applicants conducted a bald eagle nest inventory and monitoring surveys. An occupied nest was identified in Township 9N, Range 9E of Dane County. Though the bald eagle was removed from the Federal Endangered Species list in August 2007, it is still federally protected by the Bald and Golden Eagle Protection Act and the MBTA. If this project is approved, bald eagle surveys should be redone just prior to the start of construction to verify the identified nest is still active. Per USFWS guidelines, it is a requirement to maintain a buffer of at least 660 feet between project activities and an active bald eagle's nest. Work may be performed closer to the nest if conducted outside of the nesting season (August through mid-January). If these guidelines cannot be followed, USFWS must be consulted for further assistance, prior to the start of construction.

10.2.6.2. Small mammals

The NHI database identified one state threatened small mammal, the big brown bat which may be present along both Segments C and D. During the summer months, big brown bats are found in various habitats including mixed landscapes of deciduous woodlands, farmlands, edges near water and urban areas. This habitat, as well as patches of forests exist along this segment. Where suitable habitat for this species occurs, avoidance measures may include no tree removal during the maternity period (June 1 through August 15). During the winter months, these bats are found in natural and manmade structures such as caves, mines, and human dwellings. Therefore, no impact on the big brown bat is likely to occur during the winter hibernating months.

10.2.6.3. Herptiles – amphibians and reptiles

No amphibians were identified in the NHI database as occurring along Segments C or D.

Along Segments C and D, one special concern herptile, the Blanding's turtle may be present. This species utilizes a wide variety of aquatic and wetland habitat along with their associated uplands. Numerous wetlands occur within the proposed transmission line ROW along each segment. Segment C crosses 16 wetlands and Segment D crosses three wetlands. Where suitable habitat would be impacted, voluntary avoidance/minimization measures should be implemented including avoiding turtle habitat areas during the appropriate times of year, installing exclusion fencing in areas of suitable habitat before the species becomes active and moves into the workspace, and/or scheduling construction activities outside of hibernation areas during winter. When access to private lands or wet conditions precludes timely and effective installation of exclusion fencing, monitoring and removal can be effective if the ground surface is visible and the space to be cleared is relatively small.

10.2.6.4. Terrestrial invertebrates

No terrestrial invertebrates are recorded in the NHI database for Segment D.

One state endangered and one special concern leafhopper species are identified in the NHI database as being observed near Segment C. Both species are known to be present in Empire SNA, south of Subsegment C9; however, the species' habitat of dry to wet-mesic prairie is not known to be present along this segment.

10.2.6.5. Plants

Impacts on natural communities can ultimately change habitat conditions and make it difficult for rare plants to persist. Wisconsin's Endangered Species Law protects only state-listed endangered and threatened plant species on public lands, but utility, agriculture, forestry, and bulk sampling projects are exempted from this protection. Therefore, additional surveys and avoidance/minimization measures for rare plant species are encouraged and recommended. Potential avoidance measures may include conducting plant surveys to determine presence/absence and/or avoiding areas where known plants occur. Other measures, such as winter construction, use of mats to limit direct disturbance, or relocation, can minimize losses. DNR also recommends that applicants and landowners with rare species on their property develop a plan to protect these species.

Neither Segment C nor D cross areas identified by the NHI database for rare plants.

Within 1.0 mile of Segment C, the state endangered rough rattlesnake-root and the state threatened Hill's thistle may be present. The rough rattlesnake-root is found in dry prairies, usually on the lower slopes of hills while the Hill's thistle is found in dry prairies and oak barrens. These plants may be present in the one natural community crossed by Subsegment C4.

10.2.6.6. Natural communities

Most occurrences of high-quality natural communities are from surveys conducted on public lands and documented in the NHI database. In areas where there is a predominance of private lands, more diverse, high quality, or rare natural community occurrences likely exist, but remain undocumented and underrepresented in the NHI database. Below is a discussion of those natural communities that are identified in the NHI database. Natural communities may contain rare or declining species and their protection should be incorporated into the project design as much as possible. Minimizing impacts to and/or incorporating buffers along the edges of these natural communities is recommended.

Segment D crosses no natural communities.

While there is mostly agricultural land along Segment C, two natural communities, a dry-mesic forest and a mesic prairie are noted as occurring near the segment. One of the natural communities, a small fragment of mesic prairie is crossed by Subsegment C4. Due to its small size, the transmission line should be able to span this community. Recommended actions include minimizing impacts and incorporating barriers between the construction zone and the community.

10.2.6.7. Summary of endangered resource impacts for Segments C and D

Tables 10.2-5 and 10.2-6 identify the general types and numbers of rare species, natural communities, and other features that were identified as potentially being located along Segments C and D based on information primarily from the NHI database and some other sources.

Table 10.2-5 Summary of endangered resources along Segment C

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidate	Not Applicable
Small Mammals	1				
Herptiles	1				
Terrestrial Invertebrates	1	1			
Plants	2				
Natural Communities					2
Summary	5	1	0	0	2

State Required Actions – 3
State Recommended Actions – 5
Federal Required Actions – 0
Federal Recommended Actions – 0

Table 10.2-6 Summary of endangered resources along Segment D

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidate	Not Applicable
Small Mammals	1				
Herptiles	1				
Summary	2	0	0	0	0

State Required Actions – 2
State Recommended Actions – 0
Federal Required Actions – 0
Federal Recommended Actions – 0

10.2.7. Archaeological and historic resources

No intact above-ground historic structures listed with WHS have been identified by the applicants for either Segment C or D.

Segment C
One archeological site could be affected by construction in the ROW of Segment C. The site consists of a Euro-American School and contains a variety of cultural materials including whiteware, stoneware, glass, and porcelain.

Table 10.2-7 lists the name of the recorded site along with additional information from the WHS inventory of recorded sites. The listing of a site with WHS is an indication that the site is considered eligible for the NRHP.

Table 10.2-7 Previously Reported Archeological Sites in the ROW of Segment C

Site # (Site Name)	Artifacts/Materials Present	Recommended WHS Action
DA-1147 (Harvey School)	Euro-American school., contains a light scatter of historic cultural materials, including whiteware, stoneware, flat and container glass, milk glass, and one porcelain insulator	Archaeological survey

If Segment C is part of an approved route for the project, WHS recommends field survey by a qualified archeologist where a WHS-mapped site coincides with the ROW. The survey would assess potential effects to the site and would be intended to ensure the Commission's compliance with the state historic preservation law.

Segment D
No previously recorded archaeological or cemetery/burial sites are identified within the Segment D ROW; thus, no further cultural resource review is recommended for the current alignment of this segment.

10.3. COMMUNITY RESOURCES

10.3.1. Land use

In general, residential uses are considered to be more sensitive to impacts from electric transmission lines than commercial or industrial land uses, primarily because of potential adverse aesthetic effects. Greater potential for conflict with land use plans exists in areas of urban development, where existing and planned residential and commercial uses are more common. The potential for conflict is also present in areas undergoing land use change, such as where rural land is being converted to residential use. Corridor-sharing with different types of infrastructure (for example, transmission lines and multi-lane highways) can mitigate impacts by causing incremental impacts instead of the entirely new impacts associated with a new ROW corridor. Not all corridors that can be shared with a transmission line serve to lessen potential impacts, though. Places with narrow, canopy-covered, local roads, winding rural roads, and areas crowded with small lots may experience greater impacts from a new high-voltage transmission line.

Most areas along this route are rural in nature and are currently in agricultural or other undeveloped uses; residences and farmsteads are scattered throughout. These uses are expected to continue into the future. An electric transmission line is generally compatible with these surrounding land uses. Much of the land in the towns of Springfield, Westport, Dane, and Vienna is located in agricultural preservation districts, where continued agricultural use is designated in the towns' land use plans. Several conservancy districts protecting streams and wetlands would be crossed by the new transmission line in the town of Springfield.

Segment C

About 49 percent of Segment C shares existing corridors; most of this is with county or local roads, although a short distance is with an existing 69 kV transmission line. This corridor sharing mitigates the project's impacts to some extent, although the height and width of the new 345 kV line would be substantially different than the existing 69 kV line. Considering the current and future land uses along the route, residential properties would be the most likely to be impacted by the aesthetics of the new line.

Segment D

The new transmission line would be double-circuited with an existing 138 kV line for over 13 miles on Subsegment D1. Near the North Madison Substation, the segment passes adjacent to a quarry pit. It is also adjacent to northern boundary of the village of Dane. The village's land use plan shows residential development planned in the areas just west of CTH DM and west of the Wisconsin and Southern railroad corridor adjacent to Segment D. These two areas are separated by a designated rural preservation district. Two proposed bike paths are shown in the plan along the railroad track and along CTH DM.

Subsegment D1 touches the westernmost point of a Rural Development District-Rural Center located at the intersection of USH 12 and CTH P, as indicated in the town of Springfield's future land use plan. North of Kick-A-Boo Road, Segment D jogs briefly to the west to avoid several large wind turbines installed by Epic Systems.

About 88 percent of Segment D shares existing ROW with other corridors, making the proposed project a likely compatible land use, although some residential properties woulde likely to be impacted by the visual impact of the new line.

10.3.2. Proximity to residences and potentially sensitive populations

This section discusses the proposed project's proximity to homes, schools, daycares, hospitals, and other places where people frequently gather. Information for this section came from the tables submitted as part of the project application that categorize the number of residences within specified distances of the proposed centerline of the new 345 kV line and the estimated magnetic fields associated with the different proposed transmission line configurations. Additionally, Commission staff reviewed comments submitted by the public and conducted numerous site visits along the routes.

The proximity of properties to a high-voltage transmission line is important because of real and perceived concerns about local aesthetics, changes to valued viewsheds, personal enjoyment and use of one's property, potential impacts to property values, and personal and public safety.

Commission staff recognizes that individuals and families have substantial financial, physical and emotional investments in their homes and properties and that the generalized discussions in this document will most likely not adequately address all the issues felt by many individuals owning property along the proposed routes.

A generalized discussion of some of these issues is contained in Chapter 4 including: aesthetics (Section 4.5.1); magnetic fields (Section 4.5.6); noise and corona effects (Section 4.5.10); property values (Section 4.5.11); safety (Section 4.5.14); and stray voltage (Section 4.5.15). Appendix B contains a slightly more in-depth review of the health issues associated with the electric and magnetic fields generated by transmission lines. Additionally, the topic of aesthetics is discussed in the following section (Section 10.4.3) for several specific areas or properties along the proposed route that are recognized regionally or statewide for their natural beauty.

Finally, the personal sense of loss and unfairness related to burdening individuals and specific communities with the long-term presence of this high-voltage transmission line cannot be adequately addressed in this document, but a discussion of some special concerns that have been raised follows in the sections below.

10.3.2.1. Residential impacts

Segments C and D traverse mostly rural, open agricultural land. The residences present include many farmsteads and other mostly isolated homes scattered along local and county roadways. There are few, if any, subdivisions directly impacted by the proposed routes in this part of the project area. The current viewshed in many locations is one of gently rolling topography with silos, barns and large cropped fields.

Subsegment D1 follows an existing 138 kV transmission line ROW for its entire 13.0-mile length and Subsegment C3 would be double-circuited with an existing 69 kV line along CTH V for a distance of 1.3 miles. Subsegments D2 and C1, C2 and C4-C9 do not follow any existing transmission corridors and would require new 120-foot wide ROWs. Residents on D1 and C3 would experience the impacts associated with taller transmission structures and a wider ROW, while the homeowners residing along the remaining subsegments would be exposed to a large new electric transmission line and cleared ROW with an imposing presence on the landscape. The optimal placement of poles to minimize property impacts and obstructed views should be implemented if this project is approved.

Table 10.3-1 Number of homes within 300 feet of the proposed centerline

Segment	Distance from proposed centerline				
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	Total
C		1	4	12	17
D		2	2	5	9

No churches, schools, hospitals or known daycare facilities are located within 300 feet of the proposed centerline on either Segment C or D.

10.3.2.2. MAGNETIC FIELDS

Some background information and a general discussion of EMF is found in Section 4.5.6 of Chapter 4 and in Appendix B of this EIS. Due to questions and concerns from the public, the Commission requires applicants for transmission line projects to provide magnetic field data for locations where there are existing transmission lines along the project routes and the estimated magnetic field levels at varying distances from the centerline of the proposed project, for both normal load and peak load conditions, at one and ten years after the new line is placed in operation.[162] Below are brief summaries of the estimated magnetic field levels for the proposed 345 kV transmission line on Segments C and D. More detailed information can be found in Appendix G of the Badger-Coulee application.[163]

On Subsegment D1, the magnetic fields produced by the new double-circuit 138/345 kV transmission line in 2018 at 25 feet from the proposed centerline would decrease slightly from existing magnetic field levels. It would vary under normal load and peak load conditions from 21.5 to 28 mG, respectively, whereas the existing magnetic field levels range from 25 to 31 mG. At a distance of 200 feet from the centerline the magnetic fields for the new facilities would be nearly identical to the current conditions, with magnetic field levels equal to or less than 1.0 mG.

Magnetic field levels for all of Segment C, with the exception of Subsegment C3, would be very similar to those described above on Subsegment D2. On Subsegment C3, the existing magnetic levels produced by the 69 kV line are in the range of 18 to 22 mG at 25 feet from the centerline, dropping to 0.9 to 1.1 mG at 200 feet from the line. The estimated magnetic fields based on a double-circuit 69/345 kV line at 25 feet would vary, under normal load and peak load operating conditions, from 41.5 to 52 mG, respectively, and from 1.7 to 2.2 mG at 200 feet from the proposed centerline.

10.3.3. Aesthetics and visual impacts

Aesthetics and visual impact are closely related and often used interchangeably. Aesthetics tends to encompass the sights, smells, sounds and perceptions one experiences from the surrounding environment; whereas visual impact is more directly related to views, sightlines and viewsheds. The following discussion of aesthetics is based on Commission staff's visits to the project area and the following underlying assumptions:

- Different viewers may have different levels of visual sensitivity.
- The physical setting can influence the degree of visual impact.
- Viewing conditions can influence the degree of visual impact.
- In summary, aesthetic and visual impacts are difficult to measure and tend to be perceived as greater in natural or scenic settings.

In general, aesthetic and visual impacts are difficult to measure and tend to be perceived as greater in natural or scenic settings.

Segments C and D cross a landscape that consists primarily of open agricultural land supporting corn and soybeans. There are no large residential developments, mostly just farmsteads and scattered single-family homes.

Segment D
Nearly all of Segment D follows an existing transmission line ROW and the new 345 kV line would be double-circuited in that corridor for all but 1.9 miles of the total 15.3-mile segment. Although the new

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162 Peak load is defined as 100 percent of estimated peak, system normal configuration and normal load is defined as 80 percent of peak load. Values provided are for 2018, the anticipated initial year of operation.
163 PSC REF#: 191904 and 191905.

transmission structures would be taller, the visual impact associated with the new double-circuit line would be relatively minor.

Segment C

On Segment C the single-circuit high-voltage line would alternate between new cross-country ROW and following a number of local roads. Near the southern end, it would briefly join an existing ATC transmission line and follow the existing ROW before turning west along local roads to its termination point.

Local residents who own nearby homes or travel the roads commuting to work or other locations would be the main group of people who experience the visual impacts of the line. The existing viewsheds in the area contain many agricultural features, including large barns, sheds, silos and grain elevators, in addition to the large North Madison Substation and several existing transmission lines. Overall, the aesthetic and visual impacts of the new transmission line in this part of the project area would not be substantial.

10.3.4. Public lands and recreation

This section primarily describes the recreational properties and resources that could be directly affected by the construction and presence of the proposed Badger-Coulee 345 kV transmission line between the North Madison Substation and the town of Springfield. Areas such as IBAs or properties managed primarily for the purpose of providing fish or wildlife habitat, are discussed earlier in this chapter in Section 10.2.2 (Natural Resource Properties). Also, the overall effect of the proposed transmission line on aesthetics and tourism-related business is covered in Section10.3.3 (Aesthetics and Visual Impacts) of this chapter.

Although the potential adverse impacts of this project on hunting and some passive recreational activities such as hiking, bird watching, and leisure enjoyment of natural resources are not discussed with respect to individual private properties in this EIS, Commission staff acknowledges the numerous comments that have been received from owners of rural, undeveloped properties supporting woods, meadows, waterways, and wetlands.

Based on a 2013-2014 Dane County snowmobile map, it is likely that both segments cross local snowmobile trails. Communicating with trail managers prior to construction and adequate signage during construction if needed, would minimize the potential for any accidents.

No known recreational resources were identified along Segment C.

Subsegment D1 passes through a small parcel (1.68 acres) of land owned by the village of Dane, on the west side of CTH DM. Currently, an existing 138 kV transmission line is present, with the rest of the parcel comprised of agricultural land. The new 345 kV line would require an additional 20 feet of ROW width across this parcel.

10.3.5. Airports and airstrips

This portion of the project area includes two air fields and one airport. The Dane Airstrip is a privately-owned airstrip within approximately 0.4 miles of Subsegment C5. The turf runway is about 1,600 feet in length and runs in a northeasterly to southwesterly direction. This alignment could result in possible issues with FAA approach surface requirements due to the expected height of the structures if the airstrip was in operation. According to the WisDOT Bureau of Aeronautics, this airstrip is currently closed. If this route were approved for the proposed transmission line, the applicants have stated their intent to work with the airport operator and the Bureau of Aeronautics to mitigate any conflicts.

The Waunakee Airpark is a privately-owned public airport approximately 1.42 miles from Subsegment C6. It appears that the presence of the proposed 345 kV transmission line would not adversely affect flights landing and taking off from this air field.

The Eberle Ranch Airstrip is a privately-owned airstrip located southeast of the community of Dane and approximately 0.8 mile north of Subsegment D1. The turf runway is 1,900 feet long and runs in a southeast to northwesterly direction. The alignment and height of the proposed transmission line could pose problems with FAA horizontal surface requirements. The proposed line would be double-circuited with an existing 138 kV line along the current alignment. The applicants would work with FAA and the WisDot Bureau of Aeronautics if this route were approved.

Table 10.3-2 Potentially affected airports and airstrips

Segment C	Segment D
Dane Airstrip	Eberle Ranch Airstrip

CHAPTER

11

11. Environmental Analysis: Town of Springfield to Cardinal Substation (Segments A and B)

11.1. SEGMENT COMPARISONS

Segments A and B begin north of Middleton and end at the Cardinal Substation. Both segments are located in Dane County and share ROW with highways and existing transmission line corridors. Segment A is east of Segment B. Segment B has two route options, Segment Option B-north and Option B-south. At the north end, Segments A and B initially cross through agricultural land that supports heavier residential use as the segments approach the city of Middleton. Both Segments A and B enter the Cardinal Substation from the north along the common Subsegment A0/B0 by crossing USH 14 and the railroad tracks.

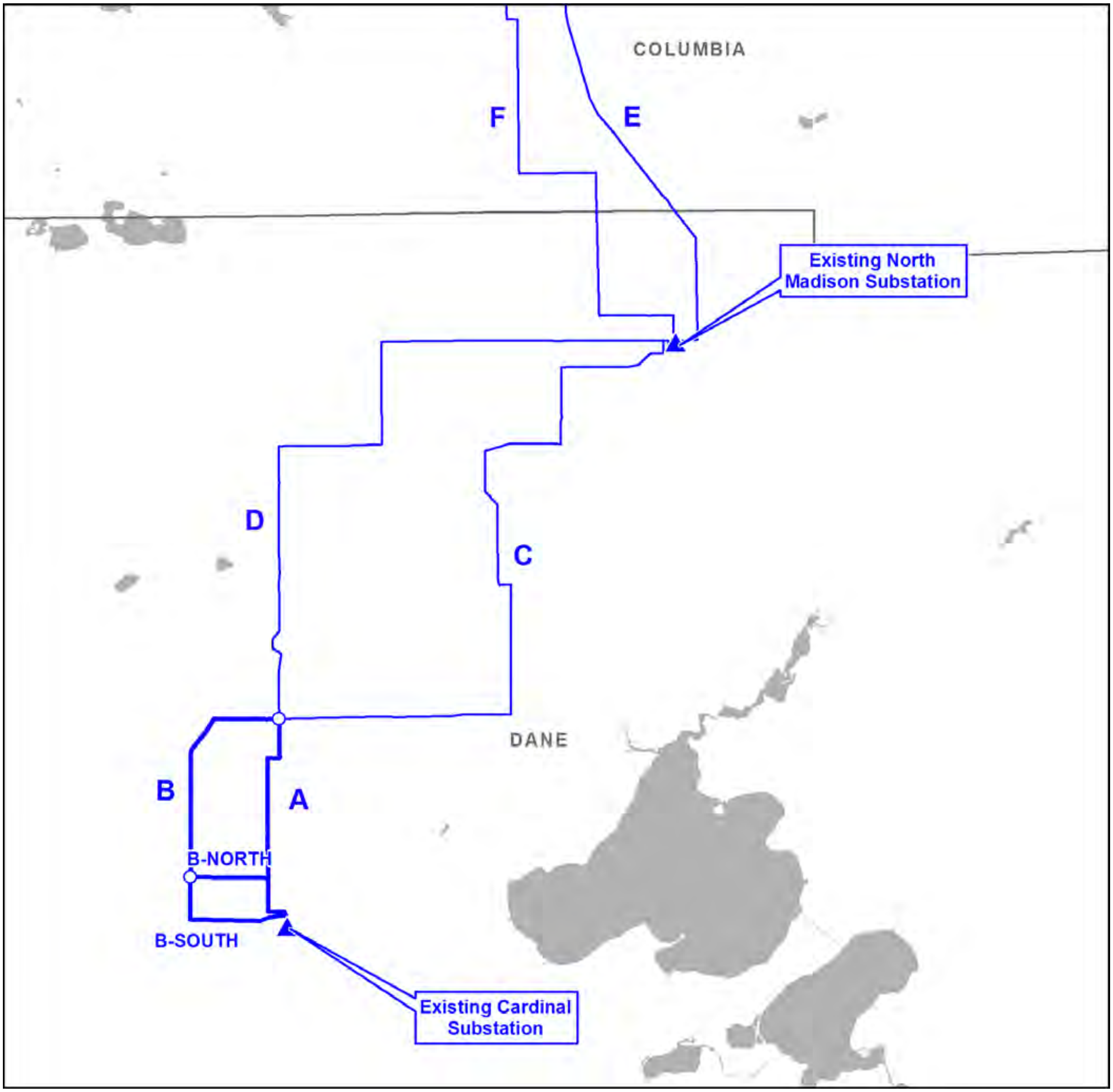
11.1.1. Detailed descriptions of Segments A and B

11.1.1.1. Segment A

Segment A is 4.6 miles long and begins where Segments C and D intersect in the town of Springfield, southwest of the intersection of Riles and Ripp Roads. It extends south and ends in the town of Middleton. All of Segment A requires a 120-foot-wide ROW. The typical height of the transmission structures would be 100 to 150 feet tall.

Subsegment A1 extends south 0.8 miles cross-country through an agricultural field and then jogs briefly west along the south side of CTH K (Subsegment A2). Subsegment A3 through A6b would be double-circuited with an existing ATC 138 kV transmission line (13875), requiring an expansion of the existing 100-foot ROW width by 20 feet. These subsegments are also cross-country with the exception of Subsegment A5 which parallels Bonner Road. The proposed route deviates from the lower-voltage transmission's centerline at two locations. In the vicinity of Schneider Road, the existing transmission line turns west 0.25 miles to parallel Vosen Road for a distance of 1.5 miles before returning to the its original north-south alignment. The applicants propose to create a new ROW so that large angle structures are not needed along Subsegment A4; the existing transmission line would be moved onto the new transmission structures. At the second location, on Subsegment A6a where Bonner Road meets Airport Road, Segment A5 bends sharply and briefly to the east, creating new impacts on existing residences. Most of these subsegments cross agricultural fields and have housing developments located to the east and west of the route, especially around Airport Road.

Figure 11.1-1 Badger-Coulee Segments A and B



Approximately 700 feet north of USH 14, Subsegment A7 departs the existing transmission corridor and becomes single-circuited. The route then turns east along the edge of a farm field and parallel to an existing MGE distribution line. It then turns southeast to cross the highway and enter the Cardinal Substation.

11.1.1.2. Segment B

Segment B begins with Subsegments B1, B2, and B3a which then connect to either Segment Option B-north (Subsegments B4a, A6b, A7, A8, and A0) or Segment Option B-south (Subsegments B3b, B4, B5, and B0). Most of Segment B does not follow any existing road or transmission line ROW. The segment starts in the town of Springfield and travels west into the town of Berry and then south into the town of Cross Plains and finally east into the town of Middleton. All parts of Segment B require 120-foot-wide ROW. The typical height of the transmission structures would range from 100 to 150 feet tall.

Subsegment B1 travels west cross-country for 1.3 miles through farm fields and a block of woodland until reaching CTH P. Subsegment B2 then parallels the south side of CTH P and crosses CTH K. After traveling approximately 0.8 miles, Subsegment B3a turns south, traveling cross-country through residential, agricultural lands and woodlands for a distance of 2.5 miles. The subsegment ends approximately 2,300 feet south of Airport Road. At this location, Segment B continues on Segment Option B-north or Option B-south.

Segment Option B-north (Subsegments B4a, A6b, A7, A8, and A0)
Subsegment B4a turns east from the north-south alignment of Subsegment B3a and continues to travel cross-country on new ROW for a distance of 1.5 miles. It crosses an agricultural field and enters a large wooded area bisected by Rocky Dell Road before heading across another farm field. The subsegment intersects with Subsegment A6 and Segment Option B-north turns south and along the identical route as Segment A. Segment A is fully described above.

Segment Option B-south (Subsegments B3b, B4, B5, and B0)
Subsegment B3b continues the north-south alignment of Subsegment B3a for an additional 0.8 miles until reaching USH 14 using new cross-country ROW. It crosses farmland and wooded hillsides. It then turns west (Subsegment B4) and would be double-circuited with an existing ATC 69 kV transmission line (6927) for a distance of 1.4 miles. The existing transmission line ROW is 50 feet wide and would need to be expanded an additional 70 feet. It crosses the undeveloped land owned by Dane County, known as the Black Earth Creek Wildlife Area – Sunnyside Unit. This parcel was purchased for the purpose of preserving natural areas with little or no development. Subsegments B5 is 0.5 miles long and again returns to a single-circuit configuration, traveling east along USH 14. The proposed ROW partially overlaps WisDOT ROW. On average, approximately 58 feet would be required from private property properties that abut the highway.

Table 11.1-1 Comparison of ROW characteristics for the routes from the town of Springfield to the Cardinal Substation

Segment Combination	Length (miles)	Total ROW Required (acres)	Existing ROW Shared (acres)	New ROW (acres)	Percentage of ROW Shared
A	4.6	67.0	26.3	40.7	39.3
B and B-north	7.3	105.7	13.1	92.5	12.4
B and B-south	7.4	107.9	16.6	91.3	15.4

11.1.2. Construction issues

Off-ROW access roads become necessary where there are natural constraints such as steep hills, large high-quality natural resources, or other limitations where direct access from public roads is not possible. A brief discussion of the role of off-ROW access roads for this project is included in Section 2.1.4. If the proposed transmission line is built, all necessary access roads will be 16 feet wide and constructed with the ability to support the movement of heavy construction equipment. If the project is approved, the applicants will re-evaluate the proposed access routes. After construction is completed, off-ROW access roads may be restored to pre-construction conditions or, depending on negotiations with the property owner, access roads constructed in upland areas may be left in place.

Table 11.1-2 Off-ROW access roads impacts by segment*

Segment Combinations	Number of Roads	Length (miles)	Wetlands (acres)	Upland Forest (acres)
A	1	0.2	0	0
B and B-north	6	1.4	< 0.1	0.5
B and B-south	7	1.8	< 0.1	1.0

* Data compiled from Application, Appendix B, Table 10.

Segment B

Segment B passes through an areas with hilly, forested terrain. Off-ROW access roads in this area would reduce the grading and road building required to construct along this type of topography. There are six access roads proposed, totaling a distance of 1.6 miles. All off-ROW access roads appear to be located along some form of existing lane or path. However, depending on the equipment required and site conditions, road improvements and widening of the existing pathway would likely be necessary at a number of these sites. In total, the access roads would impact only 0.1 acre of non-forested wetlands, 1.0 acre of upland forest, and 0.7 acre of agricultural land.

Subsegment B3a crosses an unnamed stream that feeds into Brewery Creek. The off-ROW access follows a very well established existing driveway with a culvert/bridged crossing of the waterway. No TCSB should be required in this area.

Segment A

Segment A has one off-ROW access road proposed for construction access to Subsegment A7. This road crosses an area of wetland and drainage ditches along a well-established driveway to a landfill site. No significant impacts are anticipated by the use of this off-ROW access road.

11.1.3. Electric distribution lines

Along Segments A and B, there are distribution lines owned by MGE that would require relocation if the proposed project is approved along these routes. The existing distribution lines may be located in areas that pose physical conflicts with the proposed 345 kV line or their proximity to the transmission line might result in stray voltage concerns, also known as NEV. No distribution lines are proposed to be underbuilt on the new 345 kV structures.

There is a general consensus that distribution lines located less than 150 feet from and parallel to a transmission line for a continuous distance greater than 1,000 feet can cause impacts on farms with confined animals. In Chapter 4, Section 4.5.15 of this EIS, the cause, impact, and mitigation of NEV issues are discussed in detail. In addition, the Commission may require the applicant to conduct pre-construction and post-construction testing of potentially impacted farms and lines.

All distribution modifications, required as a result of this project, would be made by the distribution owners including distribution line design, relocation, and associated permitting. For cost estimation purposes (see Section 2.4 of this EIS), all modified distribution lines were assumed to be relocated underground and the related costs are factored into the total costs presented.

Table 11.1-3 Distribution lines that would be relocated

Segment Combinations	Number of Locations	Miles of Distribution Line
A	4	3.9
B and B-north	3	1.12
B and B-south	2	0.3

11.1.3.1. Segment A

The following MGE distribution lines, totaling 3.9 miles would require relocation, if the proposed line is constructed on Segment A.

- On Subsegments A1, A4, A5, and A6b, an MGE distribution line is currently underbuilt on the existing ATC 138 kV transmission line (13875). If the project is approved using Segment A, the existing lower-voltage transmission line would be double-circuited with the new 345 kV structures and the distribution line would be relocated. Three segments of three-phase distribution line with lengths of 4,100, 6,700, and 8,000 feet (totaling 3.6 miles) would be relocated.
- On Subsegment A7, 1,700 feet of three-phase overhead distribution line located cross-country along the north side of USH 14 would be relocated.

11.1.3.2. Segment B

Segment B
Near the northern end of Subsegment B2, along the east side of CTH P, approximately 700 feet of MGE three-phase overhead distribution line would be relocated if the proposed line is constructed along Segment B.

Segment B-north
A total of approximately 1.0 mile of distribution lines owned by MGE would be relocated if the proposed line is constructed along Segment B-north.

- On Subsegment A6b, an MGE distribution line is currently underbuilt on an existing ATC 138 kV transmission line (13875). If the project is approved using Segment B-north, the existing lower-voltage line would be double-circuited with the new 345 kV line and the 3,500 feet three-phase distribution line would be relocated.
- On common Subsegment A7, 1,700 feet of three-phase overhead distribution line located cross-country along the north side of USH 14 would be relocated.

Segment B-south
On Subsegment B5, along the north side of USH 14, approximately 800 feet, of MGE three-phase overhead distribution line would be relocated if the proposed line is constructed along Segment option B-south. Unfortunately, at the printing of this EIS, the applicants have supplied insufficient information to determine the exact location of other distribution lines that would be relocated.

11.2. NATURAL RESOURCES

11.2.1. Agriculture

The continuing presence of a high-voltage transmission can adversely affect farm operations and field productivity. Refer to Chapter 4, Section 4.5.2, for a discussion of potential impacts associated with transmission line construction and operation in agricultural fields. DATCP will present its analyses of the potential impacts of the proposed project to farmed fields in the AIS it is preparing. See Chapter 1, Section 1.4.2 for a discussion of the role of DATCP in this project. The table of contents of the AIS is included in Appendix D. The acreage figures used below were obtained from the DATCP, and may differ from those supplied by the applicants due to the possible exclusion in the application of cropped wetlands from the cropland totals.

Segment A crosses mostly agricultural lands. Segment Option B-south and Option B-north also cross a substantial amount of agricultural land but they encounter more woodlands along their path than Segment A. Most of the agricultural land affected by the proposed routes is active cropland and most of the cropland on Segment A is classified as prime farmland, with additional cropland of statewide significance. Prime farmland is less common on Segment B. The majority of the crops grown are corn and soybeans; however, wheat and alfalfa/hay fields also occur. A relatively small area is devoted to pasture and the remainder is in old (fallow) fields and tree farms. No other specialty crops, such as ginseng, orchards, or cranberry bogs are grown within the proposed ROW on these segments.

According to the application, no clear evidence of drain tile lines along the segments is apparent from aerial photography interpretation or field investigation. However, there are areas of farmland along each segment that contain hydric soils and are in close proximity to ditches, which suggests that drain tiles may exist in these locations. During the final design process, the applicants would work with landowners to place structures so that impacts to drain tiles are minimized, to the extent practicable.

The full width of the ROW could be cleared for construction of the proposed line, including properties currently planted with trees as part of plantations or tree farms. Under state statute (see Section 4.3), landowners must be compensated for any crop damage caused by construction or maintenance of a high voltage transmission line. The applicants should work with tree farm and plantation landowners to minimize construction impacts and determine allowable post-construction use of the land within the easement.

11.2.1.1. Segment A

A total of 41.6 acres of agricultural land lies within the proposed ROW, about 95.2 percent of which is active cropland, 1.0 percent is pasture, 2.1 percent is old field, and 1.7 percent is tree farm. Agricultural land represents 62.1 percent of the total required ROW; new ROW (not overlapping any existing facility ROW) encompasses 29.7 acres of farmland. An additional 0.01 acre would be crossed by temporary, off-ROW access routes.

Approximately 0.7 acre of land managed as a Christmas tree farm is impacted by Subsegment A6b.

Two dairy operations (10 or more animals confined in a facility) are located within one half mile of the proposed centerline; none are within 300 feet. Ten non-residential agricultural buildings are located within 300 feet of the proposed centerline. Concerns associated with the presence of dairy operations and nearby agricultural buildings include the potential for stray voltage and induced currents. For a detailed discussion of this issue see Sections 4.5.14 and 4.5.15 in Chapter 4.

Transmission line structures would be placed outside of cultivated fields and be offset from field edges to the extent practicable. However, the proposed segment centerline crosses some fields at mid-field, potentially resulting in poles being placed in cropland away from field edges, thereby creating obstacles for farm machinery working in the fields. In three locations on this segment, these mid-field crossings exceed 1,000 feet in length and would most likely require construction of a transmission structure within a field.

Limited aerial applications of herbicides, fungicides, and pesticides may occur along the route, though no specific information is known. The applicants should work with landowners whose aerial spraying would be affected by transmission line placement to minimize potential impacts.

Windbreaks or tree lines would be cleared along 0.85 mile of the segment, increasing the potential for wind erosion in neighboring fields or drift of agricultural chemicals.

No known organic farm operations are located along this route.

11.2.1.2. Segment B

Segment Option B-south

A total of 41.7 acres of agricultural land are within the proposed ROW, about 94.1 percent of which is active cropland, 2.3 percent is pasture, and 3.6 percent is old field. Agricultural land represents 38.6 percent of the total required ROW with new ROW (not overlapping any existing facility ROW) encompassing 36.3 acres of farmland. An additional 0.7 acre would be affected by temporary, off-ROW access routes.

Five dairy operations (10 or more animals confined in a facility) are located within a half mile of the proposed centerline, one within 300 feet. Ten non-residential agricultural buildings are present within 300 feet of the centerline. Concerns associated with the presence of dairy operations and nearby agricultural buildings include the potential for stray voltage and induced currents. For a detailed discussion of this issue see Sections 4.5.14 and 4.5.15 in Chapter 4.

Transmission line structures would be placed outside of cultivated fields and be offset from field edges to the extent practicable. However, the proposed centerline crosses some fields at mid-field, potentially resulting in poles being placed in cropland away from field edges, thereby creating obstacles for farm machinery working in the fields. In two locations on this segment, these mid-field crossings exceed 1,000 feet and would most likely require construction of a transmission structure within a field.

Limited aerial applications of herbicides, fungicides, and pesticides may occur along the route, though no specific information is known. The applicants should work with landowners whose aerial spraying would be affected by transmission line placement to minimize potential impacts.

Windbreaks or tree lines would be cleared along 0.3 mile of the segment, increasing the potential for wind erosion in neighboring fields or drift of agricultural chemicals.

No known organic farm operations are located along this route.

Segment Option B-north

Segment Option B-north has a total of 37.5 acres of agricultural land within the proposed ROW, about 95.6 percent of which is active cropland, 2.5 percent is pasture, and 1.9 percent is tree farm. Agricultural land represents 35.5 percent of the total required ROW with new ROW encompassing 34.4 acres of farmland. No additional acreage is affected by temporary, off-ROW access routes.

Approximately 0.7 acre of land managed as a Christmas tree farm would be impacted by Subsegment A6b, which is part of this route option.

Four dairy operations (10 or more animals confined in a facility) are located within one half mile of the proposed centerline; none are within 300 feet. No non-residential agricultural buildings within 300 feet of the centerline. Concerns associated with the presence of dairy operations include the potential for stray voltage and induced currents. For a detailed discussion of this issue see Sections 4.5.14 and 4.5.15 in Chapter 4.

Transmission line structures would be placed outside of cultivated fields and be offset from the field edge to the extent practicable. However, the proposed centerline cross some fields at mid-field, potentially resulting in poles being placed in cropland away from field edges and thereby creating obstacles for farm machinery working in the fields. At three locations these mid-field crossings would exceed 1,000 feet and would most likely require construction of a transmission structure within a field.

Windbreaks or tree lines would be cleared along 0.5 mile of this segment increasing the potential for wind erosion in neighboring fields or drift of agricultural chemicals.

No known organic farm operations are located along this route.

11.2.1.3. Summary of agricultural impacts on Segments A and B

The agricultural acreage crossed by the Segments A and B are similar. The percentage of agriculture to non-agricultural land use is higher for Segment A because much more of Segment B is forested.

Table 11.2-1 Potential agricultural impacts on Segments A, B-north, and B-south

Segment	Total ROW (acres)	Agricultural Land (acres)	Percentage of ROW in Agriculture	Dairy Operations within 0.5 Mile
A	67.0	41.6	62.1	2
B-north	105.7	37.5	35.5	4
B-south	107.9	41.7	38.6	5

11.2.2. Natural resource properties

This section discusses the properties in this part of the project area that are managed primarily for protecting natural resource habitat. These properties may include publicly-owned lands and also private lands covered by a conservation easement or agreement. There may be some overlap in this section with properties discussed in Section 11.4.4 Public lands and Recreation because some properties serve multiple functions or have multiple designated uses.

Segment A
No properties managed specifically for natural resources habitat were identified on Segment A.

Segment Option B-south
Subsegment B4 crosses the Black Earth Creek Wildlife Area – Sunnyside Unit, owned by Dane County and managed by the Dane County Parks Department. This property consists of 292 acres of deciduous woodlands and some farmed land; it also supports an uncommon "goat prairie"—a variant type of tallgrass prairie—above a distinctive rock cut on USH 14. This area is open to the public year-round for low impact recreational activities, and also has areas for public hunting with permits.

Dane County and the town of Middleton were partners in acquiring the property. A large portion of this land was purchased with Stewardship Habitat Area Grant funds that are intended to protect, enhance, and restore natural areas, with little or no development of any type. The Parks Department has completed project planning to increase access for visitors both within the site and connections from trail networks.

Dane County Land and Water Resources staff have highlighted the potential significant impacts of a new 345 kV transmission line (constructed along Subsegment B4) on resources in the Sunnyside Unit. A 69 kV transmission line with a 50-foot easement currently runs through the area. The proposed 345 kV transmission line would follow this alignment and require another 70 feet of ROW width, resulting in additional mature trees being felled. The proposed transmission line project also includes routes that run through areas to the east and west of this site that have been identified as potential expansion areas for this unit. If Subsegment B4 is approved, the new 345 kV line would cross Black Earth Creek, a nationally recognized high quality trout stream, twice in this area.

Construction of a new high-voltage transmission line on Segment B has been highlighted by NPS as having a negative impact on the Ice Age National Scenic Trail and Cross Plains Scientific Reserve Unit (planned for a future National Park). The NPS concerns are due to the proximity of this route to the entrance to the Reserve Unit and the potential adverse impacts on views from the Ice Age Trail across the landscape to the proposed transmission lines. Dane County Land and Waters Resources staff also expressed concerns about the impact that portions of the proposed route could have on the Ice Age National Scenic Trail. Construction of the new transmission line on Subsegments B4 and B3b would likely have the greatest impact in this regard. NPS encourages the avoidance of these scenic areas when deciding the transmission line route.

Segment Option B-north

Subsegment B4a (Segment B-North Option) passes through land (currently privately-owned) that has been identified as potential future acquisition areas for the Black Earth Creek Wildlife Area – Sunnyside Unit described above. The areas are currently made up of both mature woodland and agricultural fields.

11.2.3. Forested lands

11.2.3.1. Existing environment

Segments A and B, although comparatively close in distance, are located in two different Ecological Landscapes, as discussed in Chapter 2, Section 2.3. Segment A lies within the Southeast Glacial Plains and primarily crosses agricultural areas. The potential natural vegetation for this area is oak savanna, prairie, sedge meadows, and forest dominated by white, black, and bur oaks. Most of the original vegetation has been cleared and fragments of forests remain in very small, scattered woodlots, on steeper end moraines, and in wetlands. Segment B follows a narrow finger of the Central Sand Hills Ecological Landscape and is on the boundary of the Driftless. It crosses much hillier topography that supports more forest than Segment A.

The forested areas along these segments are predominantly small upland deciduous stands of pole and saw timber, surrounded by agricultural fields. Dominant overstory species typically include a variety of oaks, basswood, black walnut, black cherry, shagbark hickory, ashes, and eastern cottonwood. Understory shrubs include sumac, prickly ash, European bush honeysuckle, black locust, and common buckthorn. Mixed deciduous-coniferous and coniferous stands are less frequent and are dominated by pole-size white and red pine with understories of honeysuckle and common buckthorn.

Forested wetlands are typically found along waterways, and are dominated by deciduous species such as basswood, American elm, green ash, and box-elder. Other forested wetlands are hardwood swamps, dominated by silver maple, black willow, quaking aspen, and cottonwood.

Forested land ownership is mostly private, with the exception of the Dane County-owned Black Earth Creek Wildlife Area – Sunnyside Unit. Land use on the forested lands is primarily classified as recreational. Wooded wetlands are classified as riparian habitat.

11.2.3.2. Potential impacts

Segment A

A total of 3.1 acres of upland woods and 0.95 acre of wooded wetland would be cleared, for a total permanent loss of 4.1 acres of woodlands. The clearing would result from widening existing transmission line and road corridors. No clearing would be required for off-ROW access routes.

Segments B and B-south
A total of 34.8 acres of upland woods and 2.4 acres of wooded wetland would be cleared, for a total permanent forest loss of 37.2 acres. Most clearing would be for the new transmission line ROW, which bisects several large woodlands. Off-ROW access routes would require an additional 1.0 acres of upland woodland clearing.

A block of parcels enrolled in the MFL program occurs south of CTH P. It is likely that the ROW clearing would impact forest land enrolled in the MFL program in this area.

Subsegment B1 crosses a large woodland block located north of CTH K, requiring 8.4 acres of upland woodland clearing. Subsegment B3a bisects several wooded tracts.

Subsegment B4 runs through the Black Earth Creek Wildlife Area. A large, contiguous forest of pole and saw-sized timber, dominated by white oak and shagbark hickory in the overstory, and common buckthorn in the understory, is present along the proposed ROW in this area. The proposed ROW follows an existing cleared transmission line ROW; however, additional ROW width would be needed for the new line, resulting in 2.9 acres of woodland loss.

Segments B and B-north
A total of 37.7 acres of upland woods and 1.6 acres of wooded wetland would be cleared, for a total permanent loss of 39.2 acres of forest. Most clearing would be done to create the new transmission line ROW which would bisect several woodlands. Off-ROW access routes would require an additional 0.5 acres of upland woodland clearing.

A block of parcels enrolled in the MFL program occurs south of CTH P. It is likely that ROW clearing would impact forest land enrolled in the program in this area.

Subsegment B1 crosses a large woodland block located north of CTH K, requiring 8.4 acres of upland woodland clearing. Subsegment B3a crosses several wooded tracts.

Subsegment B4a fragments a relatively large wooded tract located along Rocky Dell Road; this tract connects to woodlands on the Dane County-owned wildlife area, located to the south. A new 120-foot wide corridor removing 11.3 acres of trees would be cleared through this area.

Table 11.2-2 Summary of woodland loss on Segments A, B with B-north, and B with B-south

Segment Combinations	Upland Woods Cleared (acres)	Forested Wetland Cleared (acres)	Total Acres Cleared
A	3.1	1.0	4.1
B with B-south	34.8	2.4	37.2
B with B-north	37.7	1.6	39.3

11.2.4. Wetlands

Construction in wetlands could alter wetland hydrology, vegetative character, and function. More specifically, forested wetlands would be permanently lost and converted to shrub wetlands or sedge meadow and the likelihood of invasive species being introduced to the site would be greater. Furthermore, minimizing impacts is necessary and might be achieved by restricting construction to winter or periods of low flow, implementing requirements of Wis. Admin. Code ch. NR 40 for invasive species, and using matting or other low ground pressure equipment. After completing construction of the transmission line, the applicants would conduct site restoration and compensatory mitigation activities as required. General information about wetland resources and the potential short- and long-term potential impacts of constructing transmission line through and across wetlands can be found in this EIS in Section 4.5.17.

Segments A and B cross a number of wetlands and wetland types. The applicants conducted field analyses of the wetlands crossed by project routes where the wetlands were accessible along existing electric transmission and public ROWs. Thus, a substantial portion of Segments A and B were not field surveyed. The applicants evaluated wetlands on private properties using available desktop resources such as the WWI, soil maps, and recent aerial photographs.

The applicants intend to provide compensatory mitigation for permanent and conversion wetland impacts by using either existing mitigation banks, Wisconsin's In-Lieu Fee Program or, if no other option exists, permittee-responsible mitigation. As part of the permitting process, DNR and USACE will review any mitigation proposal for this project prior to the start of construction.

Segment A

Approximately 67 percent of Segment A was field surveyed. No wetlands are crossed by the northern portion of this segment. All the wetlands are located along Subsegments A6b through A8, close to USH 14 and the Cardinal Substation. Segment A crosses 7.4 acres of wetlands dominated by reed-canary grass mixed with box elder, cottonwood and invasives. One of the affected wetland acres is forested. Four structures would be constructed within the wetlands, some of which would be large angle structures. There are no significant or high-quality wetlands crossed by this segment.

Segment B (Subsegments (B1-B3a)

Most of Segment B was not field surveyed; Subsegment B2 was the only section where field surveys were conducted. All wetlands on Segment B are located in or adjacent to farm fields and/or roads and contain cattails and reed canary grass. None the less, the wetlands located along the western portion of Subsegment B1, Subsegment B2, and the northern portion of Subsegment B3a are associated with Brewery Creek, an ASNRI-designated waterway. The Black Earth Creek Conservation Organization has commented that there has been collaborative efforts to improve the watershed by creating environmental buffers in the riparian zone along this creek. If the project is approved and these segments are part of the approved route, placement of transmission structures should avoid the creek and adjacent wetlands as much as possible and consultation with the local conservation organizations should occur to ensure that wetland impacts are minimized.

Segment Option B-north (Subsegments B4a, A6b, A7, A8, and A0)

Segment B-north heads east on Subsegment B4a, a cross-country segment, and then is routed similar to the southern portion of Segment A (Subsegments A6b, A7, A8, and A0). The application identified no wetlands on Subsegment B4a; however, this subsegment was not field surveyed. As such, it appears that the impacts for Segment Option B-north would be identical to the wetland impacts for Segment A, discussed above.

Segment Option B-south (Subsegments B3b, B4, B5, and B0)

No wetlands are crossed by Subsegment B3b. However, Subsegment B4 which is routed along an existing transmission corridor crosses Black Earth Creek in several places, resulting in approximately 1,400 feet of potential wetlands impacts. Several of these wetlands are ASNRIs due to their connection to Black Earth Creek (a Class I trout stream). Subsegment B5, which parallels USH 14, crosses another area of wetlands that stretch for approximately 2,250 feet. These are primarily wet meadow wetlands dominated by reed canary grass. Transmission structures are proposed to be constructed in most of the identified wetlands.

Summary of Wetland Impacts on Segments A, B, B-north, and B-south
Along Segments A, B, B-north, and B-south, the majority of the wetlands occur northeast of Cross Plains near the intersection of CTH-P and CTH-K and close to the Cardinal Substation along USH 14. In general, the wetlands found on these segments occur in an agricultural landscape. Though no wetlands crossed by the proposed routes were identified by the applicants as significant or high-quality, several wetlands, mainly those located along Subsegments B2 and B4, have been designated as ASNRIs because of their connection to Brewery Creek and Black Earth Creek.

Table 11.2-3 Summary of wetland impacts of Segments A and B

Segment Combinations	Forested Wetland				Non-Forested Wetland			Total Wetland Impact (acres)	Significant/ High-quality Wetlands
	Existing Shared ROW Not Cleared* (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Forested Wetland Impact (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Non-Forested Wetland Impact (acres)		
A	0.2	0.2	0.8	1.0	1.9	4.3	6.2	7.2	0
B and B-north	0.2	0.2	1.4	1.6	2.2	9.6	11.8	13.4	0
B and B-south	0.1	0.1	2.3	2.4	2.1	8.0	10.1	12.5	0

* This column is a subset of the Existing Shared ROW.

11.2.5. Lakes, rivers, and streams

Some of the waterways crossed by the proposed project have significant scientific value, and are identified by DNR as Areas of Special Natural Resource Interest (ASNRI) for their protection under Wis. Admin. Code § NR 1.05. ASNRI designations are given to water bodies that meet one of a number of criteria representing high ecological value such as outstanding resource waters (ORW), exceptional resource waters (ERW), and trout streams (Class I, II, and III). See Figure Vol. 2-4.02 for a map depicting the region's waterways.

Some waterways crossed during construction would require a temporary clear span bridge (TCSB) or a bridge requiring support below the ordinary high water mark (OHWM). These waterways could be adversely affected by removal of stream bank vegetation, excavation, potential soil erosion and sedimentation, and temporary closure to users of the river. Impacts may be minimized by implementing requirements of Wis. Admin. Code ch. NR 40 for invasive species, completing site restoration and revegetation activities as required, as well as following BMPs and Erosion Control Plan specifications. General information about lakes, rivers, and streams, and the potential impacts to this resource from transmission line construction can be found in this EIS in Section 4.5.16.

The applicants identified navigable waterways intersected by the proposed routes based on a review of desktop information and DNR-supplied data, and aerial photographs; field observations were made along accessible routes. The majority of Segment A has been assessed in the field, while the majority of Segments B was not accessible for field surveys. DNR has final jurisdictional authority over navigability determinations. Some non-navigable and intermittent streams may also be present along the routes. These resources would be identified during a pre-construction engineering survey if the proposed project is approved.

Segment A
Extending south, between Ripp Road and USH-12, Segment A runs across country, through mainly agricultural land, and crosses several small intermittent tributaries of Pheasant Branch Creek, and one small tributary of Black Earth Creek. Near the intersection with USH-12 (Subsegment A7), the proposed route

would be constructed within or adjacent to an intermittent tributary of Black Earth Creek (ANSRI/ Class I trout stream). Further south, and closer to the Cardinal Substation, the line would cross over the same tributary. No TCSBs or temporary structures below OHWM are planned along this segment, however, construction in or adjacent to the crossed waterways should be avoided because of the potential for downstream impacts to Black Earth Creek. In order to reduce impacts, should this segment be part of the ordered route, BMPs including erosion control measures should be used.

Segment B and Option B-south

Segment B, located just west of Segment A, runs south through a more hilly landscape consisting of agricultural lands in the more level lowlands near streams and woodlands along the hillsides and upland area. Segment B crosses the watersheds of Brewery Creek (Subsegment B3a) and Black Earth Creek (Subsegment B4), both listed as ASNRIs. Segment B and Option B-south has six waterway crossings, four of which are ASNRIs. Three TCSBs would be required, all of which over ASNRI designated waters. One TCSB would be constructed over Brewery Creek and two over Black Earth Creek. No structures below the OHWM would be required along this segment. Following BMPs and TCSB installation standards and using proper erosion control measures would assist in minimizing impacts to these waterways.

Segment Option B-north

Segments B and Option B-north share a common northern stretch of line (B1, B2, and B3a). After Subsegment B4a, Segment Option B-north uses the same the route of Segment A into Cardinal Substation (Subsegments A6b, A7, A8 and A0). Segment B using Option B-north avoids Black Earth Creek, but would require a TCSB to cross Brewery Creek (Subsegment B3a) a designated ANSRI. No structures below the OHWM would be required along this Segment. Following BMPs and TCSB installation standards and using proper erosion control measures would assist in minimizing impacts to these waterways.

Summary of Waterway Impacts of Segments A, B, B-south, and B-north

These combined segments pass through a mixture of agricultural and wooded land. The dominant waterway type is intermittent streams passing through cropland. Overall, the eastern portion contains more farmland, while the western portion contains more hills and woodlots. Segment B using Option B-south would cause the most impacts to waterways (6 crossings); three of which would require TCSBs. One of these waterways is Black Earth Creek, an ASNRI and Class I Trout Stream, and the other is Brewery Creek, also an ASNRI. Segment B using Option B-north would avoid crossing Black Earth Creek. Segment A would cross one stream. Additionally the segment would not impact any ASNRIs, require any TCSBs, or require the construction of structures below the OHWM. Following BMPs and TCSB installation standards and using proper erosion control measures would assist in minimizing impacts to these waterways.

Table 11.2-4 Summary of waterway impacts of Segments A, B, and B-north

Segment Combinations	# of Waterways Crossed	# of ASNRIs	# of TCSBs Required	# of TCSBs Over ASNRIs
A	1	0	0	0
B and B-south	6	4	3	3
B and B-north	3	2	0	0

11.2.6. Rare species and natural communities

This section discusses the potential impacts to endangered resources that might be affected by construction or operation of the proposed transmission line along Segments A and B. A general discussion of rare species is presented earlier in this EIS in Chapter 4, Section 4.5.7.

Endangered resources include rare or declining species, high quality or rare natural communities, and unique or significant natural features. Endangered resources are tracked via the state's NHI database which is maintained by the DNR Bureau of Natural Heritage Conservation. The project area evaluation consists of both the specific route and a buffer of 1.0 mile for terrestrial and wetland species and a 2.0-mile buffer for aquatic species.

The combined presence of natural habitat and man-made disturbances must be taken into consideration to evaluate whether there is a likelihood that rare species are present and the potential for negative impacts to those species. For the purposes of this document, rare species are defined as federal- or state-listed threatened and endangered species, federal candidate and proposed species, and state special concern species. These species are not common which means they are low in numbers or restricted to small geographical areas, *i.e.*, difficult to find. Therefore, while the existing sources of information are important for estimating impacts to rare species, they are incomplete. Additional rare species beyond those identified may actually be present in potentially impacted areas.

Also, the Wisconsin NHI database only has information on rare species for areas which have been previously surveyed for that species or group, during the appropriate season and the observation recorded. Not all areas of the state have been surveyed, especially most privately-owned lands. Therefore, potential endangered resource impacts along segments dominated by private properties may be incomplete.

For specific route segments, an incidental take of state threatened or endangered animal species may occur as defined by Wis. Stat. § 29.604. Further consultation under DNR's incidental take process may be needed and an incidental take permit may be required for construction to proceed in those segments. Instances where existing information indicates that additional assessment or consultation for incidental take would be needed are described in this EIS.

This section identifies the endangered resources that could be present, the project's potential impacts to these resources, and the mitigation measures that should be implemented. Rare species are discussed as taxa groups or individually if there is a high level of concern. This list and information are taken from existing sources within DNR, such as the NHI database, as well as some external sources, including landowners and surveys completed by the applicants.

11.2.6.1. Birds

Almost all bird species are protected by the MBTA. Under the MBTA, it is unlawful to take, capture, kill, or possess migratory birds, their nests, eggs, and young. This may apply to birds nesting in or adjacent to the ROW if construction disturbance results in nest abandonment. Avoidance of impacts to nesting birds can be achieved if construction activities are scheduled in habitat areas outside the breeding and nesting season from approximately March through August.

Segment A
No bird species are recorded in the NHI database for Segment A.

Segment B
Henslow's sparrow is a state threatened bird species observed within 1.5 miles of Segment B. This species prefers old fields, open grasslands, wet meadows, unmowed highway ROW, undisturbed pastures, timothy hay fields, and fallow land grown up to tall weeds. This type of habitat is present along Segment B. If the Commission approves a route along Segment B, a presence/absence survey would be required, prior to the start of construction. If the sparrow is present, potential avoidance may

include avoiding impacts to the suitable habitat and/or a buffer area surrounding the habitat during the species' breeding and nesting period (May 20 through August 15).

The applicants conducted bald eagle nest inventory and monitoring surveys which identified one active nest. However, the nest was not adjacent to either Segments A or B. Per USFWS guidelines, it is a requirement to maintain a buffer of at least 660 feet between project activities and an active bald eagle's nest. Work may be performed closer to the nest outside of the nesting season (August through mid-January). If these guidelines cannot be followed, USFWS must be consulted for further assistance, prior to the start of construction.

11.2.6.2. Small mammals

Segment A
Two special concern small mammals, the western harvest mouse and prairie vole, may be present along Segment A in areas of suitable habitat. These species are mostly found in open grassy places, neglected fields overgrown with grasses or sedges, and abandoned farm fields. Surveys for these species may not be effective. If the Commission approves a route along Segment A, minimization measures could include limiting construction activities to the period when the species is active (April through October) so that the mammals have the ability to move away from the construction area.

Segment B
One state threatened small mammal, the big brown bat, and two special concern species, the western harvest mouse and woodland vole may be present along this segment. During the summer months, big brown bats are found in various habitats including mixed landscapes of deciduous woodlands, farmlands, and edges near water and urban areas. This habitat, as well as patches of forests can be found along this segment. Where suitable habitat for this species occurs, avoidance measures may include no tree removal during the maternity period (June 1 through August 15). During the winter months, the bats are found in natural and manmade structures such as caves, mines, and human dwellings. Therefore, no impact on big brown bats are likely to occur during the winter hibernating months.

The woodland vole is found in deciduous woodlands with well-drained soils and dense leaf litter where they spend much of their life in tunnels and burrows. Since many small woodlands would be impacted by this segment, it would be best if the work took place during the summer months when they have the ability to move out of the way of machines.

11.2.6.3. Terrestrial invertebrates

Segment A
No terrestrial invertebrates are recorded in the NHI database for Segment A.

Segment B
Two state endangered terrestrial invertebrates, the silphium borer moth (*Papaipema silphii*), and the ottoe skipper butterfly (*Hesperia ottoe*), may occur along Segment B. The silphium borer moth prefers sunny areas where host plants (*Silphium* spp.) including prairie dock, cup-plant, rosinweed, and compass plant) exist in good numbers. Habitat for the moth is generally wet to dry-mesic prairies. The ottoe skipper butterfly inhabits mixed and tallgrass prairies. The host plant for the butterfly is the bluestem grass and it nectars on prickly pear, milkweeds, vetch, blazing star, leadplant, purple coneflower, compass plant, and sunflowers.

Field surveys have not been conducted for these species along Segment B. If the transmission line is routed on Segment B and host plant surveys determine there is suitable prairie habitat, then surveys for the species itself would be required. The survey must be conducted during the species' flying period. Construction avoidance or impact minimizations for the butterfly or moth may include avoiding areas of suitable habitat, hand clearing, and timing restrictions for construction activities.

11.2.6.4. Aquatic invertebrates

Segment A
No aquatic invertebrates are recorded in the NHI database for Segment A.

Segment B
One special concern dragonfly could be present within 2.0 miles of Segment B. This species depends on springs associated with streams, especially those near rocky riffles. This type of stream habitat may be present in Black Earth Creek which Segment B crosses twice.

11.2.6.5. Plants

Impacts on natural communities described in this section of the EIS can ultimately change habitat conditions and make it difficult for rare plants to persist. Wisconsin's Endangered Species Law protects only state-listed endangered and threatened plant species on public lands, but utility, agriculture, forestry, and bulk sampling projects are exempted from this protection. Therefore, additional surveys and avoidance/minimization measures for rare plant species are encouraged and recommended. Potential avoidance measures may include conducting plant surveys to determine presence/absence and/or avoiding areas where known plants occur. Other measures, such as winter construction, use of mats to limit direct disturbance, or relocation, can minimize losses. DNR also recommends that the applicants and landowners with rare species on their property develop a plan to protect these species.

Segment A
One state endangered plant, purple milkweed (*Asclepias purpurascens*), may be present on Segment A. The plant habitat includes open oak forests, forest margins, and roadsides. Segment A generally passes through farmland habitat and parallels some roadsides where this plant may be present. For construction of the project along Segment A, plant surveys should be conducted in areas of suitable habitat to determine presence or absence. If the plant is present, DNR-recommended actions should be followed.

Segment B
Along Segment B one endangered, two threatened, and two special concern plant species have been documented in the NHI database. The endangered plant species is the purple milkweed on Segment B-north. Habitat that could support all five of these species includes prairies and remnants along roadsides and railroads; open oak forests, forest margins, and roadsides; open areas that were once savannas; wet-mesic prairies, floodplain forests; and sedge meadow habitat. Along Segment B, these plants would most likely be present in the many small woodlots or along roadside areas. For construction of Segment B, field surveys to determine the presence/absence of these plants in areas of suitable habitat would be required. Potential avoidance measures may include avoiding areas where known plants occur.

11.2.6.6. Natural communities

Most occurrences of high-quality natural communities are from surveys conducted on public lands and documented in the NHI database. In areas where there is a predominance of private lands, more diverse, high quality, or rare natural community occurrences likely exist, but remain undocumented and underrepresented in the NHI database. Below is a discussion of those natural communities identified in the NHI database. Natural communities may contain rare or declining species and their protection should be incorporated into the project design as much as possible. Minimizing impacts to and/or incorporating buffers along the edges of these natural communities is recommended.

Segment A
Route A had no natural communities recorded.

Segment B
The NHI database identifies a southern dry-mesic forest natural community (Meinholz Woods) near Segment B. While the natural community is not crossed by the project, it is part of a contiguous habit that Subsegment B1 crosses. The community has red oak as the common dominant tree and a diverse herbaceous understory. This type of community supports many rare species as well as species of greatest conservation need. Field surveys for rare species would be recommended for this segment. While natural communities themselves are not protected, the use of recommended actions would be encouraged including minimizing impacts and incorporating barriers between the project and any identified rare species.

11.2.6.7. Summary of endangered resource impacts for Segments A and B

Tables 11.2-5 and 11.2-6 identify the general types and numbers of rare species, natural communities, and other features that were identified as potentially being located along Segments A and B based on information primarily from the NHI database and some other sources. Five rare species are documented near Segment A and 12 species near Route B.

Segment A appears to potentially impact fewer rare species than Segment B. This may be primarily due to the fact that more of the segment utilizes existing transmission corridors than Segment B. For the protection of rare natural resources, it is generally best to use existing corridors and previously disturbed areas and avoid intact high-quality natural communities.

Table 11.2-5 Summary of endangered resources along Segment A

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidate	Not Applicable
Small Mammals		2			
Plants	1	2			
Summary	1	4	0	0	0

State Required Actions – 1
State Recommended Actions – 4
Federal Required Actions – 0
Federal Recommended Actions – 0

Table 11.2-6 Summary of endangered resources along Segment B

Taxa Group	Protected Status				
	State Endangered or Threatened	State Special Concern	Federal Endangered or Threatened	Federal Proposed or Candidates	Not Applicable
Birds	1				
Small Mammals	1	2			
Terrestrial Invertebrates	2				
Aquatic Invertebrates	1				
Plants	3	2			
Natural Communities	1				1
Summary	8	4	0	0	1

State Required Actions – 8
State Recommended Actions – 4
Federal Required Actions – 0
Federal Recommended Actions – 0

11.2.7. Archaeological and historic resources

No intact above-ground historic structures listed with WHS have been identified by the applicants for either Segment A or B.

11.2.7.1. Segment A

No previously recorded archaeological or cemetery/burial sites are identified within the ROW of Segment A; thus, no further cultural resource review is recommended for the current alignment of this segment.

11.2.7.2. Segment B

One archeological site listed with WHS could be affected by construction in the ROW of Segment B. The site is a prehistoric site with no known cultural affiliation and contains a small scatter of lithic artifacts that were recovered from the surface of a cultivated field.

Table 11.2-7 lists the name of the recorded site along with additional information from the WHS inventory of recorded sites. The listing of a site with WHS is an indication that the site is considered eligible for the NRHP.

Table 11.2-7 Previously reported archeological sites along Segment B

Site # (Site Name)	Artifacts/Materials Present	Recommended WHS Action
DA-0668 (Twinn Valley)	Prehistoric site with no known cultural affiliation, contains a small scatter of lithic artifacts	Archaeological survey

If Segment B is part of an approved route for the project, WHS recommends field survey by a qualified archeologist where the WHS-mapped site coincides with the ROW. The survey would assess potential effects to the site and would be intended to ensure the Commission's compliance with the state historic preservation law.

11.3. COMMUNITY RESOURCES

11.3.1. Land use

In general, residential uses are considered to be more sensitive to impacts from electric transmission lines than commercial or industrial land uses, primarily because of potential adverse aesthetic effects. Greater potential for conflict with land use plans exists in areas of urban development, where existing and planned residential and commercial uses are more common. The potential for conflict is also present in areas undergoing land use change, such as where rural land is being converted to residential use. Corridor-sharing with different types of infrastructure (for example, transmission lines and multi-lane highways) can mitigate impacts by causing incremental impacts instead of the entirely new impacts associated with a new ROW corridor. Not all corridors that can be shared with a transmission line serve to lessen potential impacts, though. Places with narrow, canopy-covered, local roads, winding rural roads, and areas crowded with small lots may experience greater impacts from a new high-voltage transmission line.

11.3.1.1. Segment A

In the town of Springfield, this segment lies within an agricultural preservation district. On most of this segment, the line would be double-circuited with an existing ATC 138 kV line. For a distance of approximately 2.0 miles, the two transmission lines would share the existing transmission line corridor. For another mile, the existing 138 kV line would be relocated from its current alignment to a new ROW with the proposed 345 kV line (Subsegment A4).

In the town of Middleton, Segment A crosses farmland, woodlands, and residential subdivisions. An existing residential subdivision borders the segment, in this area. The town's future land use plan shows this area designated for primarily low-density single-family residential development with some associated open space. At USH 14 Segment A passes through a planned commercial district surrounding the highway and the Cardinal Substation.

About 60 percent of this segment shares existing corridors. Corridor sharing with an existing 138 kV transmission line ROW somewhat mitigates the potential land use impacts of the proposed project. Considering the current and future land uses along Segment A, residential properties are most likely to be impacted by the aesthetics of the new line.

11.3.1.2. Segment B

In the towns of Springfield and Berry, Segment B lies primarily within agricultural preservation districts. Current agricultural land use is expected to continue into the future.

In the town of Cross Plains, most of Segment B is within a planned agricultural preservation district. The southernmost part of the segment crosses an environmental and resource protection district for Black Earth Creek. In the town of Middleton, Segment B first crosses an area designated for residential development in the town's comprehensive plan before entering the Dane County Black Earth Creek Wildlife Area - Sunnyside Unit. Segment Option B-south (Subsegments B3b-B5) crosses the wildlife area, sharing ROW with an existing ATC 69 kV line. Segment B-north (Subsegment B4a) provides an alternative to crossing the wildlife area. This segment lies north of the wildlife area in a future residential area, crossing cropland and a large block of woodland before turning south along Segment A (Subsegments A6b-A8). The area immediately surrounding the Cardinal Substation is designated for future commercial development.

Segment B using B-south shares about 38 percent of its route with existing corridors, whereas about 27 percent of the route using Segment B-north shares existing corridors. Corridor sharing with ATC's existing 69 kV transmission line ROW mitigates the project's impacts on land use to some extent. Considering the current and future land uses along the route, residential properties are the most likely to be impacted by the aesthetics of the new line.

11.3.2. Proximity to residences and potentially sensitive populations

This section discusses the proposed project's proximity to homes, schools, daycares, hospitals, and other places where people frequently gather. Information for this section came from the tables submitted as part of the project application that categorize the number of residences within specified distances of the proposed centerline of the new 345 kV line and the estimated magnetic fields associated with the different proposed transmission line configurations. Additionally, Commission staff reviewed comments submitted by the public and conducted numerous site visits along the routes.

The proximity of properties to a high-voltage transmission line is important because of real and perceived concerns about local aesthetics, changes to valued viewsheds, personal enjoyment and use of one's property, potential impacts to property values, and personal and public safety.

Commission staff recognizes that individuals and families have substantial financial, physical and emotional investments in their homes and properties and that the generalized discussions in this document will most likely not adequately address all the issues felt by many individuals owning property along the proposed routes.

A generalized discussion of some of these issues is contained in Chapter 4 including: aesthetics (Section 4.5.1); magnetic fields (Section 4.5.6); noise and corona effects (Section 4.5.10); property values (Section 4.5.11); safety (Section 4.5.14) and stray voltage (Section 4.5.15). Appendix B contains a slightly more in-depth review of the health issues associated with the electric and magnetic fields generated by transmission lines. Additionally, the topic of aesthetics is discussed in the following section (Section 11.4.3) for several specific areas or properties along the proposed route that are recognized regionally or state-wide for their natural beauty.

Finally, the personal sense of loss and unfairness related to burdening individuals and specific communities with the long-term presence of this high-voltage transmission line cannot be adequately addressed in this document, but a discussion of some special concerns that have been raised follows in the sections below.

11.3.2.1. Residential impacts

Segment A

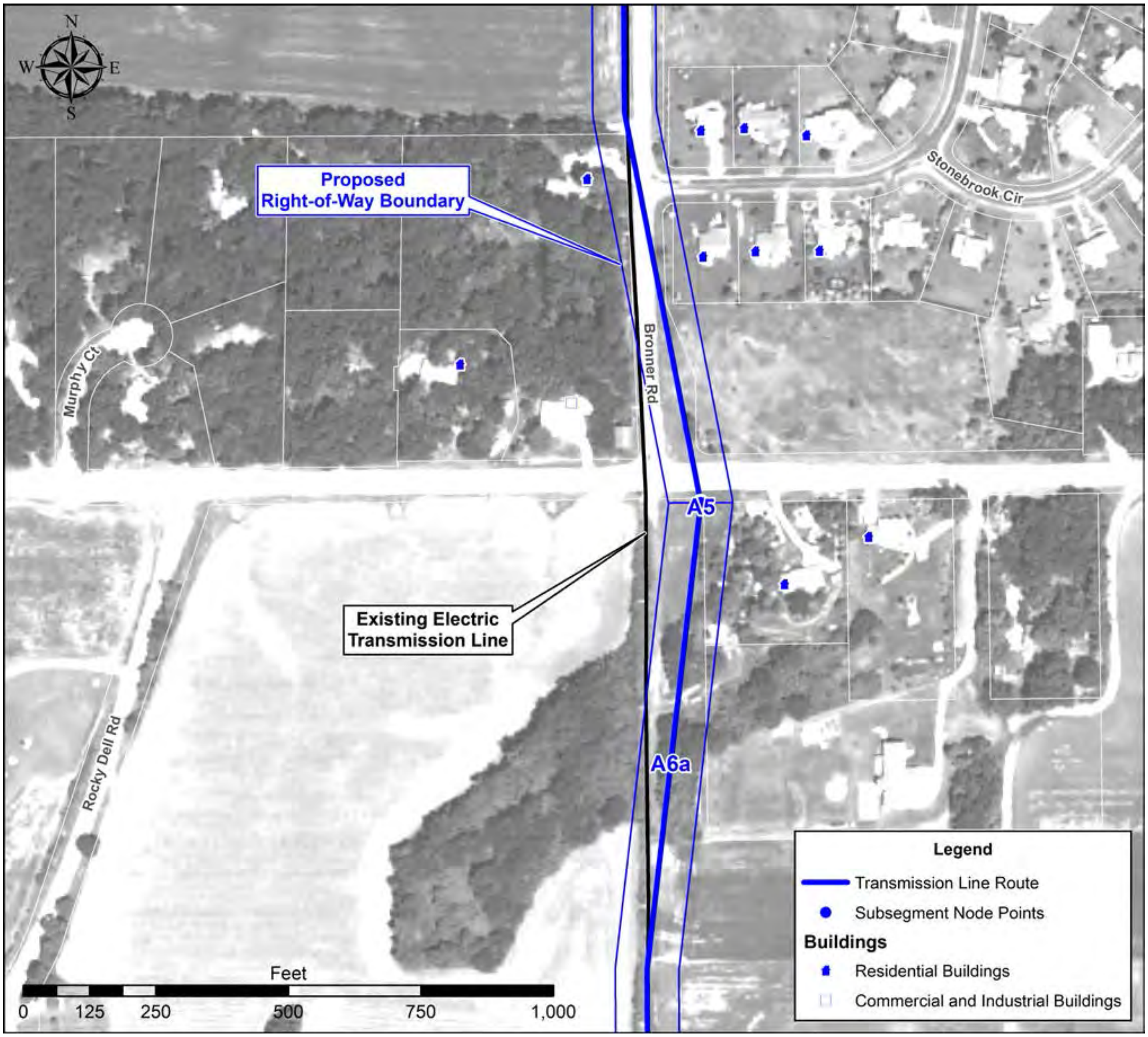
This segment heads north from the Cardinal Substation following an existing transmission line ROW. However as Subsegment A6a travels south along Bonner Road towards Airport Road and past a recently constructed subdivision on Stonebrook Circle, the subsegment deviates sharply to the east and then returns to the existing transmission ROW along a farm road that is an extension of Bronner Road. (see Figure 11.3-1). This deviation affects two properties, one on Airport Road and another on Stonebrook Circle, which would not have been impacted if the existing ROW had been followed. The new home on Stonebrook Circle would be approximately 85 feet from the centerline and the landscaping options on the property would be severely limited. Impacts to the property on Airport Road include the needless removal of mature vegetation. The applicants explain the route deviation by saying that it minimizes the potential impacts on a landowner further north, on the west side of Bronner Road, who is currently impacted by the

138 kV line. This is achieved by equally affecting the homeowner on the east side of Bonner Road where no transmission facilities currently exist, as well the other residential property south of Airport Road that was not impacted by the lower-voltage line, but would now be impacted by a double-circuit angle structure.

Many of the homeowners in the relatively new Stonebrook Circle subdivision have submitted comments expressing their concerns about the impact of the proposed transmission line on aesthetics and their property values.

Farther north on Bronner Road, another residence opposite Ellington Way is in close proximity to the existing 138 kV transmission line. The proposed ROW of Subsegment A5 for the 345 kV transmission line would be about 10 feet from the front of the residence and the centerline would be about 70 feet away.

Figure 11.3-1 Residential impacts related to Subsegment A6a deviation from existing 138 kV transmission line ROW



Segment B

This segment is mostly cross-country and would require all new ROW clearing, with the exception of Subsegment B4 (Option B-south) near USH 14. As Segment B lies within the eastern edge of the Western Coulees and Ridges Ecological Landscape (see Section 2.3.1), the terrain here is rolling with many irregularly shaped woodlots and some larger wooded tracts interspersed with fields and farms.

Many of the residences that would be affected by the construction and presence of the 345 kV transmission line are newer homes that tend to be more scattered and secluded rather than in discrete subdivisions. Many are on very large lots or significant acreage. Thus, the intrusion of a new high-voltage transmission line and its cleared 120-foot wide ROW could have a substantial effect on the personal enjoyment of one's home or property and the potential market value, especially if the secluded setting of the home is substantially altered.

Segment Option B-north (B4a)

Using this 1.5-mile segment, which would require clearing a new 120-foot ROW over a distance of approximately 3,800 feet through a heavily wooded area, affects two more residences than Segment B. One residence that would be just over 100 feet from the line is located in a very secluded location off of Rocky Dell Road. The cleared ROW would be approximately 50 feet from the home and much of the wooded drive from Rocky Dell Road to the home would be opened up.

Table 11.3-1 Number of homes within 300 feet of the proposed centerline

Segment Combinations	Distance from Proposed Centerline				
	0-50 feet	51- 100 feet	101-150 feet	151-300 feet	Total
A		3	1	4	8
B and B-south		1	1	8	10
B and B-north			2	10	12

No churches, schools, hospitals, or known daycare facilities are located within 300 feet of the proposed centerline on either Segment A or B.

11.3.2.2. MAGNETIC FIELDS

Some background information and a general discussion of EMF is found in Section 4.5.6 of Chapter 4 and in Appendix B of this EIS. Due to questions and concerns from the public, the Commission requires applicants for transmission line projects to provide magnetic field data for locations where there are existing transmission lines along the project routes and the estimated magnetic field levels at varying distances from the centerline of the proposed project, for both normal load and peak load conditions, at one and ten years after the new line is placed in operation. [164] Below are brief summaries of the estimated magnetic field levels for the proposed 345 kV transmission line on Segments A, B and B-north and B and B-south. More detailed information can be found in Appendix G of the Badger-Coulee application.[165]

Segment A

No residences were identified within 300 feet of the proposed centerline along Subsegments A1 through A4 and A6b-A8. All of the homes within 300 feet of the centerline are located along Subsegments A5 and A6a. The existing magnetic field levels here at 25 feet from the 138 kV centerline were measured at 16.1 and 20.2 mG at normal load and peak load conditions, respectively. At 50 feet from the existing line they decrease to 6.6 and 8.2 mG and at 200 feet from the 138 kV line they range from 0.9 to 1.1 mG. If the new 345 kV line is double-circuited with this line along these segments, the estimated magnetic field levels at 25 feet from the centerline would increase to 22.4 and 28.0 mG at normal load and peak load conditions, drop to 10.5 and 13.2 mG at 50 feet and would be less than 1.0 mG at a distance of 200 feet from the new proposed centerline.

Segment B

Both Option B-north and B-south include Subsegments B1, B2, and B3a, which would require a new 120-foot wide ROW. Along these subsegments 10 homes were identified between 101 and 300 feet from the proposed centerline. Option B-north follows Subsegment B4a east and continues on to the Cardinal Substation on Subsegments A6b, A7, A8, and A0 where no nearby homes were identified. Option B-south continues south on Subsegments B3b, B4, and B5. No residences were identified near

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164 Peak load is defined as 100 percent of estimated peak, system normal configuration and normal load is defined as 80 percent of peak load. Values provided are for 2018, the anticipated initial year of operation.

165 PSC REF#: 191904 and 191905.

Subsegments B4 and B5; however, one home is within 80 feet of the centerline on Subsegment B3b. On Subsegments B1, B2, B3a, B3b, and B4a where residences would be along a new transmission ROW, the magnetic fields produced by the new 345 kV transmission line in 2018 at 25 feet from the proposed centerline would vary under normal load conditions and peak load conditions from 24.5 to 30.5 mG, respectively. At a distance of 200 feet from the centerline the magnetic fields would be reduced to approximately 2.9 and 3.7 mG, respectively and at a distance of 300 feet the levels would be similar to surrounding background levels of magnetic fields.

11.3.3. Aesthetics and visual impacts

Aesthetics and visual impact are closely related and often used interchangeably. Aesthetics tends to encompass the sights, smells, sounds and perceptions one experiences from the surrounding environment; whereas visual impact is more directly related to views, sightlines and viewsheds. The following discussion of aesthetics is based on Commission staff's visits to the project area and the following underlying assumptions:

- Different viewers may have different levels of visual sensitivity.
- The physical setting can influence the degree of visual impact.
- Viewing conditions can influence the degree of visual impact.

In general, aesthetic and visual impacts are difficult to measure and tend to be perceived as greater in natural or scenic settings. However, homeowners in very newly developed or partially developed residential settings can also experience significant aesthetic and visual impacts related to a high-voltage line, especially if no other aboveground utility infrastructure is present in the area.

Segments A and B, transition from a setting where agriculture is the dominant landscape feature to a more residential, suburban setting as the routes approach USH 14 and the Cardinal Substation. Segment A is generally more open and less wooded than Segments B and the terrain is much more level. The residential developments along Segment A are more densely populated than those on Segment B, where larger, wooded lots are more common.

Segment A

Long portions of the new high-voltage line along Segment A would be double-circuited with an existing 138 kV electric line on the existing ROW. The main residential subdivisions on Segment A are located in close proximity to the proposed double-circuit line and the new larger poles and wider ROW would be apparent to these residents, on a daily basis. Several homeowners would be directly affected by the removal of existing landscape trees and wooded buffers on their property exposing them to direct views of the new high-voltage line. Conversely, the portions of the proposed 345 kV line that would be single circuit on new ROW (Subsegments A1, A7 and A8) are not adjacent roads and have few residences nearby.

Alternately, along Subsegment A4, where the existing 138 kV transmission line currently detours closer to housing developments from its straight north-south alignment, the existing lower-voltage line would be double-circuited with the new high-voltage line away from these homes. Although the new line would be taller and more visible on the landscape, the straighter alignment and its relocation farther away from homes could improve the overall aesthetic experience of these homeowners.

In summary, residential property owners will experience the greatest visual impact associated with the new transmission line on Segment A, but the presence of existing transmission lines in the immediate area mitigates this adverse impact to some extent.

Segment B

As mentioned above, because of the hilly forested terrain along much of Segment B, the residences are farther apart and the lots tend to be large and wooded. No existing transmission lines are present in the area, with the exception of on Subsegment B4 (Segment Option B-south) where no residences are located. In locations where the proposed transmission line comes in close proximity to a home and the ROW requires trees close to the residence to be cleared, the aesthetic and visual impacts of the line would be greatest. This is the situation at several locations along Subsegment B3a, one location on Subsegment B3b, and one location along Subsegment B4a. On Subsegment B4a (Segment Option B-north) a residence in a heavily wooded lot off of Rocky Dell Road would be substantially affected by the ROW clearing for the new transmission line. Although trees would remain in the 50 feet wide area between the home and the ROW edge, most of the wooded drive leading to the residence would be cleared, exposing the owners to daily views of the transmission line.

In addition to these visual impacts on residential properties, the Dane County Land and Waters Resources staff and the NPS have expressed concerns about views of the proposed transmission line from the Ice Age National Scenic Trail and Cross Plains Scientific Reserve Unit (planned for a future National Park). The NPS concerns are due to the proximity of this route to the entrance to the Reserve Unit and the potential adverse impacts on views from the Ice Age Trail across the landscape to the proposed transmission lines. Construction of the new line on Subsegments B4 and B3b would likely have the greatest impact in this regard. The NPS encourages the avoidance of these scenic areas when deciding the transmission line route.

Subsegment B4 also crosses the Black Earth Creek Wildlife Area – Sunnyside Unit along an existing transmission line ROW. The presence of larger transmission poles and a wider ROW could have an adverse aesthetic and visual impact on recreational users of this property.

11.3.4. Public lands and recreation

This section primarily describes the recreational properties and resources that could be directly affected by the construction and presence of the proposed Badger-Coulee 345 kV transmission line between the town of Springfield and the Cardinal Substation. Areas such as IBAs or properties managed primarily for the purpose of providing fish or wildlife habitat, are discussed earlier in this chapter in Section 11.2.2 (Natural Resource Properties). Also, the overall effect of the proposed transmission line on aesthetics and tourism-related business is covered in Section11.3.3 (Aesthetics and Visual Impacts) of this chapter.

Although the potential adverse impacts of this project on hunting and some passive recreational activities such as hiking, bird watching, and leisure enjoyment of natural resources are not discussed with respect to individual private properties in this EIS, Commission staff acknowledges the numerous comments that have been received from owners of rural, undeveloped properties supporting woods, meadows, waterways, and wetlands.

Based on a 2013-2014 Dane County snowmobile map, it is likely that all of the proposed segments in this area cross local snowmobile trails. Communicating with trail managers prior to construction and adequate signage during construction if needed would minimize the potential for any accidents.

No known recreational resources were identified along Segment A.

Subsegment B4 crosses the Black Earth Creek Wildlife Area – Sunnyside Unit which is owned by Dane County. This property consists of 292 acres of deciduous woodlands and some farmed land; it also supports an uncommon plant community called a "goat prairie." This area is open year-round for low impact recreational activities. Black Earth Creek, a Class 1 trout stream and designated Outstanding Resource Water, would be crossed twice by the new transmission line if this subsegment is approved. Public hunting, by special permit, is also allowed on this property.

NPS has commented that a new high-voltage line constructed on Subsegments B4 and B3a may have adverse impacts on the viewshed from the Ice Age National Scenic Trail and Cross Plains Scientific Reserve Unit (planned for a future National Park).

Although no existing recreational resources were identified on Subsegment B4a (Segment B-North Option), it abuts the Black Earth Creek Wildlife Area – Sunnyside Unit and portions of the surrounding land have been identified as possible future expansion areas for that site.

11.3.5. Airports and airstrips

The Morey Air Field in Middleton is the only airport in this portion of the project area. The end of the runway is approximately 1.8 miles from Subsegment A5, which is proposed to be constructed as a double-circuit 345/138 kV line configuration. FAA expressed a concern related to the expected structure heights that could increase the instrument flight altitude within the terminal areas of Morey Field. There are no horizontal or conical imaginary surface concerns and an existing transmission line is currently near this facility.

If the proposed transmission project is approved using Segment A, new topographical survey data would be collected during the detailed engineering design phase and the necessary modeling to address FAA's concerns would be provided. Solutions and remedies to allay FAA concerns would be discussed, agreed upon, and implemented.

No private airstrips are known to exist near Segment B.

Table 11.3-2 Potentially affected airports or airstrips

Segment A	Segment B
Morey Air Field	

CHAPTER

12

12. Summary and Comparison of Impacts among Route Segments

This chapter provides a summary and comparison of various potential natural resource and social impacts for the segment options, P-N or O, M-K or M-L, J-H or J-I, G-E or G-F, C or D, and A or B. Included in these segment choices are the three common segments that have no alternative, Segments M, J, and G. At the western end and the eastern end of the route, there are two segments options; Segment Options P-east or P-west for Segment P and Segment Options B-north or B-south for Segment B.

12.1. COMPARISON OF IMPACTS

Expected permanent natural resource impacts for any segment include: loss or degradation of natural communities and rare species habitat; upland forest clearing; loss of wooded wetlands and conversion to an open wetland type; loss of wetland or agricultural acreage due to structure placements; and aesthetic effects on natural resource properties. Additionally, community resource impacts would include impacts on existing land uses, archeological or historical resources; changes in recreation opportunities; and proximity to residences.

12.1.1. Segments P-N or O

ROW Length and Corridor Sharing

While both route options Segment P-N or Segment O cross multiple landscapes and natural communities, these extremely long segments would create very different types of impacts. Overall, Segment P-N is approximately 32 percent longer than Segment O; Segment P-N is approximately 112 miles requiring 1,600 acres of ROW and Segment O is 85 miles long requiring 1,350 acres of ROW. Another significant difference is in the amount of corridor sharing that would occur; approximately 71 percent of the ROW for Segment P-N (1,400 acres) would overlap existing utility or road ROWs; approximately 35 percent of Segment O (475 acres) would overlap existing utility or road ROWs.

The quality of the shared corridors differs significantly between Segments P-N and O. For most of its length, Segment P-N minimizes impacts on private properties by overlapping a portion of its ROW with prominent corridors, initially with 100- to 120-foot-wide existing 161 kV transmission ROWs and later with WisDOT interstate ROWs. And although the exact width of the ROW that would be required from private property owners would vary significantly, a substantial portion of the proposed transmission line would make use of these relatively wide corridors that cross the state.

On Segment O, the first third or 23 miles of its length shares ROW with existing prominent corridors, which in this case is WisDOT ROW on USH 53 and I-90. The remaining portion of the segment where corridor sharing occurs, is sporadically routed along narrow rural county roads, existing narrow 69 kV transmission line ROWs, and lastly, having the least potential benefit (if any), short distances along winding local roads.

Table 12.1-1 Segment lengths and ROW required for Segments P-N and O

Segment Combinations	Length (miles)	Total ROW Required (acres)	Existing ROW Shared (acres)	New ROW (acres)	Percentage of Shared ROW
P-west, P, and N	112.7	1,601.5	1,139.8	461.7	71.2
P-east, P, and N	112.0	1,587.2	1,142.4	444.8	71.9
O	85.4	1,354.1	474.9	879.3	35.1

Segment P-N leaves Briggs Road Substation along either Option P-west or Option P-east which then connects to the common portion of Segment P (Subsegment P9 and P10) and Segment N. Option P-west is mostly new ROW, whereas Option P-east overlaps WisDOT ROW, paralleling the approved CapX 345 kV transmission line (docket 05-CE-136).

Table 12.1-2 Segment lengths and ROW required for Segment Options P-west and P-east

Segment Options	Length (miles)	Total ROW Required (acres)	Existing ROW Shared (acres)	New ROW (acres)	Percentage of Shared ROW
P-west	4.3	64.4	26.3	38.1	40.8
P-east	3.8	50.0	29.0	21.1	58.0

Community Impacts

Segment Option P-west impacts more homes than P-east but fewer apartment buildings.

Segment O, despite its shorter length impacts slightly more residences and significantly more apartment buildings than either version of Segment P-N. While Segment O crosses through large agricultural areas with low population densities, it also crosses through some of the most densely populated areas of Onalaska. More acres of agricultural land are crossed by Segment O than Segment P-N and agriculture represents a larger percentage of the area within the ROW, despite Segment O's shorter length.

Table 12.1-3 Potential impacts to residences and apartments for Segment Options P-west and P-east

Segment Options	Distance to Proposed Centerline				Total
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	
P-west	0	0	14	11	25 homes
P-east	0	3 homes 4 apt. units (2 bldgs.)	5 homes 121 apt. units (3 bldgs.)	4 homes 16 apt. units (4 bldgs.)	12 homes 141 apt. units (9 bldgs.)

Table 12.1-4 Potential impacts to residences and apartments for Segments P-N and O

Segment Combinations	Distance to Proposed Centerline				Total
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	
P-west, P and N	2	5	47 4 apt. units	92 4 apt. units	146 homes 8 apt. units (2 bldgs.)
P-east, P and N	2	5 4 apt. units	38 125 apt. units	85 and 20 apt. units	133 homes 149 apt. units (11 bldgs.)
O	0	8 26 apt units	20 16 apt. units	123 96 apt. units	151 homes 138 apt. units (59 bldgs.)

Table 12.1-5 Potential agricultural impacts for Segments P-N and O

Segment Combinations	Total ROW (acres)	Agricultural Land (acres)	Percentage of ROW in Agriculture
P-west and N	1,601.5	364.5	22.8
P-east and N	1,587.2	339.1	21.4
O	1,354.1	503.7	37.2

While Segment P-N crosses near or along the edges of several urban areas, several unique community resources are crossed by Segment O that may require consideration. These include the Amish communities and a Buddhist retreat.

The proposed project may present some issues of concern for a few airstrips and airports near the proposed segments. For Segment P-N, the Holland Airpark, the Parkway Farm Strip, Blair Airstrip, and Lewis Airstrip may be impacted by the proposed project. Along Segment O, the La Crosse Municipal Airport would require a new no-hazard determination from FAA prior to the start of construction.

Environmental Impacts

Due to the substantial amounts of new ROW required for Segment O and the topography that the segment crosses, significantly more upland woods would be clear-cut than on Segment P-N. However the acreage of potentially impacted forested wetlands is much greater on Segment P-N.

Table 12.1-6 Woodland impacts for Segments P-N and O

Segment Combinations	Upland Woods Cleared (acres)	Forested Wetland Cleared (acres)	Total Forest Area Cleared (acres)
P-west, P and N	228.8	69.9	298.7
P-east, P and N	233.3	69.9	303.2
O	314.0	19.9	333.9

Regarding wetlands and waterways, Segment P-N crosses and potentially impacts far more acres of wetlands and a greater number of waterways than Segment O. Segment P-N crosses several large river valleys including the Black River, Trempealeau River, and the Lemonweir River; some of which have areas of associated wetlands.

Table 12.1-7 Potential wetland impacts for Segments P-N and O

Segment Combinations	Forested Wetland				Non-Forested Wetland			Total Wetland Impact (acres)	Significant/ High-quality Wetlands
	Existing Shared ROW Not Cleared* (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Forested Wetland Impact (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Non-Forested Wetland Impact (acres)		
P and N	18.6	31.2	51.3	82.5	108.0	83.0	191.0	273.5	52
O	2.2	3.1	17.7	20.8	24.0	74.6	98.6	119.4	14

Table 12.1-8 Potential impacts to waterways for Segments P-N and O

Segment Combinations	Waterway Crossings	ASNRI Waterway Crossings	TCSBs Required	TCSBs Over ASNRIs Waterways
P and N	133	43	86	10
O	63	19	44	10

12.1.2. Segments M-K or Segment M-L

Row Length and Corridor Sharing

Segment M is a short common segment routed along the interstate. Combined with either Segments K or L, there is little difference in the length of the segments, or the degree of ROW sharing between the two Segment Combinations M-K and M-L. Segment K is located along the interstate and Segment L is primarily located along a railroad.

Table 12.1-9 Segment lengths and ROW required for Segments M-K and M-L

Segment Combinations	Length (miles)	Total ROW Required (acres)	Existing ROW Shared (acres)	New ROW (acres)	Percentage of ROW Shared
M and K	7.5	108.6	60.4	48.1	55.6
M and L	7.6	109.8	50.9	58.8	46.4

Community Impacts

There are very few residences located along either segment combination.

Table 12.1-10 Potential impacts to residences for Segments M-K and M-L

Segment Combinations	Distance to the Proposed Centerline				
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	Total
M and K	0	0	0	0	0
M and L	0	0	0	4	4

Only a small portion of these segments cross agricultural fields. No significant impacts to owners of farmed land are anticipated along Segments M-K or M-L.

Table 12.1-11 Potential agricultural impacts for Segments M-K and M-L

Segment Combinations	Total ROW (acres)	Agricultural Land (acres)	Percentage of ROW in Agriculture
M and K	108.6	1.4	1.3
M and L	109.8	1.4	1.3

Environmental Impacts

A significant portion of Segments M, K, and L cross upland woods and would require clear-cutting of trees within the existing ROWs and for ROW expansion. Wetlands and waterways would also be potentially impacted.

Table 12.1-12 Woodland impacts for Segments M-K and M-l

Segment Combinations	Upland Woods Cleared (acres)	Forested Wetland Cleared (acres)	Total Acres Cleared
M and K	35.5	12.8	48.3
M and L	48.0	10.3	58.3

Table 12.1-13 Potential wetland impacts for Segments M-K and M-L

Segment Combinations	Forested Wetland				Non-Forested Wetland			Total Wetland Impact (acres)	Significant/ High-quality Wetlands
	Existing Shared ROW Not Cleared* (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Forested Wetland Impact (acres)	Existing ROW Shared (acres)	New ROW (acres)	Total Non-forested Wetland Impact (acres)		
M and K	1.2	8.9	11.5	20.4	7.3	5.9	13.2	33.6	11
M and L	0	8.0	10.0	18.0	5.5	5.5	11.1	29.1	6

Table 12.1-14 Potential impacts to waterways for Segments M-K and M-L

Segment Combinations	Waterway Crossings	ASNRI Waterway Crossings	TCSBs required	TCSBs Over ASNRI Waterways
M and K	6	4	4	4
M and L	4	4	4	4

12.1.3. Segments J-H or J-I

ROW Length and Corridor Sharing

Segment J is a short common segment routed along the interstate. There is little difference between the lengths of Segments H and I which are both are approximately 24 miles long. There is a significant difference between the new ROW that would be required for both segments; Segment H would require 232 acres of new ROW, while Segment I would require 149 acres of new ROW. While Segment H follows the interstate, it does not always overlap the WisDOT ROW. Segment I crosses through the commercial district of Wisconsin Dells on mostly new ROW but then shares much of its ROW corridor with an existing transmission line and I-39.

Table 12.1-15 Segment lengths and ROW required for Segments J-H and J-I

Segment Combinations	Length (miles)	Total ROW Required (acres)	Existing ROW Shared (acres)	New ROW (acres)	Percentage of ROW Shared
J and H*	24.3	350.0	117.5	232.4	66.4
J and I	24.2	352.2	203.2	148.9	57.7

Community Impacts

Most of the lands crossed by Segment H and the eastern portion of Segment I are properties (private, state, federal) preserved for their natural resource values. Therefore, there are few homes within 300 feet of the centerline of the proposed transmission line.

Table 12.1-16 Potential Impacts to residences for Segments J-H and J-I

Segment Combinations	Distance to the proposed centerline				
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	Total
J and I	0	2	3	20	25
J and H	1	0	0	4	5

Table 12.1-17 Potential agricultural impacts for Segments J-H and J-I

Segment Combinations	Total ROW (acres)	Agricultural Land (acres)	Percentage of ROW in Agriculture
J and H	350.2	69.0	19.7
J and I	352.2	33.7	9.6

Environmental Impacts

Potential natural resource impacts along these segments is a significant issue. Segments H and I parallel each other on either side of the Wisconsin River. The Leopold-Pine Island Important Bird Area (IBA) is also on both sides of the Wisconsin River and thus may be impacted by these segments, which generally border the northern and southern edges of this vast IBA. The IBA is a diverse natural landscape encompassing 16,000 acres of marshlands, grasslands, barrens, floodplain, upland hardwood forests, and agricultural lands. It has been the subject of intensive survey work, management, and wildlife conservation research for decades. It includes large tracts of public land, as well as private lands that have formed a partnership which now collectively manages and advocates for the IBA. The Partnership includes the Leopold Memorial Reserve (Aldo Leopold Foundation), Pine Island State Wildlife Area (DNR), Baraboo River Waterfowl Production Area (USFWS and NRCS), Lower Baraboo River Floodplain Forest (USFWS), Sand County Foundation, Wisconsin Waterfowl Association, the International Crane Foundation (ICF), and various private landowners. Additionally, inside the IBA is the Aldo Leopold Farm and Shack, a designated National Historic Landmark (NHL) with exceptional cultural and national historic value.

Looking at the two combined Segments J-H and J-I, significantly more upland woods would be cleared for construction of the line on Segment J-H versus Segment J-I. Alternatively, more wetlands would be potentially impacted and waterways crossed by Segment J-I than on Segment J-H.

Table 12.1-18 Woodland impacts for Segments J-H and J-I

Segment Combinations	Upland Woods Cleared (acres)	Forested Wetland Cleared (acres)	Total Acres Cleared
J and H	103.8	20.1	123.9
J and I	51.2	16.9	68.1

Table 12.1-19 Potential wetland impacts for Segments J-H and J-I

Segment Combinations	Forested Wetland				Non-Forested Wetland			Total Wetland Impact (acres)	Significant /High-quality Wetlands
	Existing Shared ROW Not Cleared* (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Forested Wetland Impact (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Non-Forested Wetland Impact (acres)		
J and H	1.9	1.9	18.2	20.1	6.3	34.4	40.6	60.7	8
J and I	2.6	2.7	14.3	17.0	54.6	28.3	82.9	98.9	21

Table 12.1-20 Potential impacts to waterways for Segments J-H and J-I

Combined Segments	Waterway Crossings	ASNRI Waterway Crossings	TCSBs Required	TCSBs Over ASNRIs
J and H	12	1	8	0
J and I	19	8	6	0

The IBA Partnership has provided additional information and statements comparing Segments H and I and how the potential impacts from the proposed Badger-Coulee project may affect this culturally and biologically sensitive and significant area. Tables 12.1-21 and 12.1-22 show a comparison of the land cover and land use that would be impacted by new ROW acreage for the two segments and the potential rare species that would require some form of DNR follow-up actions.

Table 12.1-21 Summary of impacts (estimated acreage) of new ROW by proposed route segments

Segment	New ROW (acre)	Residences within 300 ft.	Agriculture (acre)	Prairie/ Grassland (acre)	Wetland (acre)	Upland Forest (acre)	Natural Area Impact (acre)	Open Water
H	215.5	5	60.2	32.6	54.4	60.3	45.1	1.2
I	131.8	25	22	20.9	42.5	25.1	19.1	7.6

Table 12.1-22 Number of endangered resources impacted by proposed route segments

Segment	High-Quality Natural Habitats	Amphibians	Birds	Fish	Invertebrates/ Aquatic	Invertebrates/ Terrestrial	Mammals	Reptiles	DNR Follow-Up Actions
H	0	1	1		2			4	Required
H	18		3	4		4	1		Recommended
I	0	1	2	3	5		1	4	Required
I	14		3	6	2		1	2	Recommended

Segment H impacts more acres of new ROW, agricultural land, prairie/grassland, wetland, upland forest, and a greater number of natural areas compared to Segment I. Segment H also intersects the southern parts of the Leopold-Pine Island IBA (potentially within the viewshed of the Aldo Leopold Shack (NHL) and the Pine Island State Wildlife Area (SWA). It traverses the northeastern edge of Mirror Lake State Park, the northern edge of Fairfield Marsh WPA, the western edge of the Baraboo River WPA, and the eastern edge of the Baraboo Hills IBA. It bisects the southeastern corner of the Baraboo Hills sensitive area and may have potential impacts on a nearby archaeological site. It also crosses the Spring Brook River, Lake Blass, Dell Creek (considered an exceptional resource water and trout stream), and many unnamed tributaries of the Wisconsin River. The majority of this segment follows the I-90/94 corridor and parallels the Wisconsin River. However, the busy interstate corridor already serves as a deterrent for low-flying large birds. If this route segment is ordered, more mitigation options are available for reducing bird collision risk. Mitigation options would include a modification of the proposed transmission configuration to H-frame structures, line marking devices, and additional cooperative land management and research.

Compared to Segment H, Segment I impacts more residences within 300 feet of the centerline, more developed and urban land, and more open water. It crosses the Wisconsin River twice (Subsegments I3 and I13) as well as the Baraboo River, many unnamed tributaries, and an unnamed lake. It bisects the northern and eastern edges of the Leopold-Pine Island IBA and Pine Island Wildlife Area and traverses the eastern edge of the Dells of the Wisconsin River SNA. It also comes into close proximity to a number of archeological and burial sites along the Wisconsin River. The majority of Segment I is proposed to be double-circuited with the existing ATC 138 kV transmission line X-68 and parallels the entire corridor of the Wisconsin River. If ordered, minimal mitigation options are available for this route to reduce bird collision risk because double-circuit lines are not usually compatible with H-frame structure design without constructing side-by-side H-frames that require a much wider cleared ROW.

12.1.4. Segments G-E or G-F

ROW Length and Corridor Sharing

Segment G is another common segment that is routed along the interstate. While the lengths of the segment combinations are comparable, 17 miles for Segment G-E and 19 miles for Segment G-F, there are significant difference in the amount of ROW sharing that would occur on each. Segment F is almost entirely cross-country through a mix of farmland and forests. Segment E is located along the interstate for most of its length.

Table 12.1-23 Segment lengths and ROW required for Segments G-E and G-F

Segment Combinations		Length (miles)	Total ROW Required (acres)	Existing ROW shared (acres)	New ROW (acres)	Percentage of ROW Shared
G and E		17.3	265.3	120.6	144.7	45.5
G and F		19.2	292.9	44.8 (9.8 acres are from local roads)	248.1	15.3

Community Impacts

There is a minor difference between the numbers of homes that would be within 300 feet of the proposed centerline on these segments. However, due to the cross-country nature of Segment F, a number of currently secluded residential properties would be significantly altered by the clear-cutting that would be required through wooded areas. Segment G-F crosses a significantly greater amount of agricultural acreage than Segment G-E

Table 12.1-24 Potential impacts to residences for Segments G-E and G-F

Segment Combinations	Distance to Proposed Centerline				
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	Total
G and E	1	2	4	10	17
G and F	1	4	4	11	20

Table 12.1-25 Potential agricultural impacts for Segments G-E and G-F

Segment Combinations	Total ROW (acres)	Agricultural Land (acres)	Percentage of ROW in Agriculture
G and E	265.3	87.4	32.9
G and F	292.9	140.3	47.9

Environmental Impacts

Much of Segment G-F is wooded and would require more clear-cutting of upland woods and forested wetlands. Wetland impacts along Segment G-F are slightly greater than for Segment G-E. Segment G crosses the Wisconsin River and its side channels.

Table 12.1-26 Woodland impacts for Segments for G-E and G-F

Segment Combinations	Upland Woods Cleared (acres)	Forested Wetland Cleared (acres)	Total Acres Cleared
G and E	18.8	9.7	28.5
G and F	64.5	13.0	77.5

Table 12.1-27 Potential wetland impacts for Segments for G-E and G-F

Segment Combinations	Forested Wetland				Non-Forested Wetland			Total Wetland Impact (acres)	Significant/ High-quality Wetlands
	Existing Shared ROW Not Cleared* (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Forested Wetland Impact (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Non-Forested Wetland Impact (acres)		
G and E	0.9	0.9	8.7	9.6	4.2	10.1	14.3	23.9	7
G and F	0.6	0.6	12.3	12.9	1.2	12.8	14.0	26.9	4

Table 12.1-28 Potential impacts to waterways for G-E and G-F

Segment Combinations	Waterway Crossings	ASNRI Waterway Crossings	TCSBs required	TCSBs over ASNRIs
G and E	11	4	6	0
G and F	10	5	5	1

12.1.5. Segments C or D

ROW Length and Corridor Sharing

Segments C and D are about the same length (15.5 miles), but there is a distinct difference in the amount of new ROW required for the two segments. Segment C requires more than double the acreage of new ROW than Segment D. In addition, more homes are located within 300 feet of the proposed centerline along Segment C than Segment D. The landscape is primarily agricultural along both segments with little difference in agricultural impact between the two Segments.

Table 12.1-29 Segment lengths and ROW required for Segments C and D

Segment	Length (miles)	Total ROW Required (acres)	Existing ROW shared (acres)	New ROW (acres)	Percentage of ROW Shared
C	15.6	227.6	62.6	165.0	27.5
D	15.3	222.7	158.7	64.0	71.3

Table 12.1-30 Potential impacts to residences for Segments C and D

Segment	Distance from proposed centerline				
	0-50 feet	51-100 feet	101-150 feet	151-300 feet	Total
C		1	4	12	17
D		2	2	5	9

Table 12.1-31 Potential agricultural impacts for Segments C and D

Segment	Total ROW (acres)	Agricultural Land (acres)	Percentage of ROW in Agriculture
C	227.6	167.8	73.7
D	222.7	176.0	79.0

Environmental Impacts

There are few natural resource impacts along these Segments.

Table 12.1-32 Woodland impacts for Segments C and D

Segment	Upland Woods Cleared (acres)	Forested Wetland Cleared (acres)	Total Acres Cleared
C	3.5	0.4	3.9
D	2.4	NA	2.4

Table 12.1-33 Potential wetland impacts for Segments C and D

Segment	Forested Wetland				Non-Forested Wetland			Total Wetland Impact (acres)	Significant/ High-quality Wetlands
	Existing Shared ROW Not Cleared (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Forested Wetland Impact (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Non-Forested Wetland Impact (acres)		
D	0	0	0	0	1.6	0.6	2.2	2.2	0
C	0	0	0.4	0.4	5.5	17.6	23.1	23.5	0

Table 12.1-34 Potential impacts to waterways for Segments C and D

Segment	Waterway Crossings (#)	ASNRI Waterway Crossings (#)	TCSBs Required (#)	TCSBs Over ASNRI Waterways
C	6	3	1	1
D	2	0	1	0

12.1.6. Segments A or B

ROW Length and Corridor Sharing

There are two alternative endings for Segment B, Segment Option B-north and Option B-south. Regardless of the Segment B option considered, Segment A is about half the length of Segment B. Additionally, twice as much new ROW would be required for either Segment B option, than for Segment A.

Table 12.1-35 Segment lengths and ROW required for Segments A and B

Segment Combinations	Length (miles)	Total ROW Required (acres)	Existing ROW Shared (acres)	New ROW (acres)	Percentage of ROW Shared
A	4.6	67.0	26.3	40.7	39.3
B and B-north	7.3	105.7	13.1	92.5	12.4
B and B-south	7.4	107.9	16.6	91.3	15.4

Community Impacts

Slightly more residences would be within 300 feet of the centerline of the proposed project along Segment B than along Segment A. A comparable amount of agricultural land would be crossed by both segments.

Table 12.1-36 Potential impacts to residences for Segments A and B

Segment Combinations	Distance from Proposed Centerline				
	0-50 feet	51- 100 feet	101-150 feet	151-300 feet	Total
A	0	3	1	4	8
B and B-south	0	1	1	8	10
B and B-north	0	0	2	10	12

Table 12.1-37 Potential agricultural impacts for Segments A and B

Segment Combinations	Total ROW (acres)	Agricultural Land (acres)	Percentage of ROW in Agriculture
A	67.0	41.6	62.1
B-north	105.7	37.5	35.5
B-south	107.9	41.7	38.6

Environmental Impacts

Segment A would require very few acres of woodland to be cleared compared to both Segment B options. Similarly, there would be twice the acreage of wetlands would potentially be impacted by Segment B and it would cross more waterways.

Table 12.1-38 Woodland impacts for Segments A and B

Segment Combinations	Upland Woods Cleared (acres)	Forested Wetland Cleared (acres)	Total Acres Cleared
A	3.1	1.0	4.1
B with B-south	34.8	2.4	37.2
B with B-north	37.7	1.6	39.3

Table 12.1-39 Potential wetland impacts for Segments A and B

Segment Combinations	Forested Wetland				Non-Forested Wetland			Total Wetland Impact (acres)	Significant/ High-quality Wetlands
	Existing Shared ROW Not Cleared (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Forested Wetland Impact (acres)	Existing Shared ROW (acres)	New ROW (acres)	Total Non-Forested Wetland Impact (acres)		
A	0.2	0.2	0.8	1.0	1.9	4.3	6.2	7.2	0
B and B-north	0.2	0.2	1.4	1.6	2.2	9.6	11.8	13.4	0
B and B-south	0.1	0.1	2.3	2.4	2.1	8.0	10.1	12.5	0

Table 12.1-40 Potential impacts to waterways for Segments A and B

Segment Combinations	# of Waterways Crossed	# of ASNRIs	# of TCSBs Required	# of TCSBs Over ASNRIs
A	1	0	0	0
B and B-south	6	4	3	3
B and B-north	3	2	0	0

12.2. INDEPENDENT ENVIRONMENTAL MONITORS

Independent Environmental Monitors (IEM) have been required by the Commission in four transmission construction projects: Arrowhead-Weston (docket 5-CE-113), Gardner Park-Central Wisconsin and Morgan-Werner West, also known as GCMW (dockets 137-CE-122 and 137-CE-123), Rockdale-West Middleton (docket 137-CE-147), and CapX (docket 5-CE-136). The Commission determined in each of these dockets that one or more IEMs should be hired due to the scope of the projects, the diversity of landscapes through which the transmission would pass, and the presence of sensitive natural resources. As third-party independent monitors, IEMs report directly to PSC staff, as opposed to either the applicants or construction subcontractors. IEMs were charged with reporting incidents and stopping work, if appropriate, when construction practices violated any applicable permit, approval, order, or agreements issued by regulatory agencies or were likely to cause non-approved impacts to the environment or private properties.

Construction activities that were subject to monitoring and reporting by IEMs included activities that might impact wetlands and bodies of water, habitats and occurrences of protected species, archeological sites, agricultural fields or facilities, state and federal properties, and private property with detailed construction agreements or specific issues, such as organic farming practices or trees valued by the landowner. In these dockets, PSC, DNR, and DATCP staff submitted testimony that an IEM was critical in obtaining a clear and current record of construction activities and environmental protection measures being implemented. The utilities were required to pay the salaries and expenses of IEMs after the costs were reviewed and approved by PSC staff. The IEM's scope of work for these transmission projects varied from complete coverage of all utility construction activities to coverage for only specific areas or specific construction activities based on the specific needs of the project.

To ensure that all sensitive resources along the approved route are identified and appropriate environmental mitigation measures are planned, the PSC has required the applicants to develop a Construction and Mitigation Plan (subject to approval by PSC and DNR staff) prior to the start of construction. Consultation with other regulatory agencies ensured that sensitive sites were identified and would be properly protected. The PSC-approved plans became a useful communication and training tool for the contractors, construction crews, IEMs, and PSC staff and other regulatory agencies. The PSC-approved plans included current contact information, general construction and mitigation practices, specific construction and mitigation measures needed at sensitive resource locations, and maps identifying all pertinent structures and resources. Additionally, during the construction of GCMW and Rockdale-West Middleton, an extranet site was maintained by the utility, which allowed quick and verifiable access to project documentation and utility field reports for regulatory agencies, contractors, subcontractors, and IEMs.

12.3. SUMMARY OF COSTS

The overall cost of the Badger-Coulee Project is expected to range between $540 and $580 million, depending on the final route/segments selected. The cost estimates include substation costs, distribution line relocation costs, and allowance for funds used during construction (AFUDC).

Total project costs for four possible project route alternatives are included in the following table. The table does not include all possible segment combinations. If the Commission were to choose a route not presented in this table, additional cost information would be required from the applicants.

Table 12.3-1 Total project costs for four possible project route alternatives

	Project Route Alternative (not all possible combinations are shown)			
	Segments P with P-west, N, J, H, G, E, D, A	Segments P with P-east, M, K, J, H, G, E, D, A	Segments O, M, L, J, I, G, F, C, B with B-north	Segments O, M, L, J, I, G, F, C, B with B-south
Transmission Line Costs				
Briggs Road Substation to just north of Lyndon Station	$311,160,000	$308,640,000	$254,340,000	$254,340,000
Just north of Lyndon Station to the Wisconsin Dells	$19,200,000	$19,200,000	$19,690,000	$19,690,000
Wisconsin Dells to the town of Caledonia, Columbia County	$61,230,000	$61,230,000	$72,580,000	$72,580,000
Town of Caledonia to the North Madison Substation	$39,330,000	$39,330,000	$47,910,000	$47,910,000
North Madison Substation to the town of Springfield	$47,070,000	$47,070,000	$43,460,000	$43,460,000
Town of Springfield to the Cardinal Substation	$17,340,000	$17,340,000	$21,900,000	$22,090,000
Subtotal Transmission Line Costs	$495,330,000	$492,810,000	$459,880,000	$460,070,000
Substation Costs				
Briggs Road Substation	$7,300,000	$6,470,000	$6,470,000	$6,470,000
North Madison Substation	$7,990,000	$7,990,000	$7,990,000	$7,990,000
Cardinal Substation	$3,990,000	$3,990,000	$3,990,000	$3,990,000
Subtotal Substation Costs	$19,280,000	$18,450,000	$18,450,000	$18,450,000
Subtotal Transmission Line and Substation Costs	$514,610,000	$511,260,000	$478,330,000	$478,520,000
Calculation of Amounts Subject to Impact Fees				
Subtotal Transmission Line and Substation Costs	$514,610,000	$511,260,000	$478,330,000	$478,520,000
Less costs not subject to impact fees[166]	$107,050,000	$105,420,000	$96,210,000	$96,120,000
Subtotal Costs Subject to Impact Fees	$407,560,000	$405,840,000	$382,120,000	$382,400,000
Other Project Costs				
One-time 5.0% Environmental Impact Fee	$20,378,000	$20,292,000	$19,106,000	$19,120,000
Annual 0.3% Impact Fee (Calculated During 2-Year Construction Period Only)	$2,445,400	$2,435,000	$2,292,700	$2,294,400
Allowance for Funds Used During Construction	$27,256,000	$27,098,000	$24,688,000	$24,688,000
Precertification Costs	$15,100,000	$15,100,000	$15,100,000	$15,100,000
Subtotal Other Project Costs	$65,179,400	$64,925,000	$61,186,700	$61,202,400
Total Project Cost	$579,789,400	$576,185,000	$539,516,700	$539,722,400

[166] Described in response to data request item 01.97, PSC REF#: 197427.

Acronyms

Abbreviation or Acronym	Definition
%	Percent
§	Section
AC	Alternating current
ACSS	Aluminum conductor steel supported
AFUDC	Allowance for funds used during construction
ALTE	Alliant Energy
AIS	Agricultural Impact Statement
AMSL	Above mean sea level
APC	Adjusted production cost
ASNRI	Areas of Special Natural Resource Interest
ATC	American Transmission Company LLC
BAU	Business as usual
BFD	Bird flight diverters
BMP	Best management practices
CETF	Citizens' Energy Task Force
ch.	Chapter
CO_2	Carbon dioxide
COA	Conservation Opportunity Area
Commission or PSC	Public Service Commission
CPCN	Certificate of Public Convenience and Necessity
CRP	Conservation Reserve Program
CTH	County Trunk Highway
CUB	Citizens' Utility Board
CVS	Capacity Validation Study
CWA	Clean Water Act
DC	Direct current
DATCP	Department of Agriculture, Trade and Consumer Protection
DSM	Demand-side management
DNR	Department of Natural Resources
DOA	Department of Administration
DPC	Dairyland Power Cooperative
e.g.	*exempli gratia,* for example
EHV	Extra high-voltage
EIS	Environmental impact statement
ELPC	Environmental Law and Policy Center
EMF	Electric and magnetic fields
EMI	Electromagnetic interference
EMR	Eastern Massasauga rattlesnake
END	Endangered species
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
ERF	Electronic Regulatory Filing system
ERW	Exceptional Resource Waters
FAA	Federal Aviation Administration
FCL	Forest Crop Law
FERC	Federal Energy Regulatory Commission
FHWA	U.S. Federal Highway Administration
Focus	Focus on Energy
FSA	USDA Farm Service Agency

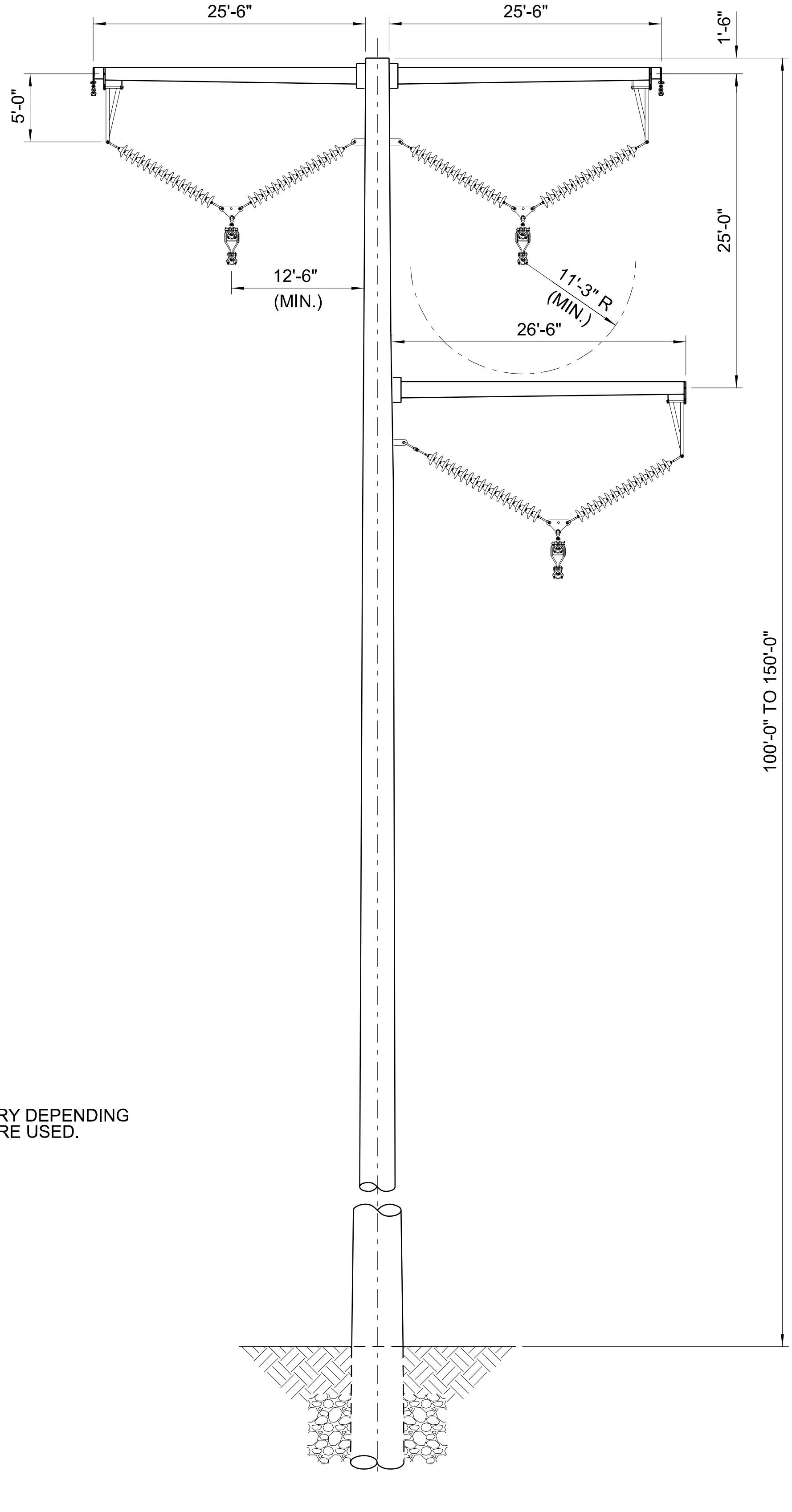
Abbreviation or Acronym	Definition
FTR	Financial transmission rights
G	Gauss
GIS	Geographic Information System
GRR	Great River Road
HCP	Habitat conservation plan
HHI	Herfindahl-Hirschman Index
HNPA	Nolland Neighborhood Preservation Association
HPFF	High-pressure fluid-filled
HPR	High potential range
HV	High-voltage
HVDC	High-voltage direct current
IBA	Important Bird Area
ICD	Implantable cardioverter defibrillators
ICF	International Crane Foundation
i.e.	*id est,* that is
IEM	Independent third-party environmental monitors
ISO	Independent system operators
IWLA	Izaak Walton League of America
kV	Kilovolt – 1,000 volts
kW	Kilowatt
kWh	Kilowatt-hour
LAWCON	Land and Water Conservation
LBA	Load balancing authorities
LG	Limited growth
LMP	Locational marginal pricing
LSE	Load serving entities
MBTA	Migratory Bird Treaty Act
MCVS	Minnesota Capacity Validation Study
MFL	Managed Forest Law
mG	Milligauss
MGE	Madison Gas and Electric Company
MISO	Midwest Independent Transmission System Operator, Inc.
MMG	Multiregional Modeling Working Group
MRO	Midwest Reliability Organization
MTEP	MISO Transmission Expansion Plan
MVA	Megavolt-ampere
MVAC	Mississippi Valley Archeological Center
MVAR	Megavolt-amperes reactive
MVC	Mississippi Valley Conservancy
MVP	Multi-Value Project
MW	Megawatt
MWEX	Minnesota-Wisconsin Export Interface
MWh	Megawatt hour
N-1 contingency	One transmission system element out of service
N-2 contingency	Two transmission system elements out of service
N/A	Not available or not applicable
NEC	National Electrical Code
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Council
NESC	National Electrical Safety Code
NEV	Neutral-to-earth voltage
NHI	Natural Heritage Inventory
NHL	National Historic Landmark
NHPA	National Historic Preservation Act

Abbreviation or Acronym	Definition
NPS	U.S. Department of the Interior National Park Service
NRC	National Research Council
NRCS	Natural Resource Conservation Service
NRPB	National Radiological Protection Board (England)
NSPW	Northern States Power Company-Wisconsin
NTA	Nest tree area
NYMEX	New York Mercantile Exchange
OHWM	Ordinary high water mark
OPGW	Optical ground wire
ORW	Outstanding Resource Waters
PAC	Planning Advisory Committee
Partnership	Leopold-Pine Island IBA Partnership
PNW	Priority Navigable Waterway
PSC or Commission	Public Service Commission of Wisconsin
PSS®E	Power System Simulator for Engineering
PSS®MUST	Power System Simulator for Managing and Utilizing System Transmission
P-V	Power transfer vs. voltage
PVRR	Present value revenue requirements
RE	Robust economy
REA	Rural Electrification Administration
RECB	Regional Expansion Criteria and Benefits
REPS	Wisconsin Rural Electric Power Services
RES	Renewable energy standard
RFI	Radio-frequency interference
RGOS	Regional Generation Outlet Study
RIB	Renewable investment benefit
Rms	Root mean squared
ROW	Right-of-way
RPS	Renewable portfolio standards
RTO	Regional transmission organizations
RUS	Rural Utilities Service
SCADA	Supervisory control and data acquisition
SMARTransmission	Strategic Midwest Area Renewable Transmission
SMMPA	Southern Minnesota Municipal Power Agency
SOUL	Save Our Unique Lands of Wisconsin
sp.	Species (singular)
spp.	Species (plural)
SSR	System Support Resource
STH	State Trunk Highway
SWA	State Wildlife Area
TCSB	Temporary clear span bridges
UMTDI	Upper Midwest Transmission Development Initiative
UPPC	Upper Peninsula Power Company
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USH	U.S. Highway
VA	Volt-amperes
VAR	Volt-amperes reactive
VSAT	Voltage Security Assessment Tool
WBLIG	Wisconsin Business and Labor Intervener Group

Abbreviation or Acronym	Definition
WEC	Wisconsin Electric Power Company
WEPA	Wisconsin Environmental Policy Act
WHS	Wisconsin Historical Society
WSHPO	Wisconsin State Historic Preservation Officer
WHPD	Wisconsin Historic Preservation Database
Wis. Admin. Code	Wisconsin Administrative Code
WisDOT	Department of Transportation
Wis. Stat.	Wisconsin Statutes
WOW	Wind on the Wires
WPA	Waterfowl Production Area
WPPI	Wisconsin Public Power, Inc.
WPSC	Wisconsin Public Service Corporation
WRP	Wetlands Reserve Program
WSTA	Wisconsin State Telecommunications Association
WWA	Wisconsin Wetlands Association
WWI	Wisconsin Wetland Inventory
WWTRS	Wisconsin Transmission Reliability Study

Appendix A – Typical Structure Diagrams

This appendix includes diagrams of the major structural types proposed for the transmission line by the applicants.



NOTE:

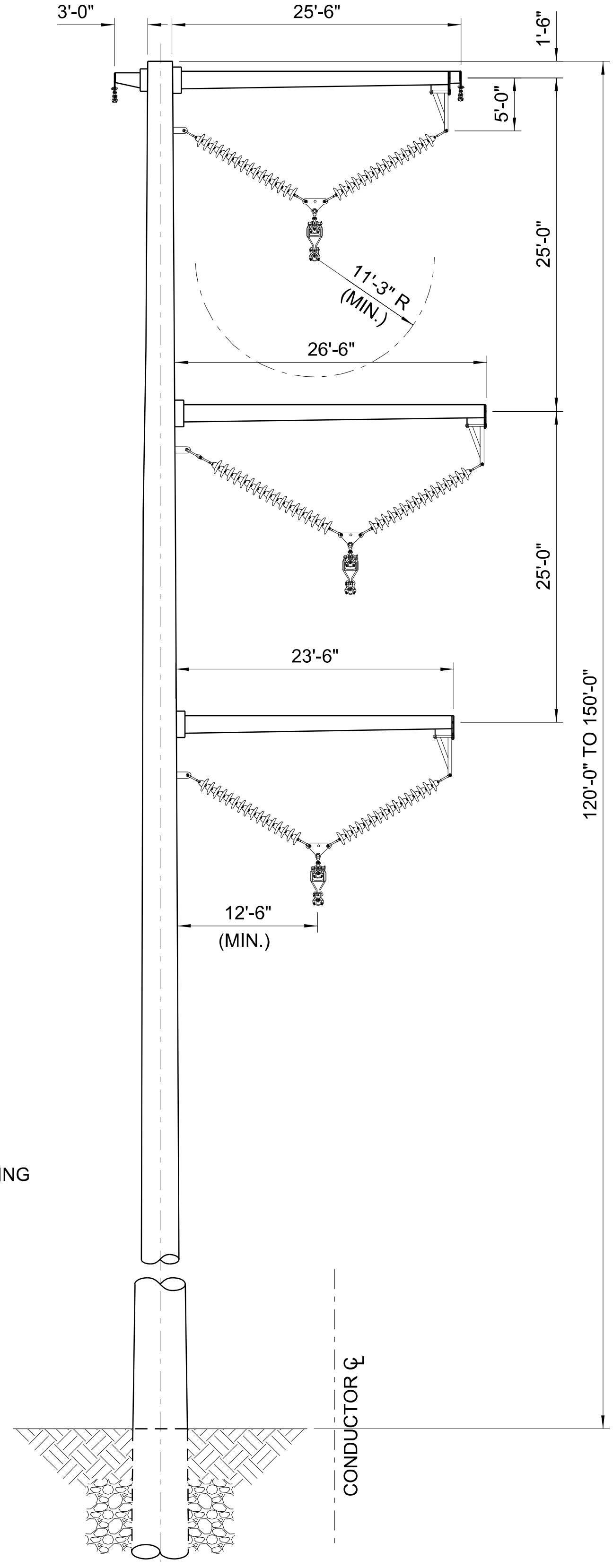
1. DIMENSIONS MAY VARY DEPENDING ON ACTUAL HARDWARE USED.

Appendix A
Figure 1

AMERICAN TRANSMISSION COMPANY

345kV STEEL SINGLE CIRCUIT TANGENT 0°-2.5°
TYPICAL STRUCTURE DRAWING
BADGER COULEE TRANSMISSION LINE

DRAWING No. BCTLP -001



NOTE:

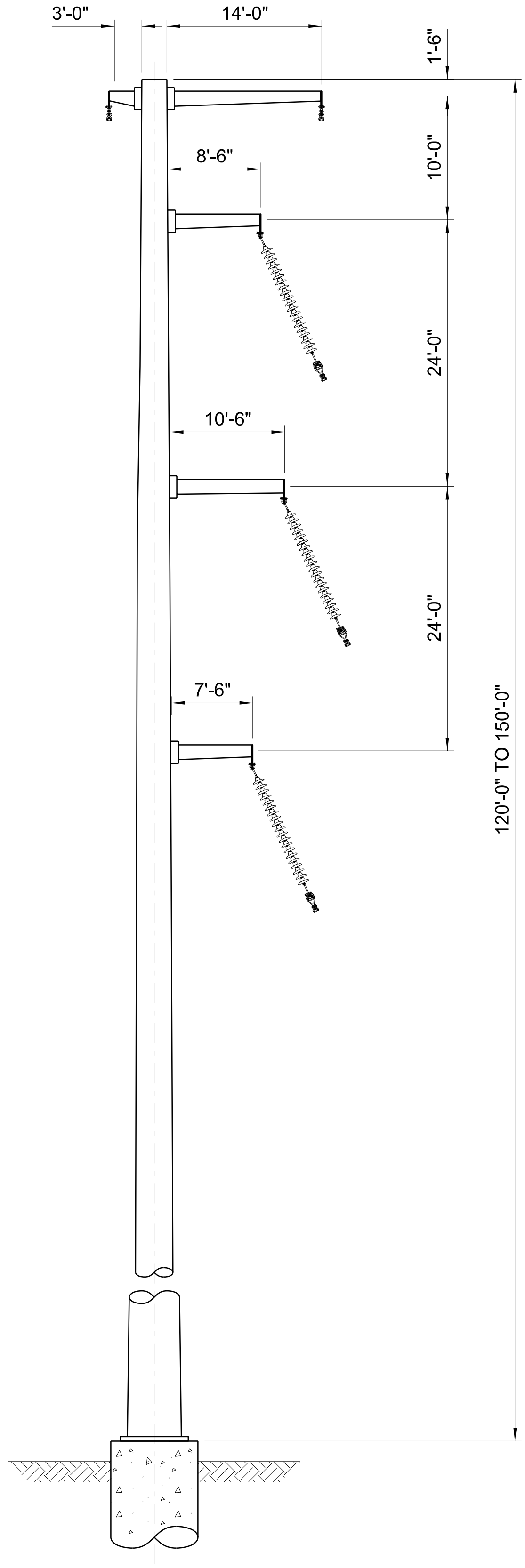
1. DIMENSIONS MAY VARY DEPENDING ON ACTUAL HARDWARE USED.

Appendix A
Figure 2

ATC AMERICAN TRANSMISSION COMPANY

345 kV STEEL SINGLE CIRCUIT VERTICAL TANGENT 0°-2.5°
TYPICAL STRUCTURE DRAWING
BADGER COULEE TRANSMISSION LINE

DRAWING No. BCTLP -002



NOTE:

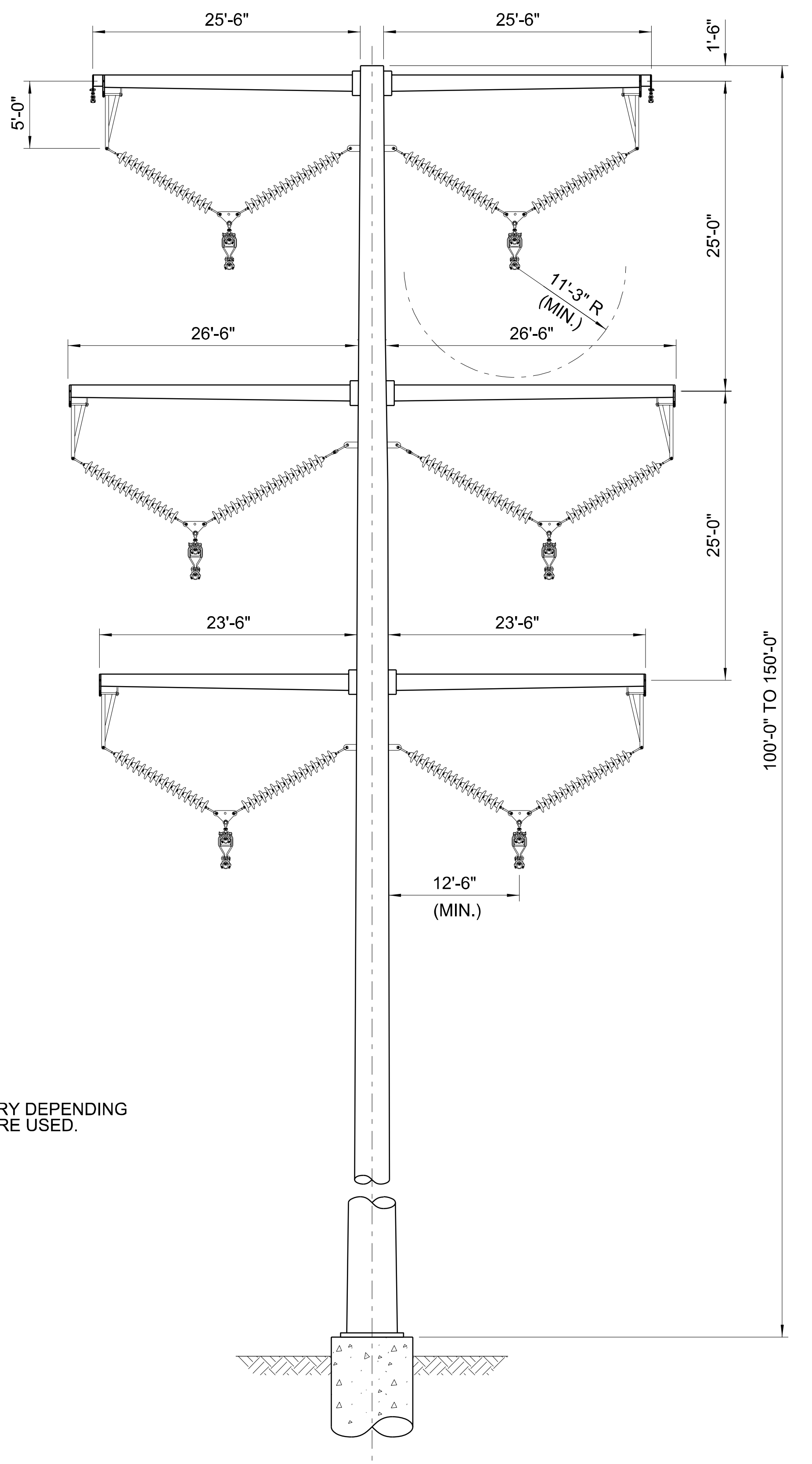
1. DIMENSIONS MAY VARY DEPENDING ON ACTUAL HARDWARE USED.

Appendix A
Figure 3

AMERICAN TRANSMISSION COMPANY

345 kV STEEL SC MEDIUM ANGLE 12°-20°
TYPICAL STRUCTURE DRAWING
BADGER COULEE TRANSMISSION LINE

DRAWING No. BCTLP -011



NOTE:

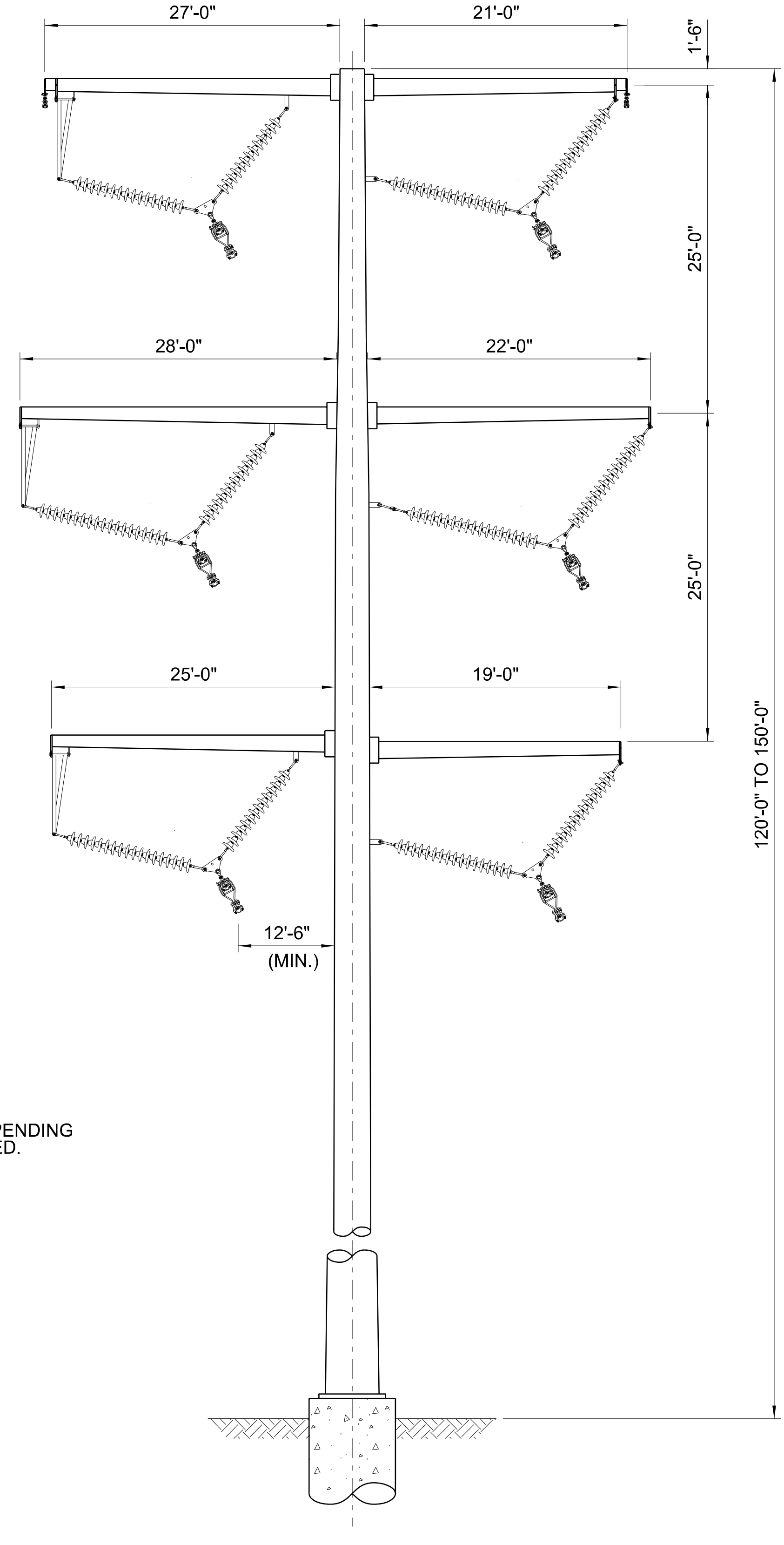
1. DIMENSIONS MAY VARY DEPENDING ON ACTUAL HARDWARE USED.

Appendix A
Figure 4

AMERICAN TRANSMISSION COMPANY

345kV STEEL DOUBLE CIRCUIT TANGENT 0°-2.5°
TYPICAL STRUCTURE DRAWING
BADGER COULEE TRANSMISSION LINE

DRAWING No. BCTLP -003



NOTE:

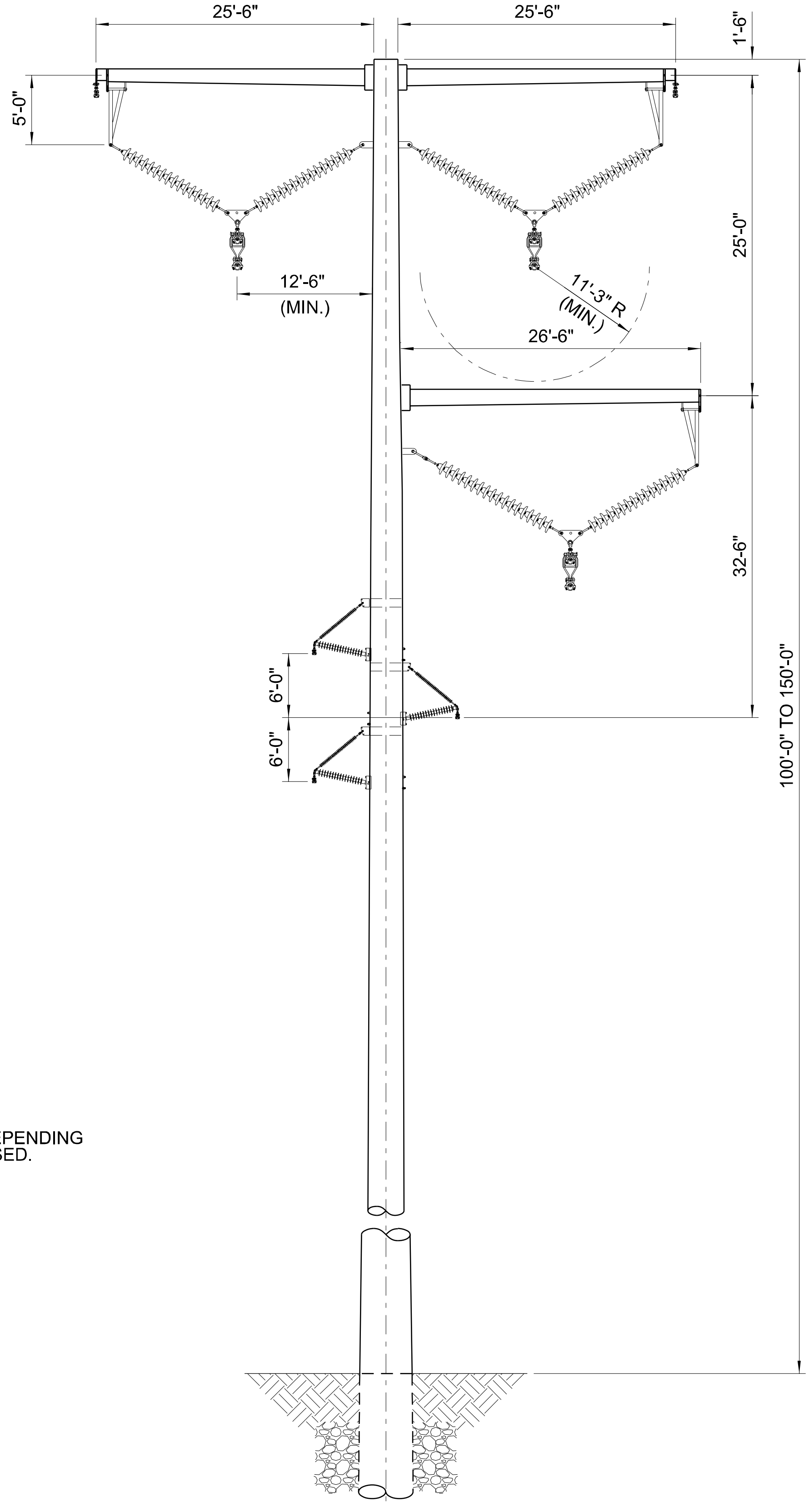
1. DIMENSIONS MAY VARY DEPENDING ON ACTUAL HARDWARE USED.

Appendix A
Figure 5

AMERICAN TRANSMISSION COMPANY

345 kV STEEL DOUBLE CIRCUIT SMALL ANGLE 2.5°-12°
TYPICAL STRUCTURE DRAWING
BADGER COULEE TRANSMISSION LINE

DRAWING No. BCTLP -009



NOTE:

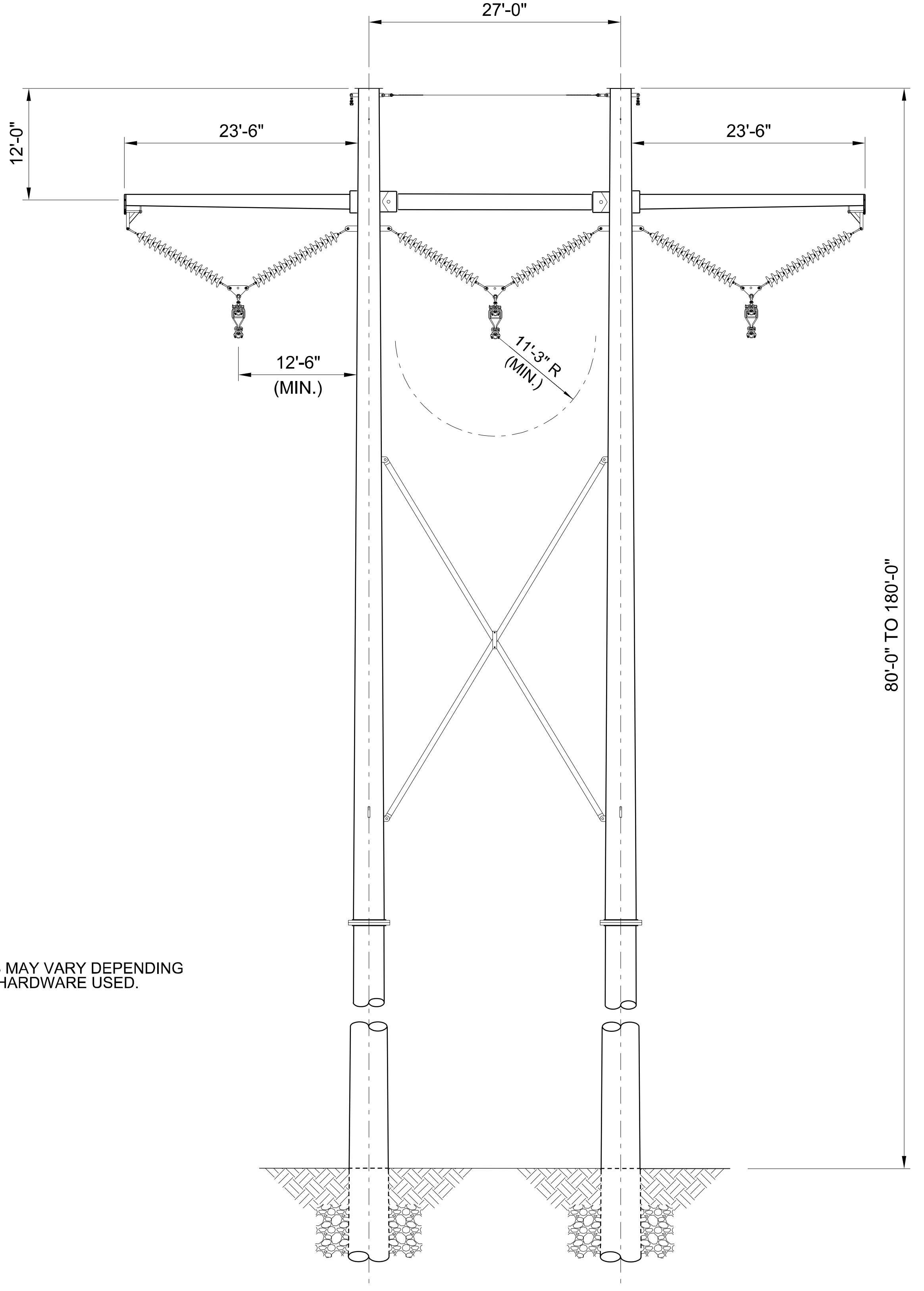
1. DIMENSIONS MAY VARY DEPENDING ON ACTUAL HARDWARE USED.

Appendix A
Figure 6

AMERICAN TRANSMISSION COMPANY

345kV STL SC TAN 0°-2.5° W/69kV UB
TYPICAL STRUCTURE DRAWING
BADGER COULEE TRANSMISSION LINE

DRAWING No. BCTLP -025



NOTE:

1. DIMENSIONS MAY VARY DEPENDING ON ACTUAL HARDWARE USED.

Appendix A
Figure 7

AMERICAN TRANSMISSION COMPANY

345 kV STEEL SINGLE CIRCUIT H-FRAME TANGENT 0°-2.5°
TYPICAL STRUCTURE DRAWING
BADGER COULEE TRANSMISSION LINE

DRAWING No. BCTLP -005

Appendix B – Electric and Magnetic Fields

Appendix B consists of a reproduction of the PSC's informational material about EMF. This material can also be found on the PSC website at http://psc.wi.gov/thelibrary/publications.htm#electric.

EMF
Electric & Magnetic Fields

The Electromagnetic Spectrum

Electricity produces two types of fields, electric and magnetic. These fields are often combined and referred to as electromagnetic fields or EMF. However, the two types of fields are quite different.

Recent scientific studies typically concentrate on the effects of magnetic fields and any potential association with health issues. "EMF" has become the popular short-hand term for magnetic fields.

Electric Fields

Wherever there is electricity, there are electric fields. While magnetic fields are created only when there is a current, electric fields are associated with any device or wire that is connected to a source of electricity, even when current is not flowing or the devise is not turned on.

Electric fields produced by high-voltage electric transmission lines have very little ability to penetrate buildings, or even skin. They are easily shielded by common objects such as trees, fences, and walls. Scientific studies have found no association between exposure to electric fields and human disease.

Magnetic Fields

Magnetic fields are created only when there is an electric current, the motion of electric charges (electrons) in a conductor, such as a wire. The magnitude of a magnetic field is proportional to the current flow through an electric line, not the voltage. As the current increases, so does the magnetic field.

There is no relationship between magnetic field strength and voltage. In the world of electric transmission lines, it is not uncommon for a 69 kilovolt (kV) electric line to have a higher magnetic field than a 115 kV line. High voltage 345 kV lines can carry large currents and as a result may produce relatively high magnetic fields, but primary distribution lines with voltages less than 69 kV can produce fields similar to those measured around a transmission line if they are carrying enough current.

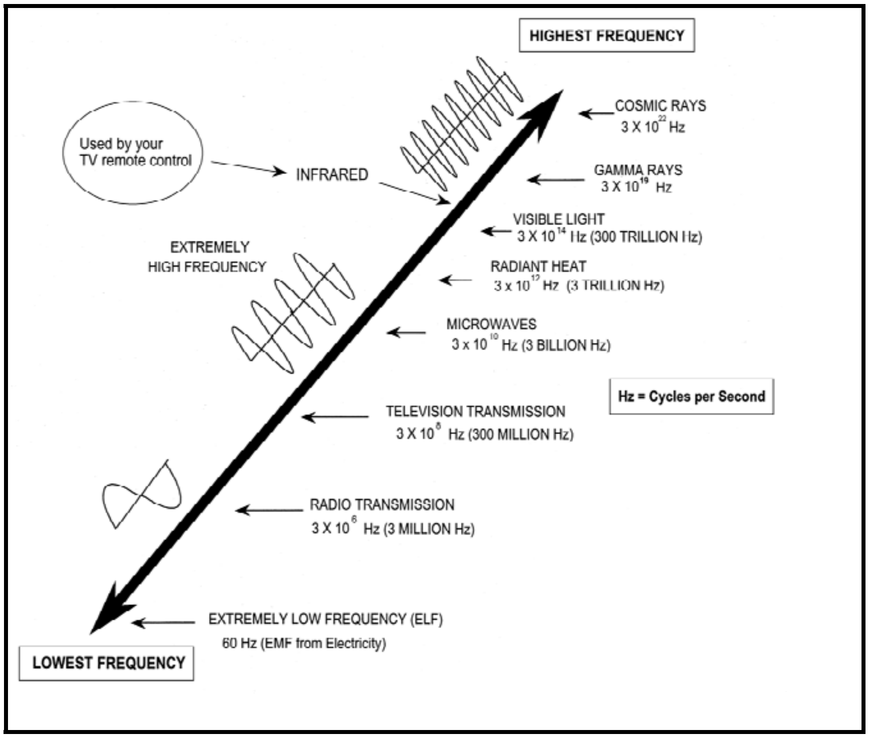
Magnetic fields become weaker rapidly with distance from the source. However, they do pass through most non-metallic materials and are therefore more difficult to shield.

In the literature, magnetic field data are presented in either units of Gauss (G) or Tesla (T). A milligauss (mG) is equal to one-thousandth of a Gauss (G). One Tesla is equal to 10,000 Gauss. A microtesla (μT) is equal to one-millionth of a Tesla or 10 mG.

Types of Radiation

Magnetic fields are part of the electromagnetic spectrum which includes cosmic rays, gamma rays, sunlight, microwaves, radio waves, and heat as illustrated in Figure 1.

Figure 1 Electromagnetic Spectrum



The electromagnetic spectrum is a name given to the range of different types of radiation from low to high frequencies. Radiation is energy that travels and spreads out as it moves away from a source. Visible light that comes from a lamp and radio waves that come from a radio station are two types of electromagnetic radiation. Only the highest frequency electromagnetic radiation, like gamma rays, can break apart DNA and lead to cancer. Low frequency radiations such as microwaves do not have enough energy to break molecular bonds, but can heat food items.

Magnetic fields generated by electric lines are in the extremely-low-frequency (ELF) range of the electromagnetic spectrum. The energy from these magnetic fields is very small. Magnetic fields from appliances and transmission lines cannot break molecular bonds.

Common Levels of Magnetic Fields

Any device that uses electric current creates a magnetic field. Electric appliances such as computers and refrigerators and the wiring that runs through walls and ceilings in homes produce magnetic fields when current is flowing. Table 1 lists sample ranges of magnetic fields for various appliances and tools. For comparison, Table 2 shows typical magnetic fields generated by different types of electric lines. Typical background environmental or ambient magnetic field levels are most often around 1 to 3 mG. Table 3 shows magnetic fields generated by different types of underground transmission lines.

Table 1 Common Sources of Magnetic Fields (mG)[1]

Sources*	Distance From Source	
	6 inches (mG)	24 inches (mG)
Microwave Ovens	100 - 300	1 - 30
Dishwashers	10 - 100	2 - 7
Refrigerators	Ambient - 40	Ambient - 10
Fluorescent Lights	20 - 100	Ambient - 8
Copy Machines	4 - 200	1 - 13
Drills	100 - 200	3 - 6
Power Saws	50 – 1,000	1 - 40

* Different makes and models of appliances, tools, or fixtures will produce different levels of magnetic fields. These are generally-accepted ranges.

Table 2 Typical US Magnetic Field Levels Associated with Overhead Transmission Lines[2]

Overhead Transmission Line Voltages	Usage	Typical Magnetic Field Measurements (mG)				
		Maximum in ROW	Approximate Distance From Centerline (Feet)			
			50	100	200	300
115 kV	Average	30	7	2	0.4	0.2
	Peak	63	14	4	0.9	0.4
230 kV	Average	58	20	7	1.8	0.8
	Peak	118	40	15	3.6	1.6
500 kV	Average	87	29	13	3.2	1.4
	Peak	183	62	27	6.7	3.0

NOTE: These values are for general information and not for a specific line.

[1] National Institute of Environmental Health Sciences (NIEHS) and National Institutes of Health, *EMF: Electric and Magnetic Fields Associated with the Use of Electric Power*, June 2002, pp.33-35, <http://www.niehs.nih.gov/health/topics/agents/emf/>, accessed on April 10, 2013.

[2] World Health Organization (WHO), *Extremely Low Frequency Fields, Environmental Health Criteria Monograph No. 238,* Geneva, World Health Organization, 2007, modified from Table 6, p. 33.

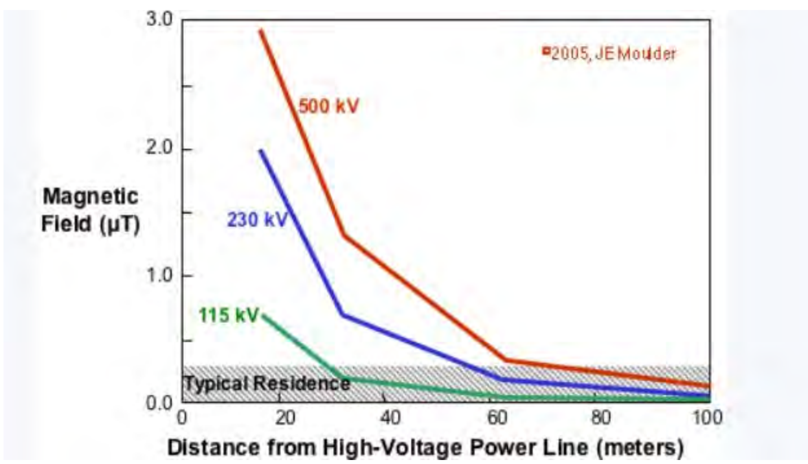
Table 3 Typical Magnetic Field Levels Associated with Underground Transmission Lines in the UK[3]

Underground Transmission Line Voltages	Details	Load	Typical Magnetic Field Measurements (mG) Approximate Distance From Centerline (Feet) 0	16	33	66
132 kV	Single cable at a depth of 1 m	Typical	50	17.8	9.4	4.7
275 kV	Direct buried with 0.5 m spacing and at 0.9 m depth	Maximum	962	131	36	9.2
		Typical	241	33	9.0	2.3

NOTE: While the standard voltages of lines in the UK differ from those used in Wisconsin, the information may be used as general background information and as a comparison with overhead transmission lines.

Since magnetic field levels in the vicinity of transmission lines are dependent on the flow of electric current through them, they fluctuate throughout the day as electrical demand increases and decreases. For overhead transmission lines, the magnetic fields typically range from about 5 to 150 mG, depending on current load, separation of the conductors, and distance from the lines. In general, at a distance of about 300 feet from a transmission line, measured magnetic fields are similar to typical ambient background levels found in most homes[4]. Figure 2 shows a generalized graphic view of how magnetic fields quickly diminish with distance.

Figure 2 Magnetic Field Strength and Distances from Overhead Transmission Lines[5]



[3] WHO, 2007, modified from Table 7 on p.34.
[4] NIEHS, 2002., p. 35.
[5] Medical College of Wisconsin website by John Moulder, *Power Lines and Cancer FAQs,* <http://www.mcw.edu/radiationoncology/ourdepartment/radiationbiology/Power-Lines-and-Cancer-FAQs.htm>, accessed on April 10, 2013.

Health Concerns

After more than three decades of research, there are still concerns among members of the public regarding exposure to elevated magnetic fields and an increased risk of childhood cancers. The concern about power lines and cancer comes largely from studies of people living near power lines and people working in the electrical occupations. Some of these studies appear to show a weak association between exposure and power-frequency magnetic fields and the incidence of some cancers.

Types of Studies

Medical research is of several different types, including epidemiological studies, laboratory studies, and clinical studies.

Epidemiological studies collect data in the real world and draw inferences from the information collected. For medical research, epidemiological studies observe and compare groups of people who have had or have not had certain diseases or exposures to see if the risks to the groups differ. Usually when epidemiological studies show a consistent and strong association to a risk factor, scientists will develop a plausible theory for how such an exposure might cause the disease. This is called a biological mechanism.

Epidemiological studies alone are not sufficient to verify a theory of cause and effect because the results are statistical associations and not direct evidence. To get beyond epidemiological studies and evaluate whether exposure to magnetic fields actually causes health effects, laboratory studies of cells and animals and clinical studies with human volunteers are necessary.

Controlled laboratory studies are conducted at the cellular level and on lab animals to test the hypothesis. In medical laboratory studies, the researchers take total control over study conditions to try to determine the actual biological mechanisms of how potential agents like magnetic fields can cause disease.

Clinical studies make use of the theories of biological mechanisms, and perhaps the laboratory testing results, to try to quantify effects on persons. In clinical studies, human volunteers are tested with different treatments to measure the actual effects on them accurately. For studies of EMF effects, medical researchers use controlled exposure rates on volunteers to look for measurable changes such as brain activity and hormonal levels.

Epidemiological Studies

In 1979, an epidemiology study by Wertheimer and Leeper[6] reported a statistical association between "wire codes" and childhood cancers in certain neighborhoods of Denver, Colorado. The term, "wire code" referred to the physical size of the power line which was assumed to be related to current flow of the line and thus a good surrogate measurement for the magnetic field. No magnetic field measurements were ever conducted for this study. Because the size of a line is not related to the magnetic field, subsequent studies have been tried to determine if there is any validity to the relationship stated in the Wertheimer/Leeper study. A multitude of increasingly sophisticated laboratory and correlative studies have investigated the potential association for more than 30 years.

[6] N.W. Wertheimer and Leeper, E., "Electric Wiring Configurations and Childhood Cancer", *Am. J. Epidem.*, Vol. 109, 1979, pp. 273-284.

Epidemiological studies are field studies. Unlike laboratory research where investigators have total control over study conditions, epidemiologists observe the world as it is. They draw inferences from information observed or collected about a study population's life, habits, and exposure to environmental factors. Because of this limitation, epidemiological studies suffer from a number of inherent weaknesses which may include issues associated with sample size, sample biases, and confounding factors. It is not uncommon for published studies to be criticized for weaknesses in study design or faulty conclusions. Additionally, particularly in regard to the study of EMF impacts, there is a problem with the lack of unexposed populations (control group) that can be compared to exposed populations. Everyone is exposed to some level of magnetic fields from household appliances and existing electric lines.

Most public and scientific attention has focused on childhood leukemia with lesser attention given to adult leukemia, childhood and adult brain cancer, lymphoma, and overall childhood cancer. Some epidemiological studies used a combination of the type of wiring and the distance to a residence as means of quantifying exposure, as the Wertheimer/Leeper study did, to see if level of exposure varied with the occurrence of cancer. Other studies used distance from transmission lines or substations as measures of exposure, and some studies have used contemporary measured fields or calculated fields. In general, the different methods of exposure assessment do not agree with each other, and there is no one method of exposure assessment common to all the major studies.

One set of epidemiological studies has involved research of potential links between the occurrence of adult cancers and EMF exposure in electrical workers. The assumption is that electrical workers present a larger population than children with leukemia and they may be routinely exposed to higher levels of magnetic fields for longer periods of time. However in some of these studies, there were no consistent dose-response relationships. They were studies based on job titles and not on measured exposures.

Laboratory Studies

Laboratory studies have been conducted to look at the possibility of genetic mutations from magnetic fields because genetic mutations are at the root of the development of cancers like leukemia.

Cellular genotoxicity studies look at the properties of an agent that might damage the genetic information within a cell and cause mutations, which may lead to cancer. There have been many published cellular studies, examining many types of cells from plasmids and bacteria to human cells. A wide range of exposure conditions and field intensities have been assessed looking for a plausible biological mechanism to explain how EMF might cause disease in the human body.

Whole-animal laboratory studies are used to determine whether or not exposure does indeed lead to disease. Animals can be exposed to elevated levels of an agent under strictly controlled conditions for long periods of time and then carefully examined for an increase in tumors, pre-cancerous effects, and cancer. The usefulness of laboratory animal work for assessing toxicity depends on how well the work is done, what care is given to the animals, and whether the results are reproducible.

Clinical Studies

Clinical studies with human individuals rely on volunteers in a last step toward determining the degree of an agent's ability to cause disease. Clinical studies have varying degrees of rigor and can depend in part of how the volunteer study participants cooperate with the researchers as well as the researchers' control over the volunteer participants.

Participating Organizations

More than 25,000 scientific epidemiological, occupational safety, laboratory animal and cellular studies have been published. In addition there have been numerous reviews of the available research from various respected national and international organizations. A short list of the countries and organizations that have participated include:

American Cancer Society (ACS)
American Industrial Hygiene Association (AHA)
American Medical Association (AMA)
British Columbia Center for Disease Control
European Union
Health Canada
Institute of Electrical and Electronics Engineers (IEEE)
International Agency for Research on Cancer (IARC)
International Commission on Non Ionizing Radiation Protection (ICNIRP)
National Cancer Institute (NCI)
National Institute of Environmental Health Sciences (NIEHS)
Netherlands Health Council (NHC)
World Health Organization (WHO)

A list of all EMF studies to-date would be too numerous for our purposes, but a list of useful links to studies and organizations can be found at the end of this publication. There is also a summary of the findings from scientific organizations on EMF and its potential health effects.

The Results

Childhood leukemia is a relatively rare disease and its causes are not well understood despite decades of research. On average, 1 to 2 children develop the disease each year for every 10,000 children in the United States.[7] Overall though, it is still the most common type of childhood cancer, amounting to 30 percent of all cancers diagnosed in children younger than 15 years. Because the disease is very serious, researchers continue to study a wide range of subjects looking for causes and for the most effective treatments.

In order to have confidence that an exposure agent is actually linked to human disease, scientists look for strong and consistent associations from epidemiological research. In the cases of electric and magnetic fields, the studies have found only weak association, or no association, between exposure and the incidence of some cancers. In addition, study outcomes are not consistent. A large number of studies show no association between transmission lines and cancers. In contrast, the vast majority of epidemiological studies on cigarette smoking have showed a strong positive association between cigarette smoking and lung, neck, and throat cancer.

Science cannot prove a negative, so magnetic fields cannot be proven to have no effect and be safe. However, so far, science has not been able to prove the positive either, that magnetic fields do have an effect -- no published power-frequency exposure study has shown a statistically-significant dose-response relationship between measured magnetic fields and cancer rates, or between distances from transmission lines and cancer rates.

[7] National Cancer Institute at the National Institutes of Health, National Cancer Institute Factsheet, Childhood Cancers, <http://www.cancer.gov/cancertopics/factsheet/Sites-Types/childhood>, accessed April 10, 2013.

Overall, most scientists are convinced that the evidence that power line fields cause or contribute to cancer is weak to nonexistent. The biological studies conducted to-date has not been able to establish a cause-and-effect relationship between exposure to magnetic fields and human disease. Scientists have been unable to identify any plausible biological mechanism by which EMF exposure might cause human disease. There is a general consensus within the scientific community that exposure to EMF is not responsible for human disease. In summary:

- There is no documented cancer linked to EMF exposure.[8]
- There is little evidence that magnetic fields cause childhood leukemia, and there is inadequate evidence that magnetic fields cause other cancers in children.[9]
- Studies of adults' magnetic field exposure from power lines show little evidence of an association with leukemia, brain tumors, or breast cancer.[10]
- Whole animal exposure studies have not shown evidence that long-term exposure to EMF causes cancer, and no link has been found to leukemia, brain cancer, and breast cancer.[11]
- For power line magnetic fields below 500 mG, no plausible mechanisms have been identified by which biological effects can be caused in living systems. [12]

Regulation of Magnetic Fields

Public Service Commission of Wisconsin

The Public Service Commission of Wisconsin (PSCW or Commission) actively monitors research on EMF and its potential for causing human health effects. Consideration of magnetic field exposures is a regular part of the review process for electric utility construction cases. Transmission and substation construction applications must contain several types of information that relate to magnetic fields.

A utility must provide estimates of magnetic fields that would be generated by a proposed transmission line. The estimates are specific to the proposed voltage, line configuration and peak power flows during the first year of operation and after ten years of operation. In its application, a utility must report the number and type of buildings within 300 feet of a proposed centerline, including schools, hospitals, and daycare centers.

Commission staff checks and verifies the utility's calculations of the estimated magnetic fields. This information is then available to the public and considered by the Commission in its route selection decisions.

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[8] Michael P. Halpin, P.E., Florida Department of Environmental Protection, *Transmission Lines – Electric and Magnetic Fields (EMF)*, presentation, <http://www.dep.state.fl.us/siting/files/application/ppsa/turkey_pt/emf_presentation.pdf>, website accessed April, 10, 2013.

[9] National Cancer Institute Factsheet, <http://www.cancer.gov/cancertopics/factsheet/Risk/magnetic-fields>, accessed April, 10, 2013.

[10] Ibid.

[11] Medical College of Wisconsin, 2006.

[12] Robert K. Adair, "Constraints on Biological Effects of Weak Extremely-Low-Frequency Electromagnetic Fields," *Phys Rev A*, January 1991, Vol. 43, Issue 2, pp. 1039-1048.

Other Regulations and Guidelines

Limits established by national and international professional organizations are well beyond the range of magnetic fields typically generated by transmission lines. In 2002, the Institute of Electrical and Electronics Engineers (IEEE), a professional group, published a public exposure guideline of 9,040 mG.[13] In 2010, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) revised its reference levels for public exposure for magnetic fields in the 60 Hz range, and recommended that magnetic fields to not exceed 2,000 mG[14]. In the US, there are no federal standards at all limiting occupational or residential exposure to power line EMF.

Some other states, particularly Florida and New York, have standards or guidance documents related to magnetic fields produced by transmission power lines. Florida limits magnetic fields at the edge of the ROW to 150 mG for transmission lines with voltages of 69 kV through 230 kV. For lines greater than 250 kV, the limit is 200 mG. Double-circuited 500 kV lines and lines greater than 500 kV may not exceed 250 mG, also at the edge of the ROW.[15] New York has a policy that requires transmission lines to be designed, constructed and operated so that magnetic fields at the edges of the ROW will not exceed 200 mG.[16]

The California Public Utility Commission requires utilities to apply no- or low-cost EMF reduction techniques to new or upgraded transmission facilities.[17]

Mitigation of Magnetic Fields

One method to lower the public's exposure to the magnetic fields generated by transmission lines is to increase the distance of the conductors from the public. The fields decrease drastically with distance. The magnetic field level at 300 feet or more from a transmission line centerline should be similar to local ambient, or background, levels. Increasing the height of any transmission structure thus lowers any resulting exposure levels.

Another common method to reduce magnetic field exposure to the public is to bring the lines (conductors) closer together. The magnetic fields interfere with one another, producing a lower overall magnetic field level. The conductors can be brought closer together by using different types of structures or double-circuiting two lines on the same structures (see Figure 3). However, there are electrical safety limits to how close together conductors can be placed. Conductors must be far enough apart so that arcing cannot occur and so that utility employees can safely work around them. Additionally, the closer conductors are to one another, the closer together poles must be constructed. Increasing the number of poles per mile increases private property land impacts and costs.

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[13] Institute of Electrical and Electronics Engineers (IEEE), *C95.6-2002 IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields 0 to 3 kHz*. New York, IEEE, 2002 <http://standards.ieee.org/findstds/standard/C95.6-2002.html>, accessed on April 10, 2013.

[14] International Commission on Non-Ionizing Radiation Protection (ICNIRP), *Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1 Hz - 100 kHz)*. Health Physics, Vol. 99, No. 6, November 2010, p. 3, <http://www.icnirp.de/documents/FactSheetLF.pdf>, accessed on April 10, 2013.

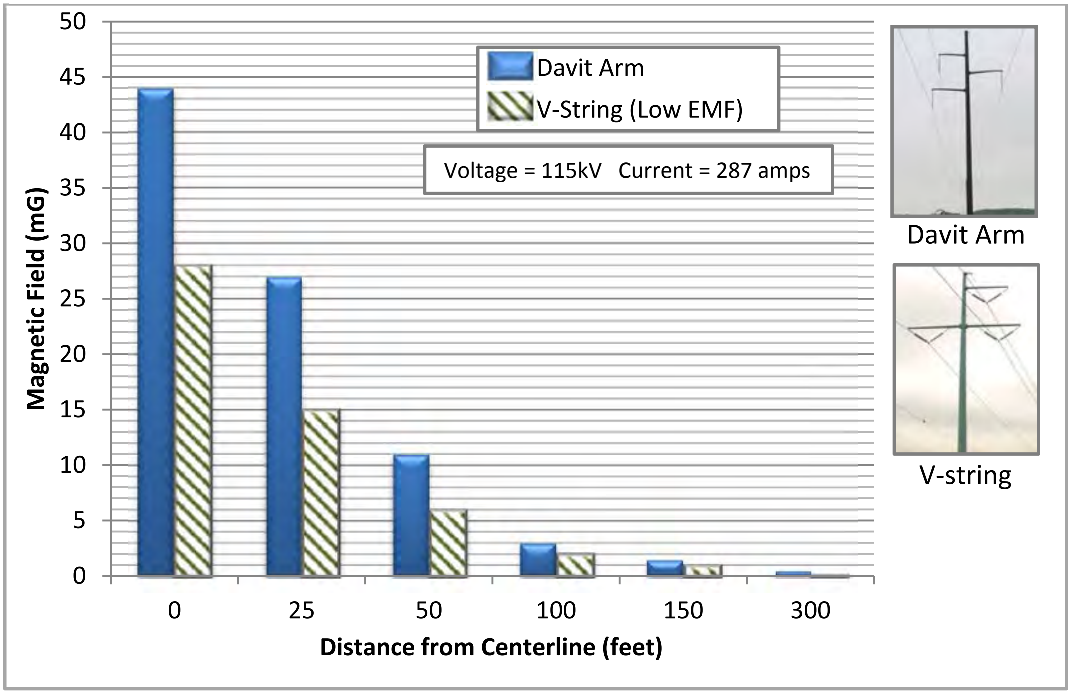
[15] Florida Administrative Code 62-814.450.

[16] State of New York Public Service Commission, *Statement of Interim Policy on Magnetic Fields of Major Electric Transmission Facilities, Cases 26529 and 26559*, Issued and Effective September 11, 1990.

[17] California Public Utility Commission, CPUC Decision D.93-11-013.

Burying transmission lines can also reduce magnetic fields because the underground lines can be installed closer together than overhead lines. Overhead lines need to be further apart because air is used as an insulator, but underground cables be insulated with rubber, plastic, or oil. Underground transmission lines are typically three to five feet below ground. While magnetic fields can be quite high directly over the line, magnetic fields on either side of an underground line decrease more drastically with increased distance than magnetic fields from an overhead line.

Figure 3 Sample EMF for Two Types of Transmission Structures



Sources of Information

The following organizations and websites contain detailed information about EMF and transmission lines along with links to published research.

International Commission on Non Ionizing Radiation Protection
http://www.icnirp.de/PubEMF.htm

Medical College of Wisconsin
http://www.mcw.edu/radiationoncology/ourdepartment/radiationbiology/Power-Lines-and-Cancer-FAQs.htm

National Cancer Institute (NCI)
http://www.cancer.gov/cancertopics/factsheet/Risk/magnetic-fields

National Institute of Environmental Health Sciences (NIEHS)
http://www.niehs.nih.gov/health/topics/agents/emf/

US EPA
http://www.epa.gov/radtown/power-lines.html

World Health Organization (WHO)
http://www.who.int/peh-emf/en/

Summaries of Scientific Consensus Group Assessments of EMF and Health Effects[18]

Scientific Group	Endpoints Considered	Overall Conclusions	Level of Concern
American Cancer Society (ACS)	cancer	[EMF] not proven to cause cancer	low
American Conference of Governmental Industrial Hygienists (ACGIH)	health	insufficient information on human responses and possible health effects of magnetic fields in the frequency range of 1 Hz to 30 kHz to permit the establishment of a threshold limit value for time-weighted exposures	low
American Industrial Hygiene Association (AIHA)	health	insufficient evidence of human health risk at EMF levels below ICNIRP guidelines	low
American Medical Association (AMA)	cancer/health	no scientifically documented health risk associated with the usually occurring levels of electromagnetic fields	low
American Physical Society (APS)	cancer/health	conjecture relating cancer to power line fields has not been scientifically substantiated	low
Australian Radiation Protection and Nuclear Safety Agency (ARPNSA)	health	no evidence that prolonged exposures to weak EMF result in adverse health effects	low
British Columbia Center for Disease Control (BCCDC)	health	no evidence yet to support the assumption that adverse health effects from exposure to current residential and occupational levels pose a risk to human health	low
British National Radiation Protection Board (NRPB), now health Protection Agency (HPA)	health	recommend ICNIRP EMF limits; apparent increased incidence of childhood leukemia at >4 mG, but weak evidence does not justify causality; no evidence of other health effects	low
Committee on Man and Radiation	health	balance of evidence is against the fields encountered by the public being a cause of cancer or any other disease	low
European Union (EU)	cancer/health	overall evidence for EMF to produce childhood leukemia is limited; no suggestions of any other cancer effects	low
Health Canada (HC)	health	no conclusive evidence of any harm caused by exposures at levels normally found in residential and work environments	low
Institution of Electrical Engineers (IEE)	health	not enough scientific evidence to indicate that harmful effects occur in humans due to low-level electromagnetic field exposure	low
Institute of Electrical and Electronics Engineers (IEEE)	health	the low-frequency standard IEEE C95.6 is leading standard worldwide on protection against ELF exposure to human beings; basic restrictions based on current biological knowledge; IEEE standards also adopted by the International Committee on Electromagnetic Safety (ICES)	low
International Agency for Research on Cancer (IARC)	cancer	limited convincing evidence in humans for childhood leukemia; inadequate evidence in humans for all cancers	low / med
International Commission on Non Ionizing Radiation Protection (ICNIRP)	health	no convincing evidence for carcinogenic effects of EMF; data cannot be used to set guidelines; ICNIRP guidelines are not based on cancer risks	low
Medical College of Wisconsin (MCW)	health	evidence that power line fields cause or contribute to cancer seen by most scientists as weak to nonexistent	low
National Academy of Sciences / National Research Council (NRC)	cancer/health	body of evidence has not demonstrated that exposures to EMF are a human-health hazard	low
National Cancer Institute (NCI)	cancer (breast)	no association between exposure to EMF and breast cancer in Long Island	low
National Cancer Institute (NCI)	cancer (leukemia)	little support for hypothesis that EMF is related to risk of childhood leukemia	low
National Institute of Environmental Health Sciences (NIEHS)	health	weak evidence for possible health effects from EMF; but they cannot be ruled out, especially epidemiological associations with childhood leukemia	low

[18] State of Connecticut, Connecticut Siting Council, "*Current Status of Scientific Research, Consensus, and Regulation Regarding Potential Health Effects of Power-Line Electric and Magnetic Fields (EMF)*", January 2006, modified from Appendix A.

Summaries of Scientific Consensus Group Assessments cont'd

Scientific Group	Health Endpoints Considered	Overall Conclusions	Level of Concern
National Toxicology Program (NTP)	cancer	no increased neoplasm incidences at sites in highly exposed rats and mice for which epidemiology studies have suggested an association with EMF	low
Netherlands Health Council (NHC)	cancer	adheres to its previously expressed view that, on the basis of the current level of knowledge, there is no reason to take action to reduce EMF levels	low
Occupational Safety and Health Administration (OSHA)	health	no specific OSHA standards address ELF fields; however, there are national consensus standards which OSHA could consider (ACGIH and ICNIRP)	low
World Health Organization(WHO)	health	cause-and-effect link between ELF field exposure and cancer has not been confirmed	low
California Department of Health Services	health	concern about possible health hazards - childhood leukemia, adult brain cancer, Lou Gehrig's disease and miscarriage, but evidence is incomplete, inconclusive and often contradictory	low
California Public Utilities Commission (CPUC)	health	interim measures adopted because of the lack of scientific or medical conclusions about potential health effects from utility electric facilities and power lines	low / med
Connecticut Department of Public Health	health/cancer	health risk caused by EMF exposure remains an open question; some studies show a weak link between EMF exposure and a small increased risk of childhood leukemia at average exposures above 3 mG; for cancers other than childhood leukemia, none of the studies provide evidence of an association	low
Florida Department of Environmental Protection	health	no convincing evidence for carcinogenic effects of ELF fields	low
Maryland Department of Natural Resources	health	EMF exposures remain suspect, but remaining unknowns are the reason for continued lack of firm affirmation of health risks from EMF exposures	low
Massachusetts - Energy Facilities Siting Board	health	informally adopt edge of ROW permissible levels of 85 mG for magnetic fields	
Minnesota Department of Health	health	body of evidence insufficient to establish a cause and effect relationship between EMF and adverse health effects	low
New Jersey Department of Environmental Protection	health	not known at this point whether exposure to magnetic fields from power frequency sources constitutes a health hazard	low
New York Department of Environmental Protection	health	interim policy requires transmission lines to be designed, constructed and operated such that magnetic fields at the edges of their ROWs will not exceed 200 mG	
Utah Department of Environmental Quality	health	no convincing evidence in the published literature to support the contention that exposures to extremely low frequency electric and magnetic fields (ELF-EMF) generated by sources such as household appliances, video display terminals, and local power lines are demonstrable health hazards	
Vermont Department of Health	health	data insufficient to establish a direct cause and effect between EMF exposure and adverse health effects	low
Virginia Department of Health	health	scientific proof of a causal association has not been satisfied for the implicit adverse effects of power-line frequency EMF	low

The Public Service Commission of Wisconsin is an independent state agency that oversees more than 1,100 Wisconsin public utilities that provide natural gas, electricity, heat, steam, water and telecommunication services.

Public Service Commission of Wisconsin
P.O. Box 7854
Madison, WI 53707-7854

Telephone: 608-266-5481
Toll free: 888-816-3831
Consumer affairs: 608-266-2001 / 800-225-7729
TTY: 608-267-1479 / 800-251-8345
Fax: 608-266-3957

Website: psc.wi.gov

Electric 12 (5/13)

Appendix C – Important Bird Area Correspondence and Documentation

Appendix C includes correspondence and documentation regarding IBAs.

Item 1. Comment from Sand County Foundation, May 31, 2012
Item 2. Comment from The Aldo Leopold Foundation, November 26, 2012
Item 3. Comment from Sand County Foundation, November 28, 2012
Item 4. Comment from Leopold Pine Island Important Bird Area Partnership, October 1, 2013
Item 5. Comment from International Crane Foundation, June 25, 2014
Item 6. Comment from Riverside Farms, September 30, 2013
Item 7. Letter from USFWS, February 26, 2014
Item 8. Applicants Data Request Response 01.52
Item 9. Applicants Data Request Response 01.52, Attachment 10, Structure Design Comparisons
Item 10. Applicants Data Request Response 01.52, Attachment 7, Currently Proposed Single-Circuit Structure
Item 11. Applicants Data Request Response 01.52, Attachment 6, Swan Flight Diverters
Item 12. Applicants Data Request Response 01.52, Attachment 9, H-frame Structure Configuration
Item 13. Applicants Data Request Response 01.52, Attachment 8, Double-Circuit Vertical Structure Configuration

SAND COUNTY FOUNDATION

31 May 2012

Mr. Lee Meyerhofer
American Transmission Company (ATC)
Senior Local Relations Representative
2 Fen Oak Court
Madison, WI 53718-8810

Dear Mr. Meyerhofer:

As a landowner in the Town of Fairfield, Sauk County, Sand County Foundation was contacted in April regarding the proposed alternative routes of the Badger Coulee Transmission Line. On that potentially impacted landscape, Sand County Foundation has engaged with private landowners since the mid-1960's to establish, maintain, and enhance an active tribute to the work and writings of Aldo Leopold. He was inspired to write *A Sand County Almanac*, in part, because he became a landowner there in 1935. The resulting Leopold Memorial Reserve and associated Leopold – Pine Island Important Bird Area are just two places there that could be affected by transmission line establishment and operation.

When Aldo Leopold, by then one of the nation's most well respected wildlife conservationists, bought a few hundred acres along the banks of the Wisconsin River in the Town of Fairfield, Sauk County, he did so amidst the Great Depression as a personal experiment in how man could restore health to abused land. His experiences over the next 15 years and the insights he gained, led to the publication, shortly after his 1948 death, of *A Sand County Almanac*. That book has sold millions of copies and been translated into 12 languages. That classic book is widely regarded as the foundation upon which modern conservation philosophy is based. Leopold's life story has recently been in theaters and on television as presented in "Green Fire – Aldo Leopold and a Land Ethic for Our Time," drawing ever more interest in the landscape that inspired his famous essays.

During the 1960s, in response to the threats of subdivision and development near the Leopold "Shack", prominent Wisconsin conservationists lead a private effort to protect the landscape made famous among national conservation leaders by *A Sand County Almanac*. By 1968 neighboring farmland owners had agreed to voluntarily restrict development and manage their lands cooperatively. Sand County Foundation arose as the institution that operated the landowner agreements and provided professional management.

Since then, the roughly two square miles of land with I-90/94 on its south and the Wisconsin River on its north, now mostly owned and managed by Sand County Foundation and the Aldo Leopold Foundation, has become internationally significant. The Leopold Shack property itself attained National Park Service's National Landmark status in 2010. The Leopold Memorial Reserve has become much more than a landscape. It is regarded as mankind's reminder of how to "live on a piece of land without spoiling it."

Now after seven decades of effective management and restoration the private lands of the Leopold Memorial Reserve and area teem with native plant communities and abundant wildlife. There the autumn sky literally darkens with sandhill cranes and Canada geese and in winter, bald eagles soar low over the floodplain, fishing and hunting. Because of the extensive avian activity, the 2,000 acre Leopold Memorial Reserve is at the core of a 15,000 acre Important Bird Area. This international designation, as administered in Wisconsin by the Department of Natural Resources, attracts thousands of birders every year.

There is much more that we could say about the Leopold Memorial Reserve, the lands' ecological attributes and historic significance. The Foundation would be delighted to provide a tour of the property to ATC officials at your convenience. If there isn't a convenient opportunity to meet on site, we respectfully request a face-to-face meeting with you and appropriate staff in the near future.

In the meantime, I hope the information we have shared in this letter is helpful as you evaluate final alternative routes for the Badger Coulee Transmission Line. The context in which ATC's footprint is viewed by the public will speak volumes about the company's respect for the natural environment and its commitment to Wisconsin's role in conservation history.

Very sincerely,

Brent M. Haglund

Brent M. Haglund, Ph.D.
President

CC: Dr. Stanley Temple
Mr. Buddy Huffaker

THE ALDO LEOPOLD FOUNDATION

Fostering the Land Ethic through the legacy of Aldo Leopold

November 26, 2012

Jon Callaway
Sr. Local Relations Representative
American Transmission Co.
5303 Fen Oak Drive
Madison, WI 53718-8810

RE: Badger Coulee Transmission Line Placement in the vicinity of Northern Route I021a and Southern Route A680

Dear Jon,

It is our understanding American Transmission Corporation's (ATC) Badger Coulee Transmission Line (BCTL) will submit two potential placement routes to the Public Service Commission for review with eventual selection of a route. This letter introduces the Aldo Leopold Foundation's work to BCTL project staff and expresses our concerns during the public comment period as both potential routes are near ALF's property and through our local conservation projects.

The Aldo Leopold Foundation, a non-profit conservation organization, fosters a mutually beneficial relationship between people and land through the legacy of Aldo Leopold. In 1935, Aldo Leopold purchased a "worn-out" farm along the Wisconsin River to retreat with family and learn, first-hand, how to care for land – in short, demonstrate a land ethic. This place and their experiences led Leopold to write, ***A Sand County Almanac***, a highly influential literary masterpiece. Professional and aspiring conservationist the world over liken their visit to Leopold's Shack to a "pilgrimage." Recently, Aldo Leopold's Shack and property was dedicated as a National Historic Landmark, United States highest honor for historic sites. The Aldo Leopold Foundation, started by Leopold's children in 1982, is the executor of this historic site and Leopold's literary estate. The Foundation has projects inspiring Leopold's land ethic that range from local to international.

One such local project is the Leopold-Pine Island Important Bird Area (IBA). The IBA encompasses roughly 12,000 acres of public and private lands and 16 miles of Wisconsin River frontage between the Wisconsin Dells and beyond Portage. Participating landowners include Aldo Leopold Foundation, Sand County Foundation, Wisconsin DNR, US Fish and Wildlife Service and Phill and Joan Pines Family.

In 2005, a breeding bird survey found 116 breeding species, including common moorhen, American woodcock, black tern, black-billed cuckoo, willow flycatcher, sedge wren, marsh

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Appendix C
Item 2

wren, cerulean warbler, prothonotary warbler, and Henslow's sparrow; migrants surveyed included American bittern, northern harrier, greater yellowlegs, acadian flycatcher, and golden-winged warbler. This IBA provides fall migration roosting for roughly 5,000 sandhill cranes (approx. 10% of Wisconsin's population). This project underscores the conservation value of public-private partnerships. http://www.aldoleopold.org/programs/iba.shtml

Post-bird survey, all of the IBA partners supported and participated in a planning exercise that implement on-the-ground stewardship activities in support of national, statewide and regional conservation plans. Our area, participants, and properties are in many large scale plans including, Partners in Flight, Joint Venture, Land Legacy Report, State Wildlife Action Plan and Conservation Opportunity Areas. Birds serve as a very identifiable, widely appreciate, non-threatening and non-controversial indicator of ecosystem quality. This IBA exemplifies the potential of birds as indicators of ecosystem health and catalyze conservation partnerships depending on a shared resource like the Wisconsin River and its floodplain forests and wetlands.

The partnership completed a 150-page, color report detailing the results of the 2005 survey as well placing the entire IBA into the perspective of these larger plans and developing general guidelines and recommendations so that the management of each partner's property synergistically fits with the others. No other IBA in Wisconsin as has rich a dataset or diversity of active partnership. http://www.aldoleopold.org/programs/IBA_Report.pdf

We are extremely proud of how the plan captures breeding bird usage for the entire IBA at a point in time (a common baseline condition), creates a unified vision for a diverse group of owners (private, non-profit, state and federal agency) and identifies specific stewardship actions that will benefit our priority species.

For bird conservationists, the repeatable survey and plan is "an end" in itself; for land managers, it is a "means to an end" in which birds serve as indicator for ecosystem direction, health and diversity. Both are tremendously valuable and demonstrate conservation delivery and accountability. To our public audience, the IBA has received a great deal of attention as it demonstrates the importance of public-private partnerships in stewarding Wisconsin's shared natural resources. We have little understanding of impacts of the proposed BCTL on breeding or migrating birds.

One such potential conflict is sandhill crane daily flight patterns during migration season. Each fall, thousands of sandhill cranes use sandbars in the Wisconsin River to roost for the evening in preparation for migrating south. During the day they leave the river to forage in harvested fields, heading south over Interstate 90 or north over Hwy 16. If we have at least 4,500 sandhills stay 30 days on the roost, making two trips per day, and assume half go either north or south, there are a total of 135,000 sandhill crane trips over either proposed route. Importantly, these are short-distance, low-flying trips. At this point we do not assume there is conflict because we are under-informed on this specific instance of large, low-flying birds and high power lines. We would welcome an opportunity to learn more from ATC if this is an area of previous study by your staff. If conservative opinions assert a high probability of conflict we would like to work with ATC to mitigate the conflict.

Currently, The Southern Route, segment 680A, actually runs through the northern boundary of the IBA on the Pines Family property. The Northern Route, segment I021a, follows I-90 Interstate and runs immediately along the southern boundary of the Leopold-Pine Island Important Bird Area (IBA) and within likely view-shed from the Aldo Leopold National Historic Landmark.

ALF's concern is maintaining the integrity of the IBA and the cultural significance of the Aldo Leopold National Historic Landmark. Potential conflicts between power line placement and the work of ALF is the impact on breeding and migrating birds and aesthetics. We would like to work with ATC to better understand and mitigate these potential conflicts.

We have been following transmission line construction along south beltline in Madison. We are aware of similar efforts to preserve aesthetics in the vicinity of the UW-Arboretum. This prior work may serve as example for segments near our projects and property resolving similar conflicts.

We would be interested discussing the potential routes and our work with the property ATC representatives as they specifically address our projects and concerns. Reach me at 608-434-5994 or Steve Swenson, our Ecologist on staff at 608-393-7354.

Sincerely,

BH.

Buddy Huffaker
President

Garthus, Tia

Subject: Badger Coulee Transmission Routing
Attachments: ATC Letter 28 November 2012.pdf

From: Kevin Mcaleese [mailto:kmcaleese@sandcounty.net]
Sent: Wednesday, November 28, 2012 10:06 AM
To: Callaway, Jon
Cc: Haglund Brent; Temple Stan; Swenson Steve; Huffaker Buddy; Moore Samantha
Subject: Badger Coulee Transmission Routing

Dear Jon,
Attached is a letter very similar to the one sent to Mr. Meyerhofer in May 2012. We did not receive a response. As I understand you have had on chance to consider the lands in question during discussions with Steve Swenson of the Aldo Leopold Foundation and Mr. Jim Lutes of the US Fish and Wildlife Service. Therefore, I wanted to be on the record with you as well.
I desire an opportunity to discuss Sand County Foundation's concerns as your earliest convenience.

Sincerely,

Kevin McAleese
Executive Vice President
Sand County Foundation
16 North Carroll, Suite 450
Madison, WI 53703
608-663-4605 x 23 off.
608-576-6015 cell.
kmcaleese@sandcounty.net
www.sandcounty.net

SAND COUNTY FOUNDATION

28 November 2012

Mr. Jon Callaway
Senior Local Relations Representative
American Transmission Company
5303 Fen Oak Drive
Madison, WI 53718-8810

Dear Mr. Callaway:

As a landowner in the Town of Fairfield, Sauk County, Sand County Foundation was contacted in April regarding the proposed alternative routes of the Badger Coulee Transmission Line. On that potentially impacted landscape, Sand County Foundation has engaged with private landowners since the mid-1960's to establish, maintain, and enhance an active tribute to the work and writings of Aldo Leopold. He was inspired to write *A Sand County Almanac*, in part, because he became a landowner there in 1935. The resulting Leopold Memorial Reserve and associated Leopold – Pine Island Important Bird Area are just two places there that could be affected by transmission line establishment and operation.

When Aldo Leopold, by then one of the nation's most well respected wildlife conservationists, bought a few hundred acres along the banks of the Wisconsin River in the Town of Fairfield, Sauk County, he did so amidst the Great Depression as a personal experiment in how man could restore health to abused land. His experiences over the next 15 years and the insights he gained, led to the publication, shortly after his 1948 death, of *A Sand County Almanac*. That book has sold millions of copies and been translated into 12 languages. That classic book is widely regarded as the foundation upon which modern conservation philosophy is based. Leopold's life story has recently been in theaters and on television as presented in "Green Fire – Aldo Leopold and a Land Ethic for Our Time," drawing ever more interest in the landscape that inspired his famous essays.

During the 1960s, in response to the threats of subdivision and development near the Leopold "Shack", prominent Wisconsin conservationists lead a private effort to protect the landscape made famous among national conservation leaders by *A Sand County Almanac*. By 1968 neighboring farmland owners had agreed to voluntarily restrict development and manage their lands cooperatively. Sand County Foundation arose as the institution that operated the landowner agreements and provided professional management.

Developing conservation leadership through ethics, science & incentives
16 North Carroll Street • Suite 450 • Madison, WI 53703 • 608.663.4605
www.sandcounty.net

Since then, the roughly two square miles of land with I-90/94 on its south and the Wisconsin River on its north, now mostly owned and managed by Sand County Foundation and the Aldo Leopold Foundation, has become internationally significant. The Leopold Shack property itself attained National Park Service's National Landmark status in 2010. The Leopold Memorial Reserve has become much more than a landscape. It is regarded as mankind's reminder of how to "live on a piece of land without spoiling it."

Now after seven decades of effective management and restoration the private lands of the Leopold Memorial Reserve and area teem with native plant communities and abundant wildlife. There the autumn sky literally darkens with sandhill cranes and Canada geese and in winter, bald eagles soar low over the floodplain, fishing and hunting. Because of the extensive avian activity, the 2,000 acre Leopold Memorial Reserve is at the core of a 15,000 acre Important Bird Area. This international designation, as administered in Wisconsin by the Department of Natural Resources, attracts thousands of birders every year.

There is much more that we could say about the Leopold Memorial Reserve, the lands' ecological attributes and historic significance. The Foundation would be delighted to provide a tour of the property to ATC officials at your convenience. If there isn't a convenient opportunity to meet on site, we respectfully request a face-to-face meeting with you and appropriate staff in the near future.

In the meantime, I hope the information we have shared in this letter is helpful as you evaluate final alternative routes for the Badger Coulee Transmission Line. The context in which ATC's footprint is viewed by the public will speak volumes about the company's respect for the natural environment and its commitment to Wisconsin's role in conservation history.

Very sincerely,

K J McAleese

Kevin McAleese
Executive Vice President

CC: Dr. Stanley Temple
Mr. Buddy Huffaker

Leopold-Pine Island
Important Bird Area
P.O. Box 77, Baraboo, WI 53913 608-355-0279

October 1, 2013

Nayo Parrett
American Transmission Co.
P.O. Box 47
Waukesha, WI 53187-0047

RE: Badger Coulee Transmission Line (BCTL) Placement in the vicinity of Northern Route Segment I021a and Southern Route Segments A682, A680a, A680 and I001e

Dear Nayo,

We want to thank you for helping convene and facilitate our conversation on August 6th, 2013 regarding the Leopold-Pine Island Important Bird Area (IBA) and the proposed ATC/Xcel Energy Badger Coulee Transmission Line (BCTL). Thanks for your time and attention to answer our many questions and in doing so, bringing expertise from American Transmission Corp, Xcel Energy and subject matter experts on powerline impacts on birds.

In the meeting we spent the majority of time discussing routing (proposed and alternate), tower design/engineering, rights-of-way, line maintenance, bird impacts and habitat. On the heels of this meeting, **the IBA partnership wishes to communicate routing recommendations, tower design recommendations, information needs, requested information and IBA background.** We hope our recommendations and areas of concern are respectfully considered throughout decision-making and serve as basis for proactive communication between the IBA Partnership and ATC/Xcel Energy throughout the process.

Routing Recommendations
We understand ATC/Xcel Badger Coulee Transmission Line (BCTL) will submit two potential placement routes to the Public Service Commission (PSC) for review and possible selection. The Northern Route, segment I021a, follows I-90 Interstate and runs immediately along the southern boundary of the IBA, passing near Sand County Foundation and Aldo Leopold Foundation lands, and through portions of Wisconsin DNR and US Fish and Wildlife Service (USFWS) lands. The Southern Route, segments A682, A680a, A680, and I001e run through the northern boundary of the IBA across the Phill and Joan Pines Family property (IBA participant since inception), then south along I-39 beside the USFWS's Baraboo River Waterfowl Production Area.

The IBA strongly rejects the BCTL Southern Route (in particular, segments A682, A680a, A680 and I001e) based on potential bird impacts, engineering constraints and habitat impacts. The IBA views the Northern Route (following I-90/94) as the most bird-friendly route of the two proposed.

During our meeting, bird and powerline expertise reaffirmed large-bodied birds are most susceptible to powerline collisions. The IBA's most numerous large bird is the sandhill crane. Each fall, thousands of sandhill cranes roost on Wisconsin River sandbars each evening in preparation for migration south. During the day they leave the river to forage in harvested fields, heading south over Interstate 90 or north over Hwy 16. It is important to note these are short-distance, low-flying, daily "commutes." Juvenile and migratory sandhill cranes, unfamiliar with the area, are most susceptible to collision, especially during low light or inclement weather. It is the IBA's experience that the majority of daily "commutes" head north from the Wisconsin River, greatly increasing the chance of negative bird impacts along the Southern Route. Other migratory waterfowl, including ducks and geese, are making these daily trips.

We learned during the meeting pre-existing powerline infrastructure along the Southern Route presents a number of unique challenges when incorporating the proposed transmission line in this corridor. It is our understanding the most "bird friendly" tower design (shortest H-design) is not likely in this segment. We understand the application specifies mono-pole structure (tallest) double-circuited (to incorporate preexisting line and new transmission lines), with a vertical arrangement of wires. We understand the only way to utilize the most bird-friendly tower design (shortest H-design) would be to co-locate a new H-designed transmission line running adjacent to the preexisting H-designed powerline. This option seems unlikely given increases in right-of-way, desire to double-circuit and obvious impact to aesthetics, to say nothing of cost implications.

The Southern Route at segment I001e follows I-39 south of the City of Portage. The value of the eastern half of the IBA is in its extensive and contiguous forest canopy. Segment I001e would widen the interstate's permanent interruption of canopy cover and compromise habitat value, as well as creating a collision-threat to herons, red-shouldered hawks and other large birds that fly up and down the Baraboo River and the adjacent floodplain.

Alternatively, the Northern Route follows Interstate 90/94 (segment I021a in vicinity of IBA). This route placement appears subject to fewer sandhill crane and migratory waterfowl daily "commutes" and presumably fewer constraints for tower design since it is new construction. Further, this busy traffic corridor (I-90/94) already serves as an additional deterrent for low-flying, large birds.

Right-of-way in the vicinity of the IBA has breeding habitat potential for small grassland and savanna birds given appropriate maintenance.

Tower Design Recommendation
We understand from our meeting mono-pole towers with a vertical arrangement of wires are specified for the proposed Northern and Southern routes. Furthermore, bird and powerline subject experts characterized bird-friendly towers as short and having a horizontal arrangement of wires with visibility markers between towers.

The IBA strongly recommends utilizing the most bird-friendly tower height, wire placement, and wire visibility technology, which we interpret to be the shortest towers, horizontal arrangement of wires and wire visibility markers between towers.

Information Needs

The IBA has been a leader in bird research for the upper Midwest since its inception. Our bird surveys are held up as a model, inspiring similar efforts in other IBAs. There remain a number of questions that could help inform planning and minimization of impacts for the cultural and biological integrity of the IBA. Questions might include: At what height are sandhill cranes crossing I-90? Do they fly lower during bad weather? What segments of the proposed power line route have the most bird traffic? What is the feasibility of bird-friendly tower design and wire visibility measures? These and other questions are opportunities for shared interest and better outcomes. And, opportunity for ATC/Xcel Energy and/or IBA partners or regional conservation groups such as the International Crane Foundation to build expertise and demonstrate leadership.

Requested Information

In conversation after the meeting, you requested a better understanding of the viewshed from the Aldo Leopold National Historic Landmark. When standing on this historic property along Levee Road, the viewshed is more or less the interstate segment between Schepp and VanHoosen Roads.

Leopold-Pine Island Important Bird Area Background

The IBA encompasses roughly 15,000 acres of public and private lands and 16 miles of Wisconsin River frontage between the Wisconsin Dells and beyond Portage. Participating landowners include Aldo Leopold Foundation, Sand County Foundation, Wisconsin Department of Natural Resources, US Fish and Wildlife Service, and Phill and Joan Pines Family.

In 2005 and 2011, a breeding bird survey found 120 breeding species, including red-shouldered hawk, bald eagle, common moorhen, American woodcock, black tern, black-billed cuckoo, willow flycatcher, sedge wren, marsh wren, cerulean warbler, prothonotary warbler, and Henslow's sparrow; migrants recorded included American bittern, northern harrier, greater yellowlegs, Acadian flycatcher, and golden-winged warbler. This IBA provides fall migration roosting for roughly 5,000 sandhill cranes (approx. 10% of Wisconsin's population). This project underscores the conservation value of public-private partnerships.
http://www.aldoleopold.org/programs/iba.shtml

Following the 2005 survey, all of the IBA partners supported and participated in a planning exercise to plan and implement on-the-ground stewardship activities in support of national, statewide and regional conservation plans. Our area, participants, and properties are in many large-scale plans including, Partners in Flight, Joint Venture, Land Legacy Report, and State Wildlife Action Plan. Birds serve as very identifiable, widely appreciated, non-threatening and non-controversial indicators of ecosystem quality. This IBA exemplifies the potential of birds as indicators of ecosystem health and catalysts for conservation partnerships focused on a shared resource like the Wisconsin River and its floodplain forests and wetlands.

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We are extremely proud of how the plan captures breeding bird usage for the entire IBA, creates a unified vision for a diverse group of owners (private, non-profit, state and federal agency) and identifies specific stewardship actions that will benefit our priority species.

For bird conservationists, the repeatable survey and plan is "an end" in itself; for land managers, it is a "means to an end" in which birds serve as indicator for ecosystem direction, health and diversity. Both are tremendously valuable and demonstrate conservation delivery and accountability. To our public audience, the IBA has received a great deal of attention as it demonstrates the importance of public-private partnerships in stewarding Wisconsin's shared natural resources.

The Leopold-Pine Island Important Bird Area continues to be a leader in bird conservation throughout the region. Our success has been the results of intentional and committed partnership, planning and application. We anticipate your thoughtful consideration of our recommendations and continued willingness to understand, refine and improve the proposed BCTL.

Sincerely,

Steve

Steve Swenson
IBA Partnership Coordinator

cc:
Jon Callaway, American Transmission Company
Lee Meyerhofer, American Transmission Company
Matthew Langan, Xcel Energy
Benjamin S. Callhan, Wisconsin Department of Natural Resources
Marilyn Weiss, Public Service Commission

International Crane Foundation
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608-356-9465 fax
cranes@savingcranes.org
www.savingcranes.org

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PUBLIC SERVICE COMMISSION
Gas & Energy Division

25 June 2014

Mr. Greg Levesque
Manager, Local Relations
American Transmission Company
2 Fen Oak Court
Madison, WI 53718

Dear Mr. Levesque,

A section of the Badger-Coulee transmission line is being proposed to follow the Wisconsin River corridor between Wisconsin Dells and Portage. This area is home to the Leopold Pine Island Important Bird Area. This IBA encompasses roughly 12,000 acres of public and private lands and 16 miles of Wisconsin River frontage between the Wisconsin Dells and Portage. This stretch of the Wisconsin River offers many sandbars which serve as ideal roosting and staging habitat for resident and migrating cranes.

Bird mortality from powerline strikes is a well-documented phenomenon; large birds, such as cranes, are especially at high risk for collision. There are different social groups of cranes in the area; both breeding and non-breeding resident birds gather on the river throughout the year, but especially in fall. While resident adult cranes might be familiar with obstacles in the area, juvenile cranes preparing for their first migration and non-resident birds gathering during migration are at higher risk for line collisions, as they are unfamiliar with the landscape. In addition to a large population of Sandhill cranes, Wisconsin's reintroduced Whooping Crane population is increasingly utilizing this area as well. Mortality and morbidity from collision could have a significant impact on these endangered cranes, and any mortality is very costly to the reintroduction project.

The flight patterns used by the cranes to access feeding areas away from the river are important factors in determining crane risks from the proposed line. There appears to be particularly heavy use of harvested corn fields to the north of the river for feeding in the fall, but cranes also fly south to forage in agriculture fields. More information is needed to quantify how cranes use the area to inform decisions about line placement, construction, and marking.

ICF advises the need for this information before line construction. If funding is made available, ICF will evaluate the patterns of crane use in this area to inform planning for the best placement of the powerline corridor, optimal line height, as well as marking options to deter birds from the lines. We also recommend both pre- and post-construction phase research to first evaluate the bird use within the corridor and then assess the effectiveness of the mitigation measures that are chosen. This is a unique opportunity to gather information about the potential effects of transmission lines in a known high-use area for cranes, and to assess the magnitude of threat to cranes from the proposed line based on how crane populations are using the area. Based on the outcome of this evaluation, we will be positioned to consult on mitigation strategies for line placement, pole structure, and bird flight diverter deployment.

Given that additional transmission lines are likely to be routed through Wisconsin and other regions important to cranes in the future, the proposed study will be an invaluable tool to prevent and mitigate the effect of power lines on bird populations. The Avian Powerline Interaction Committee (APLIC), originally founded to provide guidance on how to reduce Whooping crane powerline collisions, provides the most current information on reducing bird collisions to electric utilities, wildlife agencies, and other stakeholders. We believe that placing a priority on gathering these data addresses several areas APLIC has identified as critical needs of the industry: standardizing mortality estimation, testing and documenting the efficacy of line marking devices, testing and documenting the efficacy and limitations of remote collision detection devices, determining collision risk levels associated with potential high avian-use habitats, and monitoring and reporting over the long term.

Thanks for your consideration of this request. I will follow-up with a phone call in the coming week.

With best wishes,

Richard Beilfuss, Ph.D., Lic Prof Hydrologist
President & CEO

cc: Marilyn Weiss, PSC
Nayo Parrett, ATC

<u>Assessment of the impact to cranes from a newly constructed transmission line</u>

A section of the Badger-Coulee transmission line is being proposed to follow the Wisconsin River corridor between Wisconsin Dells and Portage. This area is home to the Leopold Pine Island Important Bird Area. This IBA encompasses roughly 12,000 acres of public and private lands and 16 miles of Wisconsin River frontage between the Wisconsin Dells and Portage. This stretch of the Wisconsin River offers many sandbars which serve as ideal roosting and staging habitat for resident and migrating cranes.

Bird mortality from powerline strikes is a well-documented phenomenon; large birds, such as cranes, are especially at high risk for collision. There are different social groups of cranes in the area; both breeding and non-breeding resident birds gather on the river throughout the year, but especially in fall. While resident adult cranes might be familiar with obstacles in the area, juvenile cranes preparing for their first migration and non-resident birds gathering during migration are at higher risk for line collisions, as they are unfamiliar with the landscape. In addition to a large population of Sandhill cranes, Wisconsin's reintroduced Whooping Crane population is increasingly utilizing this area as well. Mortality and morbidity from collision could have a significant impact on these endangered cranes, and any mortality is very costly to the reintroduction project

The flight patterns used by the cranes to access feeding areas away from the river are important factors in determining crane risks from the proposed line. There appears to be particularly heavy use of harvested corn fields to the north of the river for feeding in the fall, but cranes also fly south to forage in agriculture fields. More information is needed to quantify how cranes use the area to inform decisions about line placement, construction, and marking.

ICF proposes to assist ATC in determining the best placement and design of the Badger Coulee transmission line to minimize impacts on cranes. We will evaluate the patterns of crane use in this area to inform planning for the best placement of the powerline corridor, optimal line height, as well as marking options to deter birds from the lines. We propose both pre- and post-construction phase research to first evaluate the bird use within the corridor and then assess the effectiveness of the mitigation measures that are chosen. This is a unique opportunity to gather information about the potential effects of transmission lines on a known high use area for cranes.

Pre-construction Study Plan: We will assess how cranes are utilizing the airspace and ground within the proposed areas of construction.

<u>Data Collection</u>: During the peak of crane staging and migration (Sept – Nov) we will monitor Crane use of the area, recording

- estimates of Sandhill and Whooping cranes using of the area
- morning and evening flight paths, numbers of cranes, and flight altitudes
- weather conditions and their effect on these daily flights (e.g. flight altitude, time of day)

Deliverables: An assessment of the magnitude of threat to cranes from the proposed line based on how crane populations are using the area. Based on the outcome of the use evaluation, we will propose mitigation strategies for line placement, pole structure, and bird flight diverter deployment.

Post-construction Study Plan: We will assess how crane use of the area is altered and if bird flight diverters are helping to deter collisions.

Data Collection: During the same peak period of crane activity used in the Pre-construction study, we will monitor crane numbers, flight paths, and flight altitudes (and now reactions) over the transmission line. These results will be compared to pre-construction levels. Observations will be replicated for transmission line spans with diverters and for control sections without diverters. There will also be regular mortality surveys underneath both sections of line chosen for the study; any identified carcasses (of cranes or other species) will be collected for cause of death determination. Weather conditions will be monitored to evaluate the efficacy of diverters in various conditions. Collision detectors deployed on spans that have been determined to have the highest crane use will allow comparisons with mortality searches and indicate the number of collisions that may not result in immediate death.

Deliverables: An assessment of the impact of the transmission line on cranes (and opportunistically other large waterfowl that use the river corridor) and of the success of the mitigation measures.

Transmission line development will continue in this region and others important to cranes; the development process will be optimized the more we understand how to prevent negative interactions and mitigate the effect of power lines on bird populations. The Avian Powerline Interaction Committee (APLIC), originally founded to provide guidance on how to reduce Whooping crane powerline collisions, provides the most current information on reducing bird collisions to electric utilities, wildlife agencies, and other stakeholders. Our proposed study addresses several areas APLIC has identified as critical needs of the industry: standardizing mortality estimation, testing and documenting the efficacy of line marking devices, testing and documenting the efficacy and limitations of remote collision detection devices, determining collision risk levels associated with potential high avian-use habitats, and monitoring and reporting over the long term.

Budget for phase 1, Pre-construction Assessment (2 year study period):

Project staffing	$ 62,000.00
Mileage	2,400.00
Equipment	1,500.00
	$ 65,900.00

Budget for phase 2, Post-construction Assessment (2 year study period):

Project staffing	$ 67,000.00
Mileage	2,000.00
Laboratory cost	1,000.00
	$ 70,000.00

Project leaders:

Anne Lacy (M.S. Conservation Biology, 11 years' experience) is Crane Research Coordinator for the International Crane Foundation. Anne coordinates field activities relating to crane research. She has supervised an MS student at UW-Madison investigating indicators of Sandhill crane powerline collisions and is advising the Whooping Crane Eastern Partnership on potential impacts to the Whooping Crane population from collision mortality.

Andy Gossens (B.S. in Ecology, Evolution, and Behavior, 6 years' experience) is North American Crane Project Manager for the International Crane Foundation. Andy leads the field research team of interns to implement research projects related to Sand hill and Whooping Cranes. He is also involved in data collection and analysis activities for research on global crane species.

To Whom It May Concern: September 30, 2013

The purpose of this document is to provide the Wisconsin Public Service Commission (WPSC), American Transmission Company (ATC) and Xcel Energy (EE) with recommendations and "areas of concern" that I have as a private landowner regarding the Badger-Coulee transmission line (BCTL) project. My family is the owner of Riverside Farms which encompasses in excess of 2,400 acres on the Wisconsin River between the Wisconsin Dells and Portage. The farm is operated on a day-to-day basis with the highest priority placed upon sound land management and conservation principles and processes. Beyond the day-to-day activities of the farm we have undertaken numerous larger scale conservation projects, the most recent being the completion of a 120 acre wetland restoration in 2011. We also take great pride in being a contributing member of the Leopold-Pine Island Important Bird Area (IBA).

The IBA encompasses approximately 12,000 acres of public and private lands and 16 miles of Wisconsin River frontage land between the Wisconsin Dells and beyond Portage. Participating IBA landowners include The Aldo Leopold Foundation, The Sand County Foundation, The Wisconsin Department of Natural Resources, The US Fish and Wildlife Service, and The Phillip and Joan Pines Family farm (Riverside Farms). An important participant in IBA is the International Crane Foundation (ICF).

The IBA members have had numerous meetings amongst ourselves and have taken all reasonable efforts to obtain information regarding the Badge-Coulee transmission line project in order to allow us to make an accurate assessment of the impact that the project will have on our lands and on our broader conservation interests. This process was highlighted by an afternoon meeting on August 6, 2013 between IBA members, ATC and EE management representatives, WPSC employees and representatives from the Wisconsin Department of Natural Resources at the Leopold Center in Baraboo. Having digested all of the information that I am capable of, I feel that I understand most of the implications that the BCTL project would have on Riverside Farms. It is clear to me that the factors that will impact Riverside Farms will have equal and potentially broader implications upon the overall IBA. Thus, I feel that my personal interests are aligned with those of the IBA and that my recommendations will be supported by the IBA.

In the interest of not "diluting" my recommendations I have only submitted two (2). The "areas of concern" that follow the recommendations are important, but will not have the potential impact on Riverside Farms and the IBA that transmission line routing and tower configuration will have (the recommendations). Furthermore, most of the "areas of concern" are eliminated if the recommendations provided below are followed.

Recommendation #1: Routing.

It is my understanding that ATC and EE will submit two potential transmission line placement routes for the Badger Coulee project to the PSC for review and selection. The southern "pink" route, segment 680A, runs through the northern boundary of the IBA across the Riverside Farms primarily along highway 16. The northern "blue" route, segment I021a, follows the I-90/94 Interstate and runs immediately along the southern boundary of the Leopold-Pine Island IBA.

The impact that Badger Coulee project will have on the areas habitat will undoubtedly affect all wild life that thrive at Riverside Farms and in the IBA, not just birds. When I attended the meetings of IBA members and we discussed the transmission line routing issue, it was determined that our primary concern should focus upon the potential for mortality of large birds. The Wisconsin River, on which the farm is located, is an important navigational and protection resource for migratory waterfowl. While we could select the potential impact on any number of large waterfowl in order to substantiate our recommendation, we feel it is logical to focus on the area's most numerous large migratory birds, the sandhill crane. Each fall, thousands of sandhill cranes use sandbars in the Wisconsin

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River to roost for the evening in preparation for their migrating south. During the day they leave the river to forage in harvested fields both south over Interstate 90/94 and north over Hwy 16. These flights are short-distanced, low-altitude, daily "commutes." Juvenile and migratory cranes that are not familiar with the area are most susceptible to transmission tower and line collision, especially during low light or inclement weather which is a normal condition at the times of year that the cranes pass through this area of Wisconsin. Through council from our partners at the International Crane Foundation it has been concluded that the vast majority of these daily "commutes" are to the north from the Wisconsin River making the Highway 16 southern route a much less desirable location for transmission line placement than the 1021a northern route.

Alternatively, I021a of the proposed northern route follows Interstate 90/94. This transmission line route placement is considerably more compatible with the overall conservation interests of Riverside Farms and the IBA and importantly provides substantially less risk regarding potential bird mortality. The busy interstate traffic corridor already serves as an existing deterrent for low-flying, large birds. Locating the transmission line along the interstate corridor will minimize negative bird impacts, especially those associated with collision and mortality, as birds have already adapted to the conditions associated with the interstate. **Riverside Farms strongly recommends that the northern route be utilized for passage through this part of the states (the IBA area).**

Areas of Concern should the 1021a northern "blue" route accepted.

As more fully described below under recommendation #2, The IBA was advised by ATC and EE that the planned new transmission line structure for both proposed routes through this area corridor would likely be a tall mono-pole structure with vertical line configuration and that the shortest H-design with a horizontal wire is not likely to be part of this segment. This contradicts the recommendation outlined in recommendation #2 below.

Areas of Concern should the 1021a northern "blue" route rejected.

a. The Interstate 39 corridor. Should the northern route be rejected, a brand new transmission line corridor would have to be established from the Portage area south to Interstate 94 along Interstate 39. This would cut through a highly sensitive area not only of the IBA but for the state overall and create numerous problems for the IBA and wild life supporters in general. The large scale issue that routing transmission lines through this area is that doing so would necessitate major alteration of the natural habitat that to date, for the most part, has been unaltered by man. This area is now dominated by mature forested lands that encompass the Wisconsin and Baraboo rivers, the NCRS wetlands restoration area west of I-39 as well as the IBA lands. The combination of these features has created a phenomenal habitat which supports a very unique mix of plants and wildlife.

b. Tower types. As more fully described below under recommendation #2, we were advised during our meeting on August 6, that the IBA's idea of the most "bird friendly" tower design is not likely to be constructed through the IBA. Shorter towers structures with horizontal wire arrangements are the goal for Riverside Farms.

Recommendation #2: Tower Types.

Through the investigation process that I have taken individually and through meetings with the IBA we have all concluded that the most "bird friendly" tower design is the shortest H-design with a horizontal transmission line configuration. The portion of the presentation provided by ATC and EE to the IBA on August 6 in Baraboo specifically related to the power line impacts on birds confirmed the IBA's findings (through the ICF) that short towers with horizontal wires arrangements would be the least impactful and accordingly the correct configuration for the structures deployed in the IBA.

In addition to the benefits that the IBA's recommended tower configuration would provide the IBA community's wild life inhabitants, the designs will also benefit humans by minimizing the visual impacts for recreational users throughout the IBA. These recreational areas include the Pine Island Wild Life Area, the Baraboo River WPA, the Leopold Memorial Reserve and the Aldo Leopold National Historic Landmark. The view shed for recreational users utilizing these properties within the IBA encompasses the entire corridor from the western and eastern extent of the IBA. **The Riverside Farms strongly recommends the use of the shortest H-design with a horizontal transmission line configuration for the structures places on the land within and adjacent to the IBA.**

Areas of Concern-Short H Towers with Horizontal Wires Accepted. Potential widening of easements and right-of-ways associated with a wider tower base.

Areas of Concern-Short H Towers with Horizontal Wires Rejected.

The IBA was advised by ATC and EE that the planned new transmission line structure for both proposed routes through the IBA corridor would likely be a mono-pole structure (tallest) with vertical line configuration and that the shortest H-design with a horizontal wire is not likely to be part of this segment. This contradicts the recommendation of the IBA as outlined in recommendation #2 below. Of additional concern is that segment 680a of the proposed southern route has a preexisting power line and that incorporating the proposed transmission line with the existing one will present a number of challenges in this corridor. During the August 6 meeting it was represented to the IBA that the only way to utilize the most bird-friendly short H-design tower design would be to co-locate a new H-designed transmission line adjacent to the preexisting H-designed power line. This option seems unlikely given increases in right-of-way, desire to double-circuit and obvious impact to aesthetics. This "unfriendly" tower construction for birds would be placed in the highest density area of bird movement creating substantially greater risk for bird collision and mortality.

United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE
Horicon National Wildlife Refuge
W4279 Headquarters Road
Mayville, WI 53050

February 26, 2014

American Transmission Company
Ms. Nayo Parrett
P.O. Box 47
Waukesha, WI 53187-0047

RE: Right-of-Way Application, Badger Coulee 345 kV Transmission Line Project, Fairfield Marsh WPA, Town of Caledonia, Columbia Co., Wisconsin

Nayo
Dear ~~Ms. Parrett~~:

The purpose of this letter is to respond to your letter dated, September 12, 2013 for the request of a Right-of-Way (ROW). Additionally, you had requested what options would be available for planning the transmission line route related to the Fairfield Marsh WPA.

First, the ROW application has been withdrawn from further review. Since our meeting in June 2012 there has been discussion within U.S. Fish & Wildlife Service (Service) staff regarding the application in terms of the National Wildlife Refuge Improvement Act of 1997, specifically laws, regulations, and policies for ROWs on Service lands. Therefore the granting of a new ROW based on "Compatibility" (see 50 CFR 25, 26, & 29) has been dismissed and the $50 application fee will be returned.

As a follow-up from a recent telephone call we discussed two options, because of the dismissal of the ROW application. One option was the avoidance of the Fairfield Marsh WPA within the corridor and the second option was the potential divesture of the ROW area through the WPA. The divesture would impact approximately 7 acres and the value would need to be "exchanged" for other WPA lands to be acquired at a later date. Obviously at this time, the corridor route or a preferred alternative has not been determined. However you had formally requested Service input which of these options would be viable. Based on the same reasons of compatibility, laws, and policies for the dismissal of granting a new ROW; the divesture or exchange of any WPA lands are absolutely doubtful. The Service respectfully requests the transmission line corridor to avoid the WPA.

If you have any questions, please don't hesitate to call me at 920-387-2658, extension 111.

Steve
Steven J. Lenz
Project Leader
Horicon NWR Complex

Badger Coulee 345 kV Transmission Line Project
Docket No. 5-CE-142

PSCW First Set of Request Items
Request No. 01.52 Response

REQUEST NO. 01.52:

(Application p. 91; AFR Section 6.) Discuss the concerns raised by the Leopold-Pine Island Important Bird Area partnership regarding the two proposed Segments H and I and the proximity of these natural resource properties to the proposed routes. Discuss any potential mitigation of their concerns including the different impacts associated with Segments H versus I, the pros and cons of using different structure types (including those not proposed in the application), the timing of the proposed construction, and how any or all of this might likely impact habitats, bird flight patterns, and bird use of the resource.

RESPONSE TO REQUEST NO. 01.52:

The Leopold-Pine Island Important Bird Area (IBA) was approved in 2005 by the Wisconsin Bird Conservation Initiative. IBAs are designated sites that provide essential habitat for breeding or migratory bird species. IBAs vary in size, but provide important habitat or ornithological significance that differs from the overall landscape within which they are found. IBAs contribute to bird conservation through support of rare and vulnerable species such as: endangered, threatened or special concern species; species whose populations are concentrated in certain habitat types; species with limited distributions; and species that congregate for breeding, feeding, roosting or migration. The identification of a site as an IBA does not carry any legal status or regulatory requirements. However, most are protected or managed for bird conservation through other methods. The Leopold-Pine Island IBA is unique in that an organized partnership has developed a strategic vision for managing the IBA as a landscape, while respecting individual landowners' and land managers' property goals. Partners to the Leopold-Pine Island IBA include the Aldo Leopold Foundation (ALF), the Sand County Foundation, the Wisconsin Department of Natural Resources (WDNR), the U.S. Fish and Wildlife Service (USFWS), the Natural Resources Conservation Service (NRCS), and several private landowners.

During the Project pre-application outreach process, the Applicants received written comments from the Sand County Foundation on May 31, 2012 and November 28, 2012 and the ALF on November 26, 2012 expressing their concerns about the proximity of the proposed routes to the Leopold-Pine Island IBA. These comments were included with the public comments provided on October 22, 2013 as part of the Joint Application on electronic media (PSC REF # 192217), and are also being provided as Attachments 01.52-1, 01.52-2 and 01.52-3, respectively. In response to these comments, the Applicants began coordination with members of the partnership. Several meetings were held between the Applicants and members of the IBA partnership. At a meeting on August 6, 2013, the Applicants presented information in a question and answer format to a large group of stakeholders. Attendees included representatives from the ALF, the International Crane Foundation, the WDNR, the Public Service Commission of Wisconsin (PSCW), the USFWS, and the Riverside Farms (private landowner). As a follow up to the meeting, Riverside Farms and the Leopold-Pine Island IBA partnership submitted comment letters to the PSCW summarizing their concerns and recommendations on September 30, 2013 (PSC REF # 191244) and October 1, 2013 (PSC REF # 191315), respectively. The Applicants will continue communicating with members of the Leopold-Pine Island IBA partnership regarding their concerns. The following is a summary of the IBA and its importance for birds, a discussion of potential Project impacts to avian resources along portions of Segments H and I, and a description of the pros and cons of mitigation measures that could be implemented to minimize avian impacts.

Concerns Raised by Leopold-Pine Island IBA Partnership and Mitigation Options

The primary concerns associated with Segments H and I being proposed through and adjacent to the IBA include potential disturbance to nesting birds during construction, loss or conversion of breeding bird habitat, and bird collision risk associated with overhead power lines. The Applicants evaluated these concerns along the portions of Segments H and I that within the area of the Leopold-Pine Island IBA and to the west of the IBA where there are large river crossings. These evaluation areas are highlighted in yellow and green on Attachments 01.52-4 and 01.52-5, hereafter referred to as the "areas of avian concern."

Disturbance to nesting birds during construction is generally an avoidable impact. If either segment is ordered for the Project, the Applicants will strive to implement avoidance measures during exclusion dates for threatened or endangered bird species as described in the Certified Endangered Resources (ER) Review completed for the Project. However, if for some reason avoidance is not possible, impact minimization measures will be implemented in coordination with WDNR and the IBA partnership.

Impacts resulting in the loss of breeding bird habitat are likely to vary among different bird groups. Because each segment follows either an existing cleared transportation or transmission line corridor, impacts to open country or grassland birds are anticipated to be low. Grassland birds may be impacted indirectly by temporary habitat disturbance during construction; however, direct habitat impacts would be mitigated by restoring the right-of-way (ROW) to as close to pre-construction conditions as possible. As pointed out in the Leopold-Pine Island IBA partnership's October 1, 2013 letter, it is possible that some breeding grassland birds could benefit from additional grassland habitat created by the transmission line corridor – provided the ROW is maintained appropriately. Birds that prefer shrub-scrub habitat, forest edges, overgrown and brushy understories, and disturbed ROW corridors may be impacted by shrub removal during construction that results in habitat loss. Tree clearing to widen existing transportation and transmission line ROWs could have an impact on forest breeding birds through canopy disturbance and incremental forest habitat loss; however, these impacts will be minimized to the extent possible by routing Segments H and I along existing transportation and transmission line corridors.

The risk of birds colliding with overhead power lines was a common theme in discussions with the IBA stakeholders. Many factors influence the probability of bird collisions with overhead power lines including the bird species involved, their behavioral characteristics, and the surrounding environmental characteristics. Bird species and behavioral characteristics that influence bird collision risk include body size, weight, maneuverability, vision, age, sex, flight altitudes, migration status, active time of day, flocking behavior, seasonal and daily use patterns, colonial nesting habits, and habitat use. Environmental characteristics that influence bird collision risk include habitat, land use and disturbance, weather conditions, and landscape context.

Considering the biological and environmental characteristics known to contribute to avian collisions, the Applicants have assessed the potential avian collision risk along Segments H and I. As proposed, Segments H and I present a potential for collision exposure – primarily as a result of high bird use in and adjacent to the IBA and the Wisconsin River corridor. Both segments are adjacent to and cross portions of the IBA (see Attachments 01.52-4 and 01.52-5). In addition, both segments parallel the Wisconsin River corridor for nearly their entire length. Segment I crosses the Wisconsin River in two locations, whereas Segment H does not cross the Wisconsin River. The IBA partnership informed the Applicants that sand hill cranes and waterfowl (primarily ducks and geese) are known to make daily, low-altitude flights from roost locations along the Wisconsin River to foraging areas in the agricultural fields north and south of the river – particularly during the fall migration period. In addition, waterfowl and other birds move along the Wisconsin River during spring and fall migration. Because cranes and waterfowl are known high risk groups for collisions with overhead power lines, and given their potential risk exposure along portions of Segments H and I within and adjacent to the IBA, the Applicants have explored mitigation measures to minimize bird collision risk. These include installing line marking devices to make the top-most shield wires more visible to birds, as well as changing the structure configurations where feasible to reduce and lower the wire exposure zone. Each of these mitigation measures, areas where they are proposed, limitations, associated costs, and tradeoffs are summarized below.

<u>Mitigation Measures – Additional Information</u>

Installation of line marking devices on the shield wires is a mitigation measure that considerably reduces bird collision risk. The shield wires located at the top of the structures are used for lightning protection and communications. They tend to be of thinner diameter, which presents a higher collision risk than the conductors. While eliminating the shield wires is rarely possible in the upper Midwest due to lightning storms, adding line marking devices to increase visibility to birds is a viable mitigation option. Examples of line marking devices include Bird Flight Diverters (preformed PVC coils) and Swan Flight Diverters (large preformed PVC coils). These devices make overhead shield wires more visible; therefore allowing birds to see them earlier and avoid them during flight. When properly installed and spaced, line marking devices have been shown to reduce bird collision rates with overhead power lines approximately 60% to 90%. The estimated cost to install Swan Flight Diverters along the portions of Segments H and I shown in Attachments 01.52-4 and 01.52-5 is approximately $390,000 and $560,000, respectively. The Applicants have experience with using Swan Flight Diverters on other 345 kV transmission lines. Swan Flight Diverters were installed to mitigate bird collision risk along portions of the Rockdale - West Middleton 345 kV Transmission Line Project (see Attachment 01.52-6).

In addition to installing line marking devices, the Applicants have explored changing the proposed structure configuration along portions of Segments H and I where feasible. Structure configuration changes evaluated by the Applicants to minimize bird collision risk include reducing the structure height, line height, wire exposure zone, and number of wire planes. Keeping structure and line height as low as possible and using surrounding vegetation (i.e., forest) and topography (i.e., bluff lines) to shield the lines helps reduce bird collision risk. Similarly, using a “horizontal” line configuration to keep all conductors in the same plane reduces the collision risk zone and the amount of exposure to the lines for birds in flight. Most researchers generally believe “horizontal” line configuration minimizes bird collisions because it reduces the number of wire planes and the height of the wire exposure zone.

Drawings for typical structures proposed along Segments H and I were included in the Joint Application (Appendix C, Figures 10 and 12). Preliminary engineering conducted for the Joint Application, which is subject to change based on final engineering, selected the majority of structures along Segment H to be a single circuit “delta” configuration (see Attachment 01.52-7). Typically, this structure configuration is comprised of a single pole, approximately 105 feet tall that supports three conductors and two shield wires. The wire exposure zone is comprised of three wire planes and is approximately 40 feet tall. Along the portion of Segment I where aligned with an existing transmission line and railroad corridor (primarily the west to east orientation), the majority of structures are proposed to be a double-circuit “vertical” configuration (see Attachment 01.52-8). Typically, this structure configuration is comprised of a single pole, approximately 130 feet tall that supports six conductors and two shield wires. The wire exposure zone is comprised of four wire planes and is approximately 67 feet tall. The remaining structures along the portion of Segment I adjacent to I-39 (primarily the north to south orientation) are similar to the typical single-circuit “delta” configuration described above for Segment H.

The avian mitigation design evaluated by the Applicants is a single-circuit H-frame “horizontal” configuration (see Attachment 01.52-9). Typically, this structure configuration is comprised of two poles, approximately 85 feet tall that support three conductors and two shield wires. The wire exposure zone is comprised of two wire planes and is approximately 29 feet tall. This avian mitigation design provides an alternative to the single circuit “delta” configuration summarized above for Segment H and a portion of Segment I, and could be used in the areas depicted for “avian mitigation structures” on Attachments 01.52-4 and 01.52-5. A similar alternative is not feasible for the double-circuit “vertical” configuration proposed along much of Segment I due to reliability concerns associated with a double-circuit H-frame configuration. For this reason, the Applicants cannot consider the H-frame design for most of Segment I. A comparative summary of the three structure types discussed above, as they relate to Segments H and I, can be found in Attachment 01.52-10.

While the avian mitigation design helps minimize potential bird collision risk, several associated impacts need to be considered, including increased cost, increased ROW width needed, additional impacts to private and public lands, and land cover / habitat impacts. For example, the additional structure material and installation labor for the H-frame “horizontal” line configuration is estimated to cost approximately $20,000 more per structure than the “delta” line configuration. This amounts to an increased cost of approximately $1,340,000 along Segment H and $400,000 along Segment I. Attachment 01.52-11 summarizes the differences in Total ROW Width, New ROW Area, and Existing ROW Area between the H-Frame “horizontal” line configuration and the originally proposed “delta” line configuration for the “areas of avian concern.” The use of an H-frame “horizontal” line configuration would require an additional 10 feet of Total ROW Width on average. In addition, the use of two-legged H-frame “horizontal” line structures would require the centerline be shifted further from the adjacent Interstate to maintain “all clear zones” for traffic safety. As such, an average of 20 feet of new ROW width (most of it on private property) would be required. Additional impacts to land cover would also occur and are summarized by land cover category in Attachment 01.52-11.

Dated this 28th day of March, 2014.

Attachment 01.52-10

Structure Design Comparison

Comparison of proposed structure design configurations and avian mitigation structure design configurations along portions of Segments H and I.

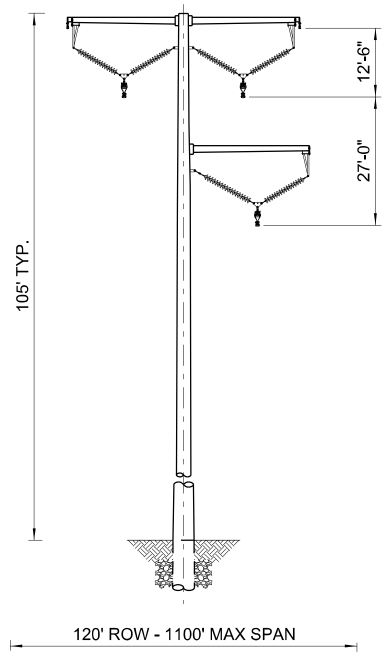
Structure Configuration [1, 2]	Total Average ROW Width (feet)	Number Poles per Structure	Approximate Height (feet)	Total Number of Wires	Total Number of Wire Planes	Approximate Height of Wire Exposure Zone (feet)
"Delta" Single-Circuit (Proposed Design, Portions Segments H and I)	120	1	105	5	3	39.5
"Vertical" Double-Circuit (Proposed Design, Portion of Segment I)	120	1	130	8	4	66.5
"Horizontal H-Frame" (Avian Mitigation Design, Portions of Segments H and I)	130	2	85	5	2	29.0

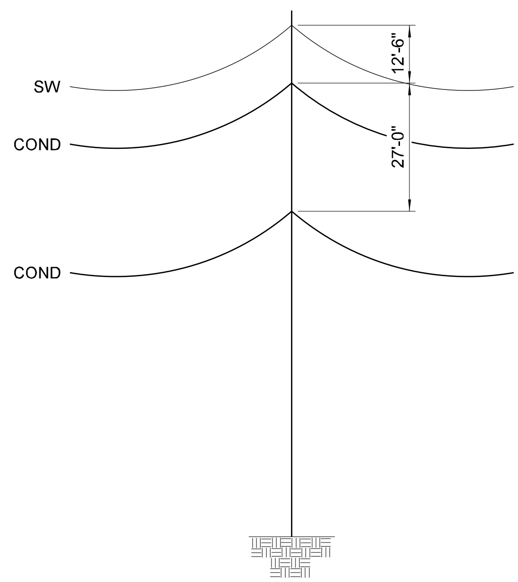
[1] Refer to Attachments 01.52-4 and 01.52-5 to see the extent along portions of Segments H and I where the "Horizontal H-Frame" design would be feasible for avian mitigation.

[2] Information provided is based on preliminary engineering of typical structure configurations and is subject to change or vary based on final engineering for individual structures.

Attachment 01.52-7

SEGMENT H & SEGMENT I (SINGLE CIRCUIT SECTIONS)
CURRENTLY PROPOSED DESIGN





345 kV STEEL SINGLE CIRCUIT "DELTA" TANGENT

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	01/20/14			LTS	CDJ	GLE	ECI
REV	DATE	W.O. #	DESCRIPTION	DRAWN	CHK'D	APP'D	CMPY

AMERICAN TRANSMISSION COMPANY

AVIAN IMPACT ALTERNATIVES
GENERAL DRAWINGS
BADGER - COULEE

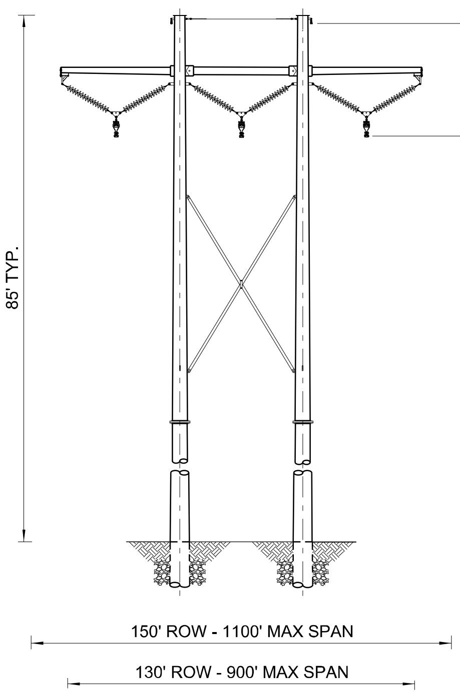
ENGINEERING RECORD DRAWING No.

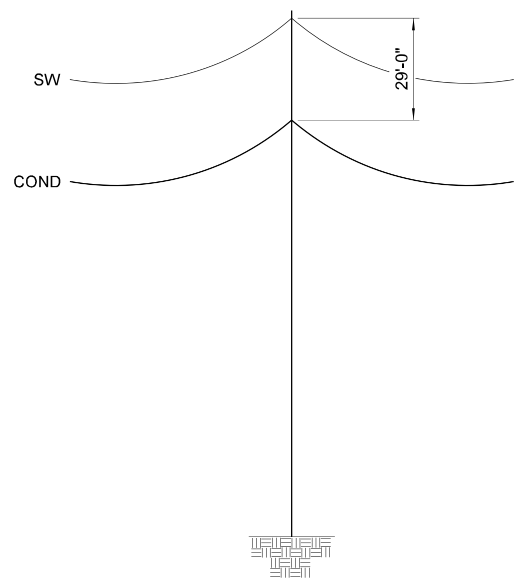
EXHIBIT - 1

Figure 3. Swan Flight Diverters being installed on overhead shield wire of 345 kV transmission line. Note visibility and diameter difference between braided conductor wire and shield wire.

Attachment 01.52-9

SEGMENT H & SEGMENT I (SINGLE CIRCUIT SECTIONS)
AVIAN MITIGATION DESIGN





345 kV STEEL SINGLE CIRCUIT "H-FRAME" TANGENT

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REV	DATE	W.O. #	DESCRIPTION	DRAWN	CHK'D	APP'D	CMPY
	01/20/14			LTS	CDJ	GLE	ECI

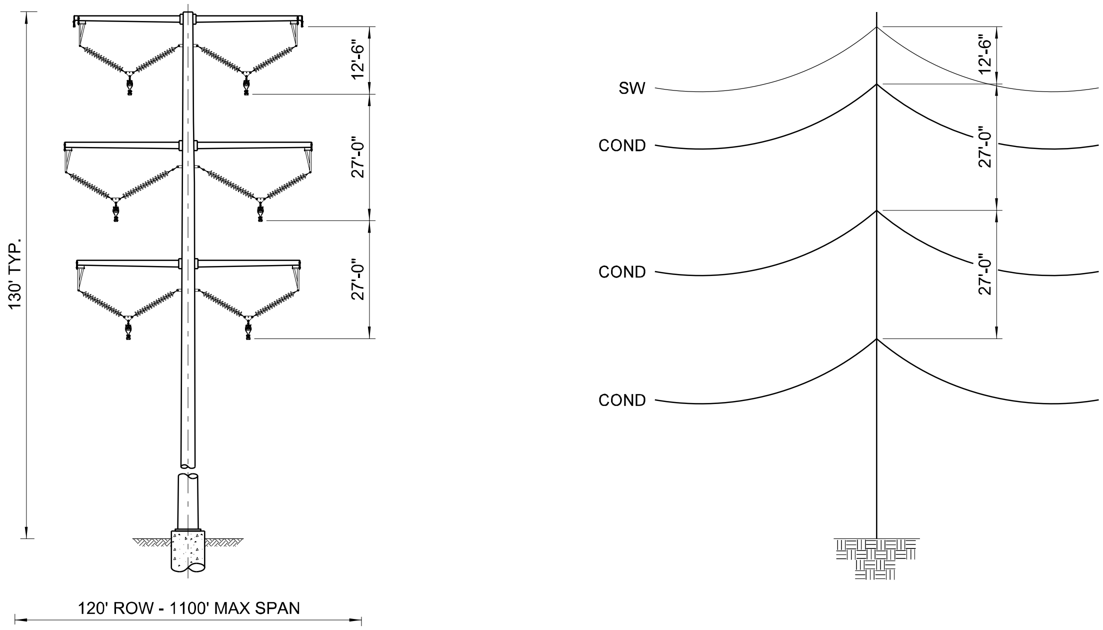
AMERICAN TRANSMISSION COMPANY

AVIAN IMPACT ALTERNATIVES
GENERAL DRAWINGS
BADGER - COULEE

ENGINEERING RECORD DRAWING No.

EXHIBIT - 3

SEGMENT I - (DOUBLE CIRCUIT SECTIONS)
CURRENTLY PROPOSED DESIGN



345 kV STEEL DOUBLE CIRCUIT "VERTICAL" TANGENT

Appendix C
Item 13

	01/20/14			LTS	CDJ	GLE	ECI
REV	DATE	W.O. #	DESCRIPTION	DRAWN	CHK'D	APP'D	CMPY

AMERICAN TRANSMISSION COMPANY

AVIAN IMPACT ALTERNATIVES
GENERAL DRAWINGS
BADGER - COULEE

ENGINEERING RECORD DRAWING No.

EXHIBIT - 2

Appendix D – Agricultural Impact Statement

Agricultural Impact Statement for the Proposed Badger-Coulee 345 kV Transmission Line
Wisconsin Department of Agriculture, Trade and Consumer Protection
Draft Table of Contents

August 2014

PUBLIC SERVICE COMMISSION OF WISCONSIN
WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Badger-Coulee Transmission Line Volume 2

Draft Environmental Impact Statement

PSC Docket 5-CE-142

Date Issued: August 2014

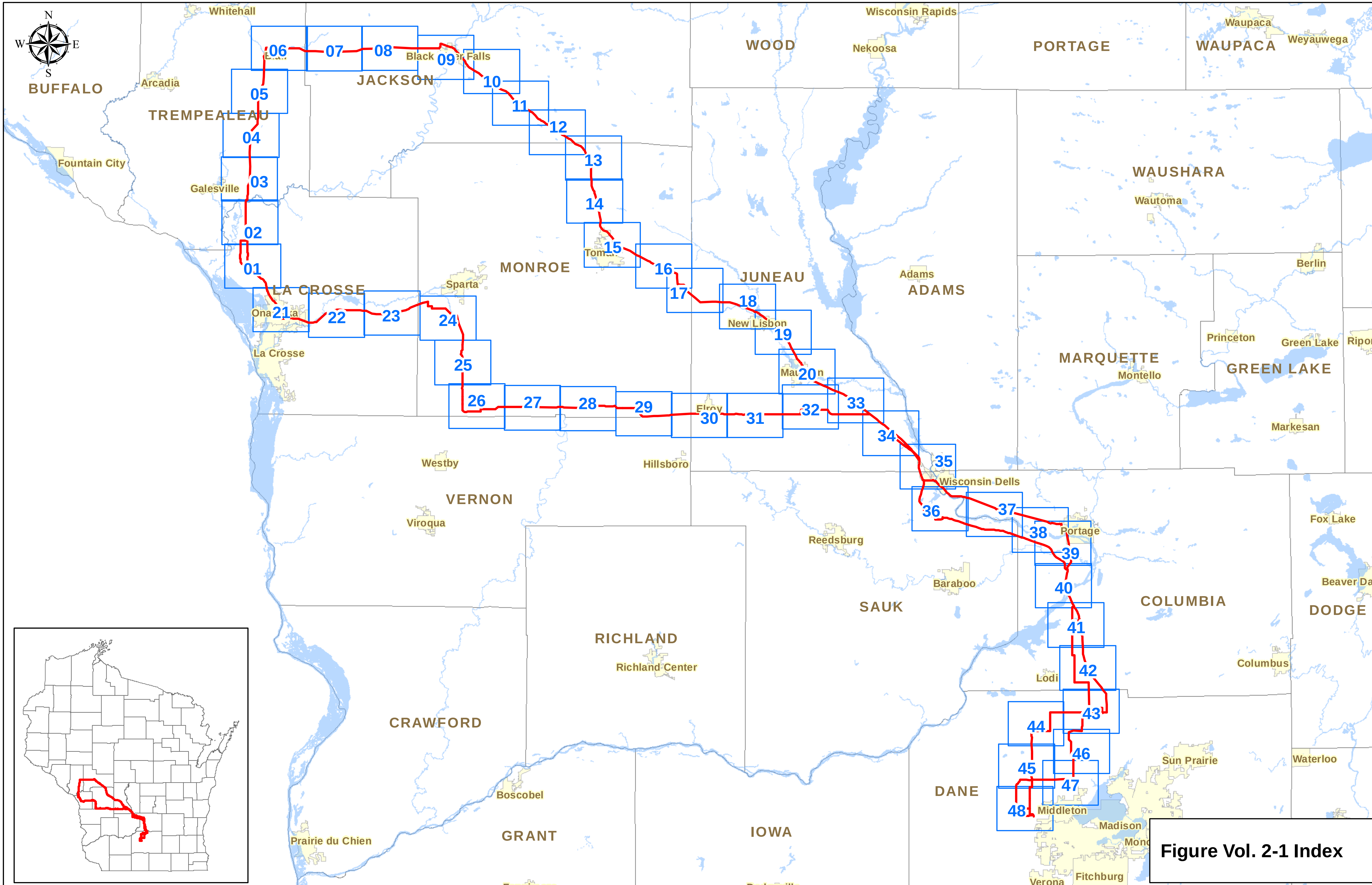
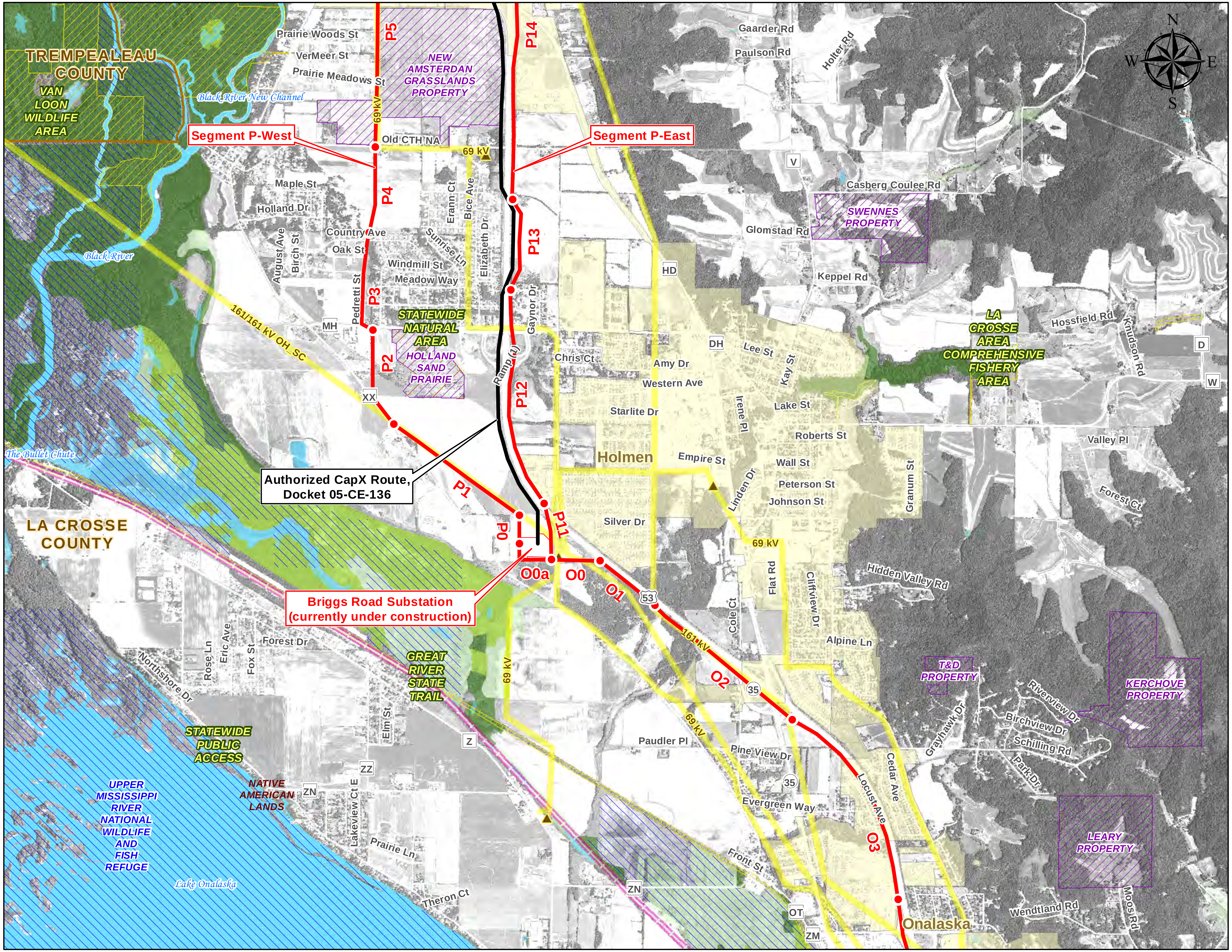
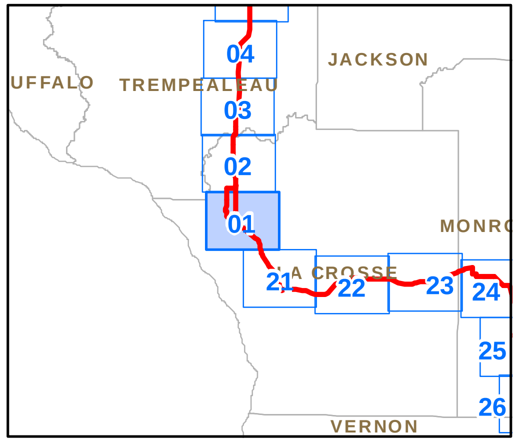


Figure Vol. 2-1 Index





Legend
1 inch = 2,640 feet

- Segment Node Points
- Subsegment Node Points
- Possible Transmission Line Routes
- Authorized CapX Route 05-CE-136
- Natural Gas Pipelines

Existing Infrastructure

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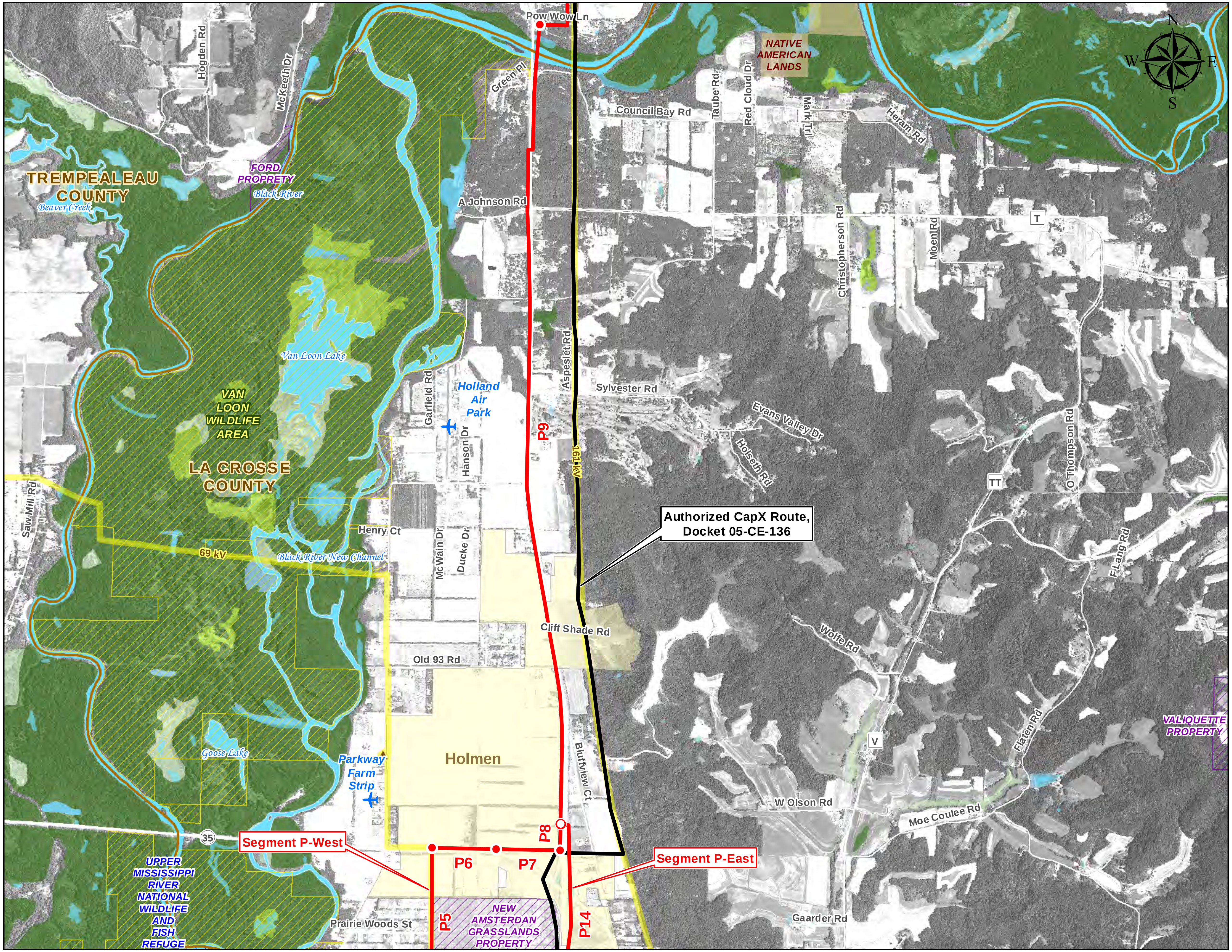
Fig. Vol. 2-1.01



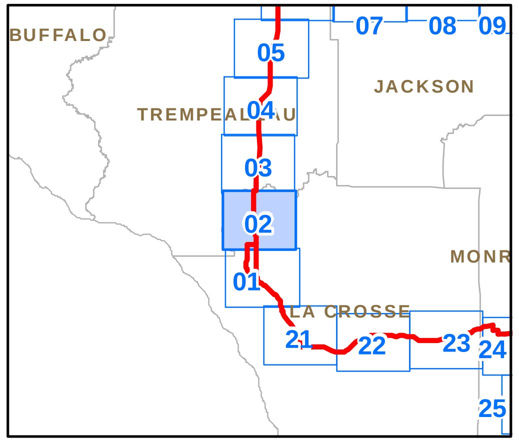


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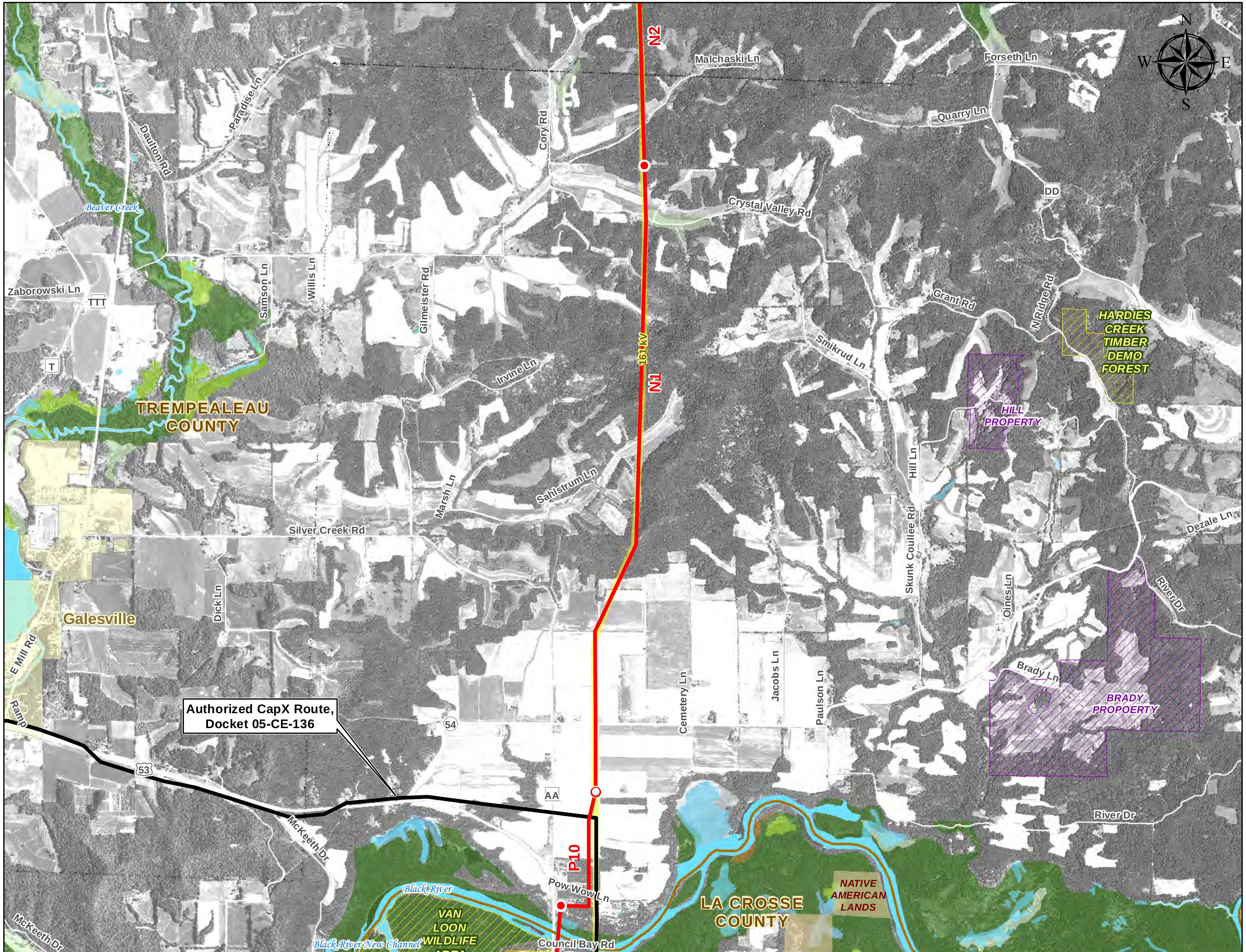
Fig. Vol. 2-1.02



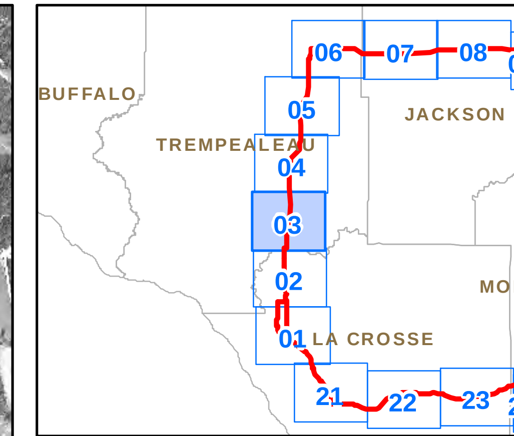


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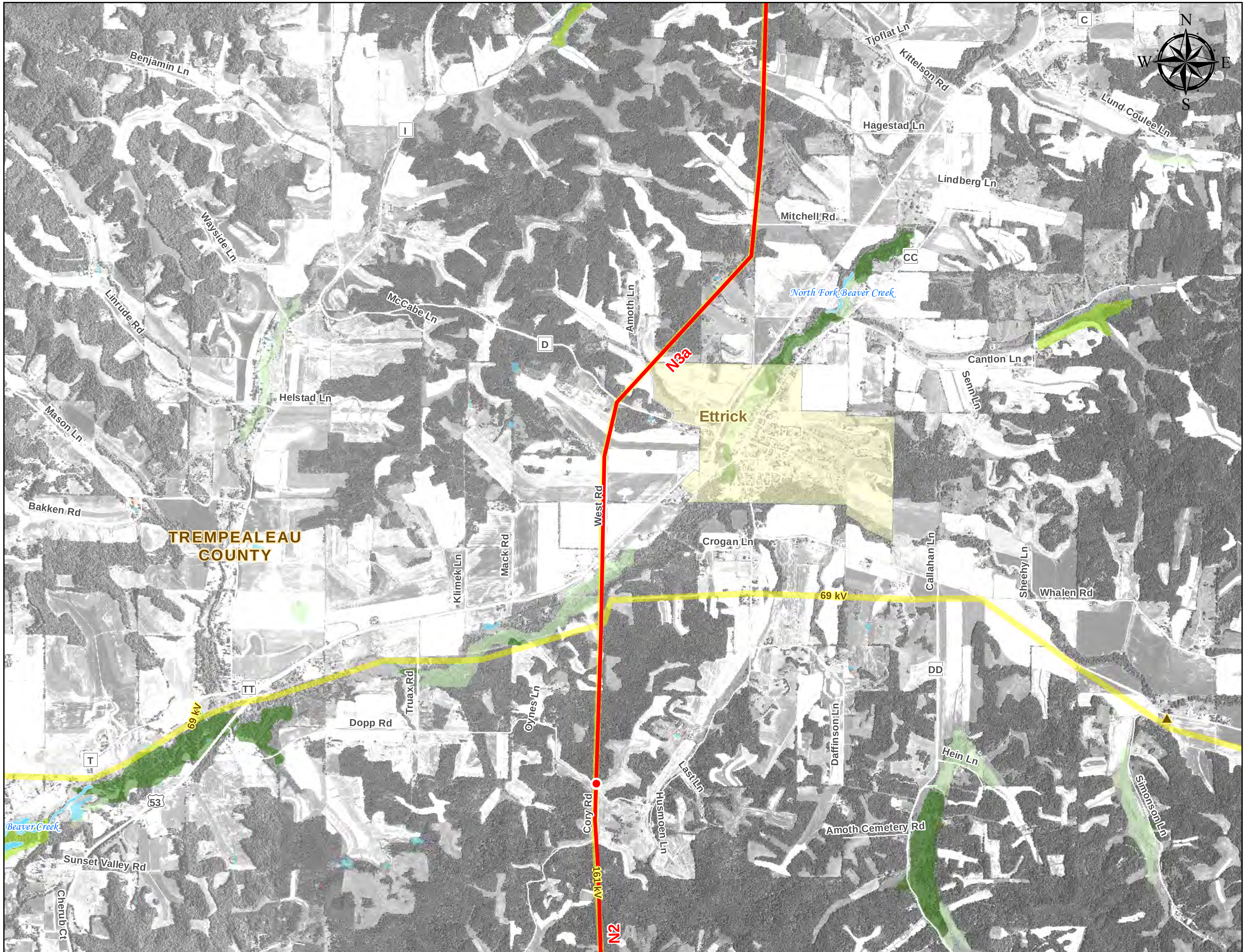
Fig. Vol. 2-1.03



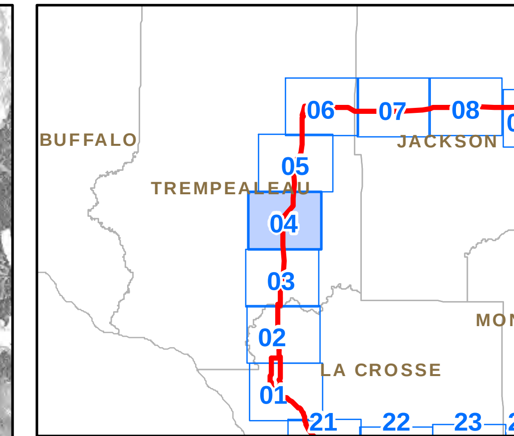


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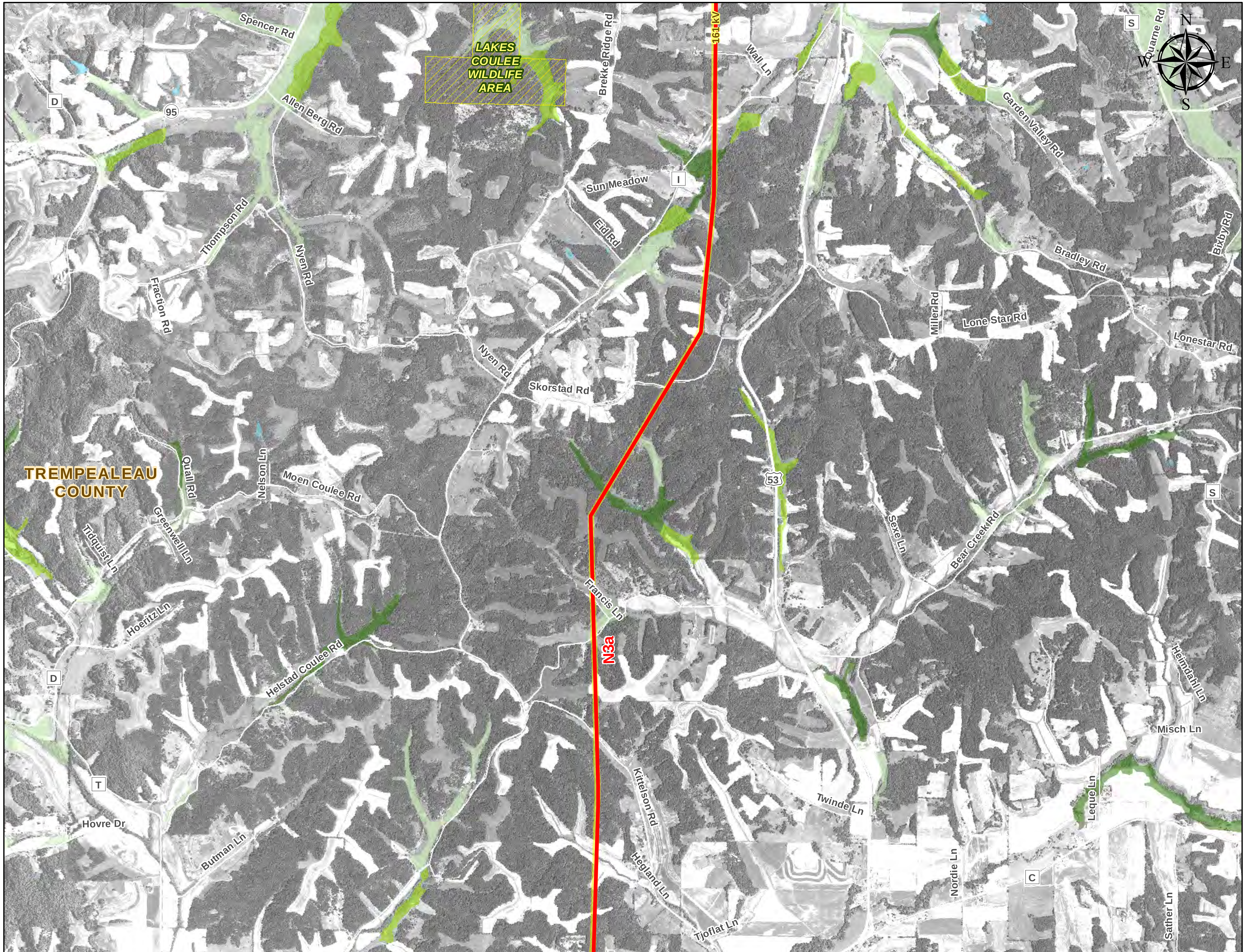
Fig. Vol. 2-1.04



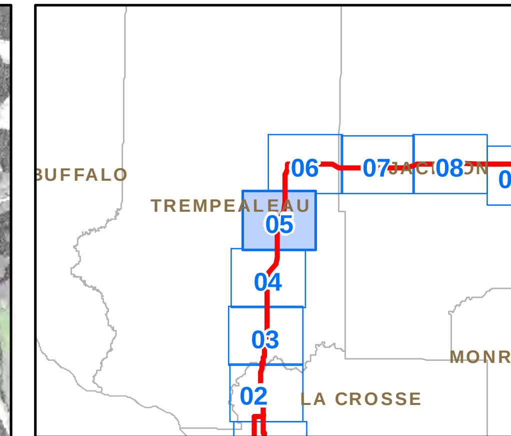


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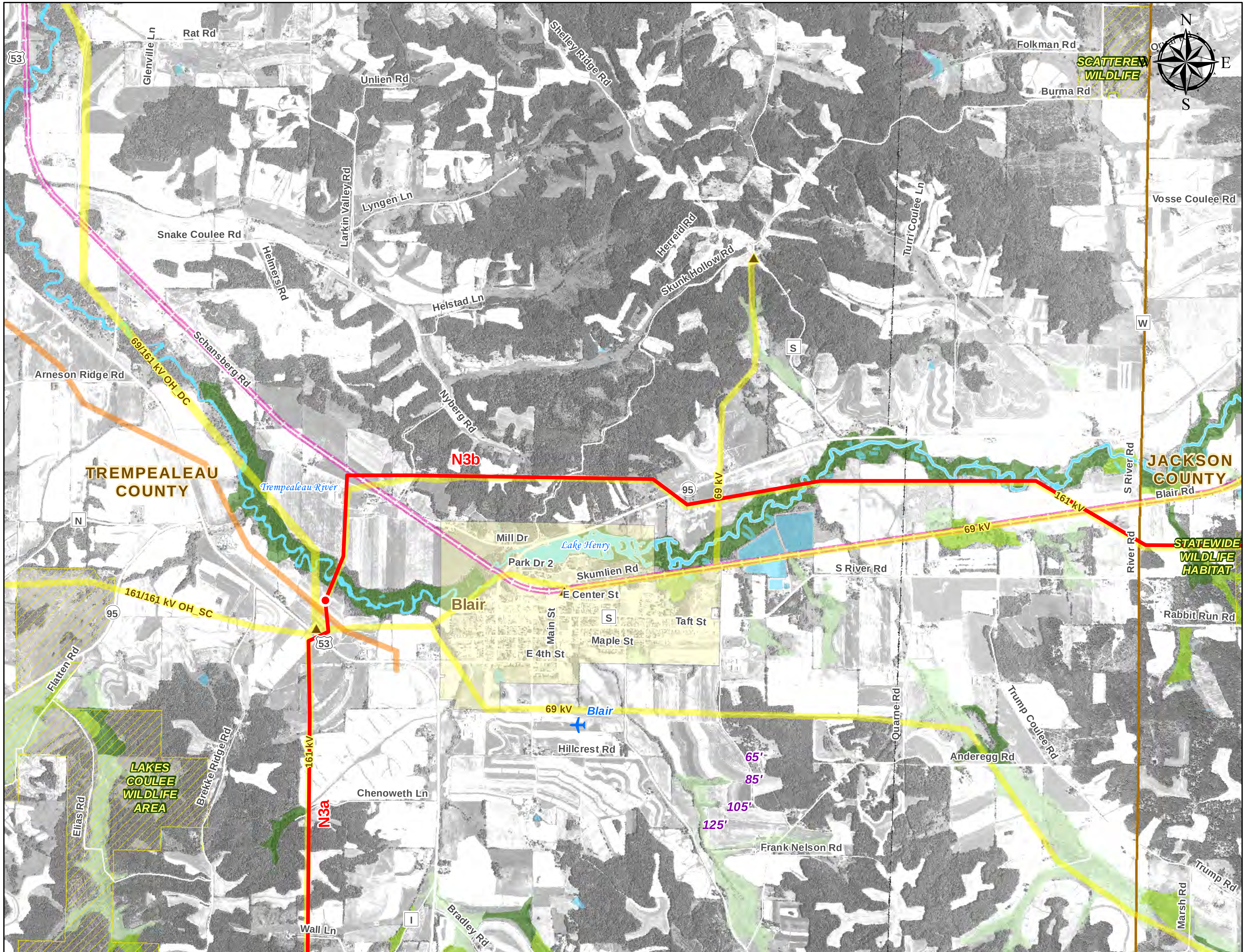
Fig. Vol. 2-1.05



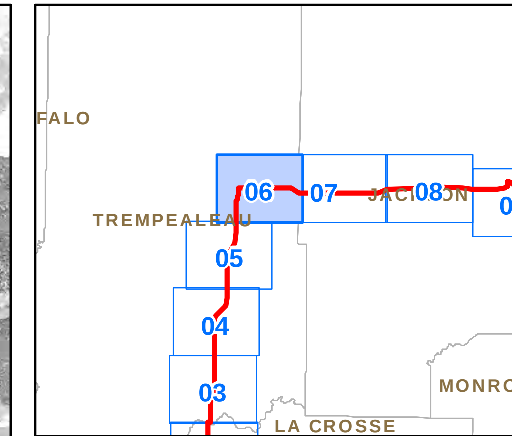


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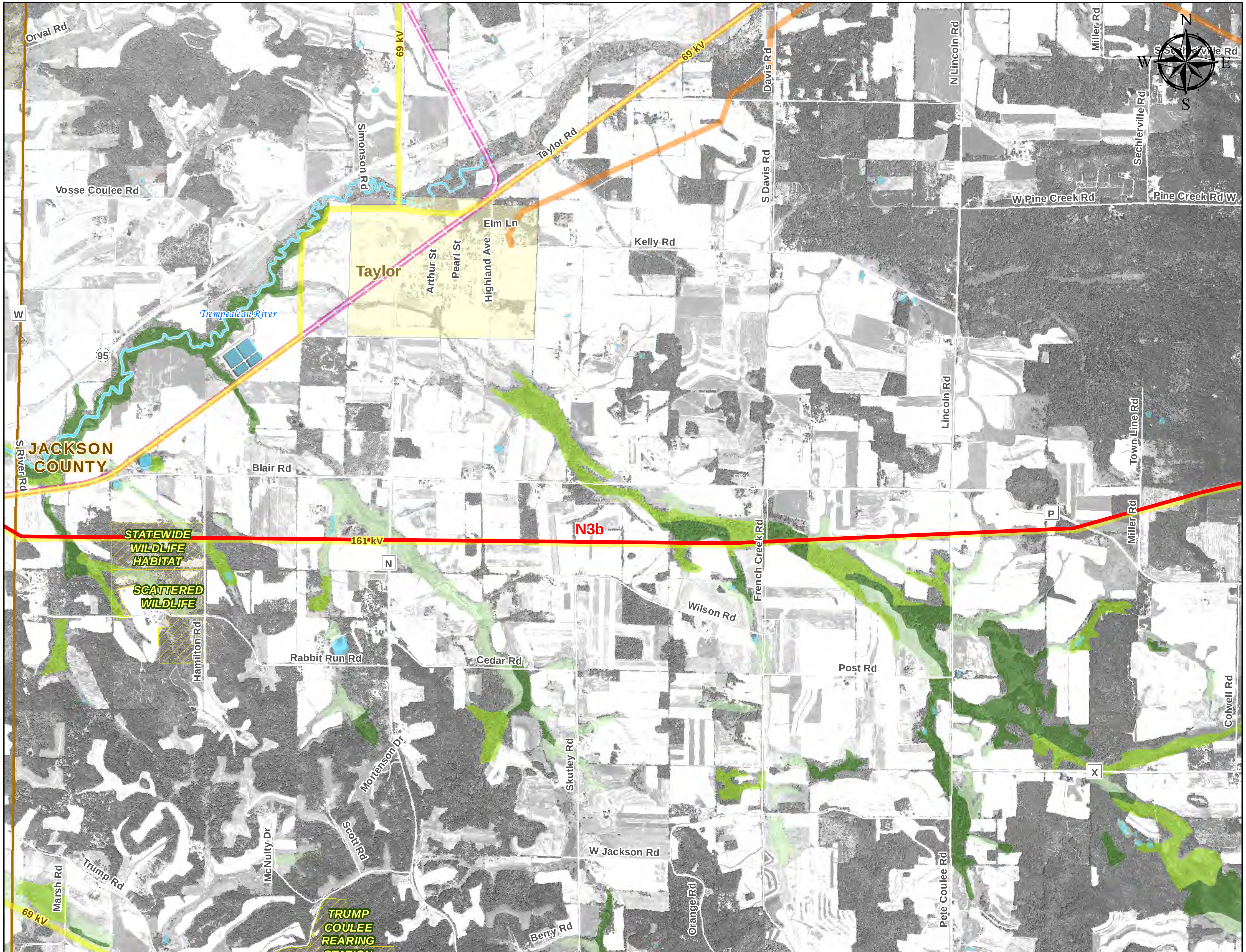
Fig. Vol. 2-1.06



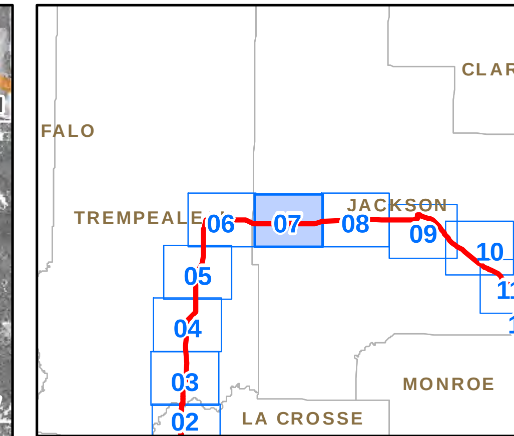


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Fig. Vol. 2-1.07

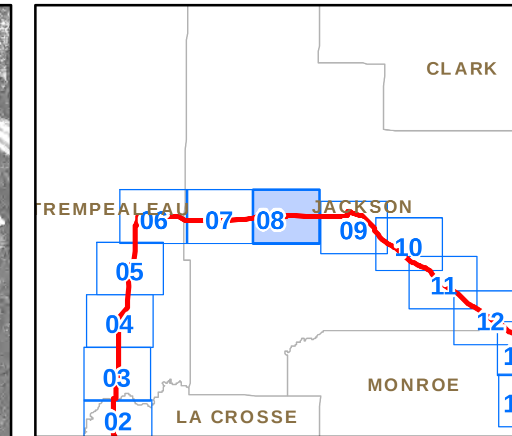

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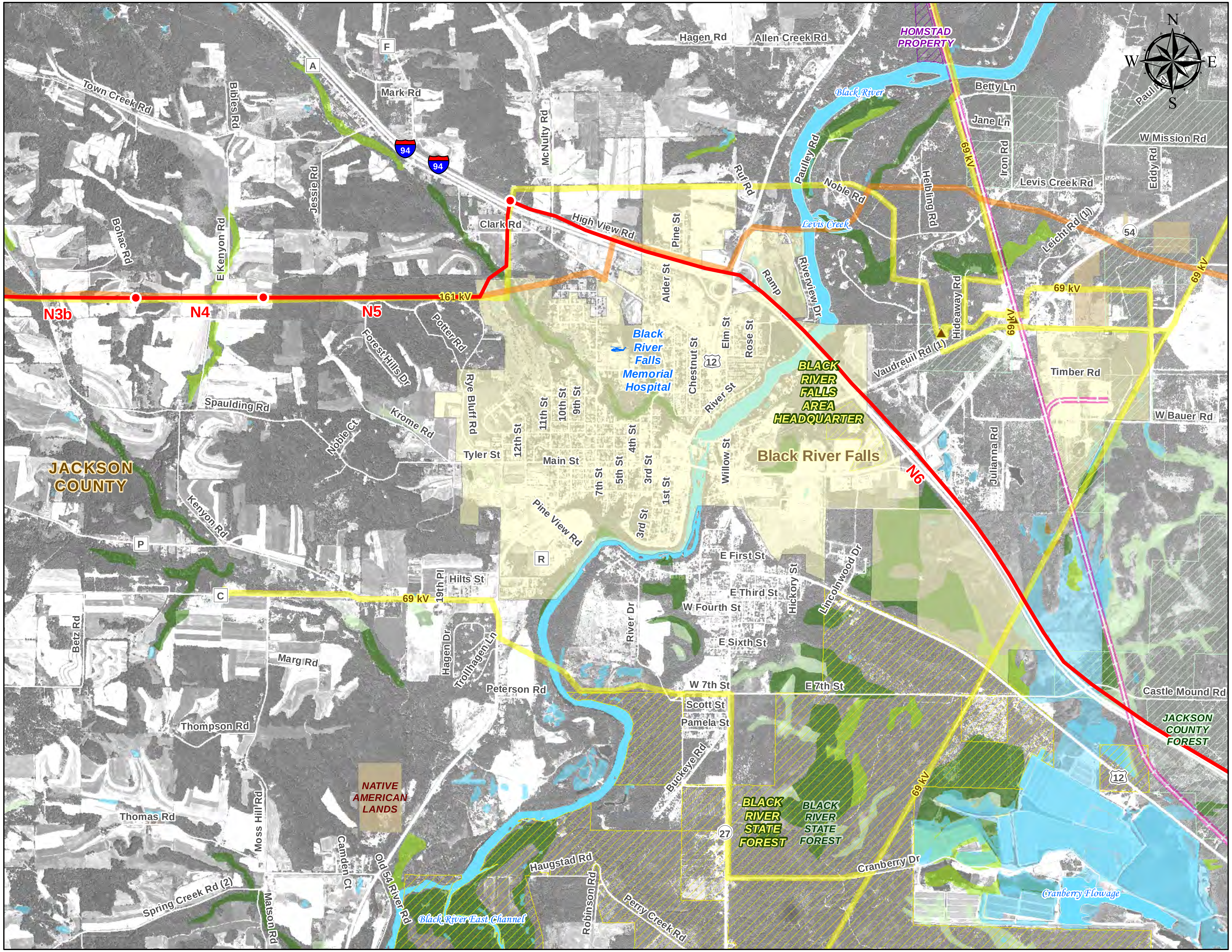
Fig. Vol. 2-1.08



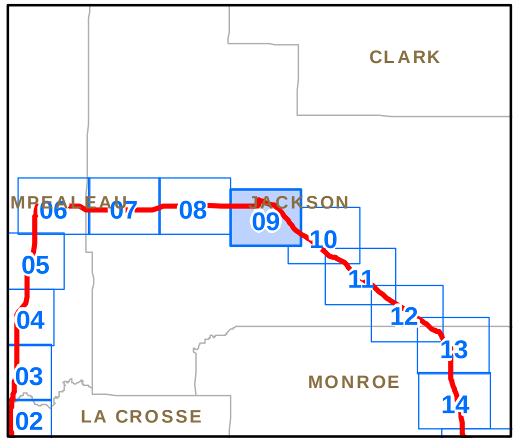


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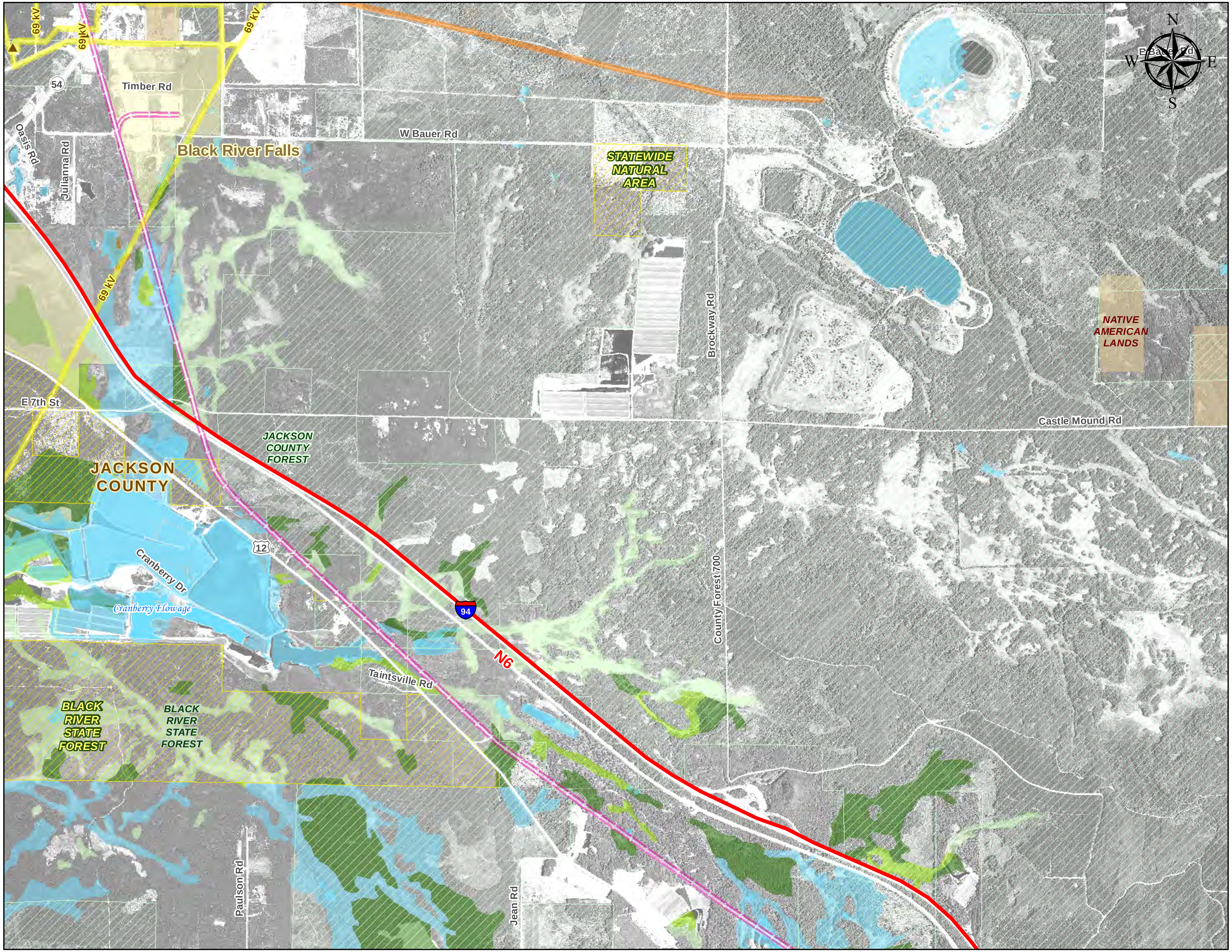
Fig. Vol. 2-1.09



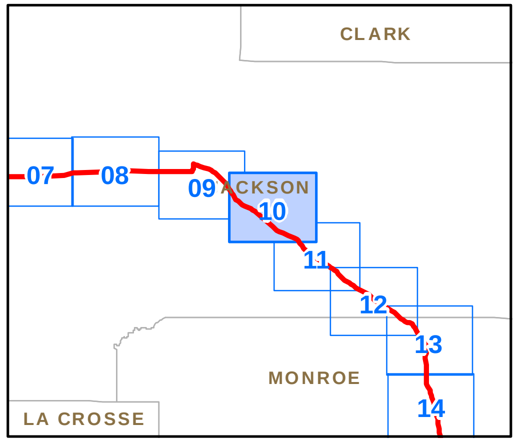


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Fig. Vol. 2-1.10

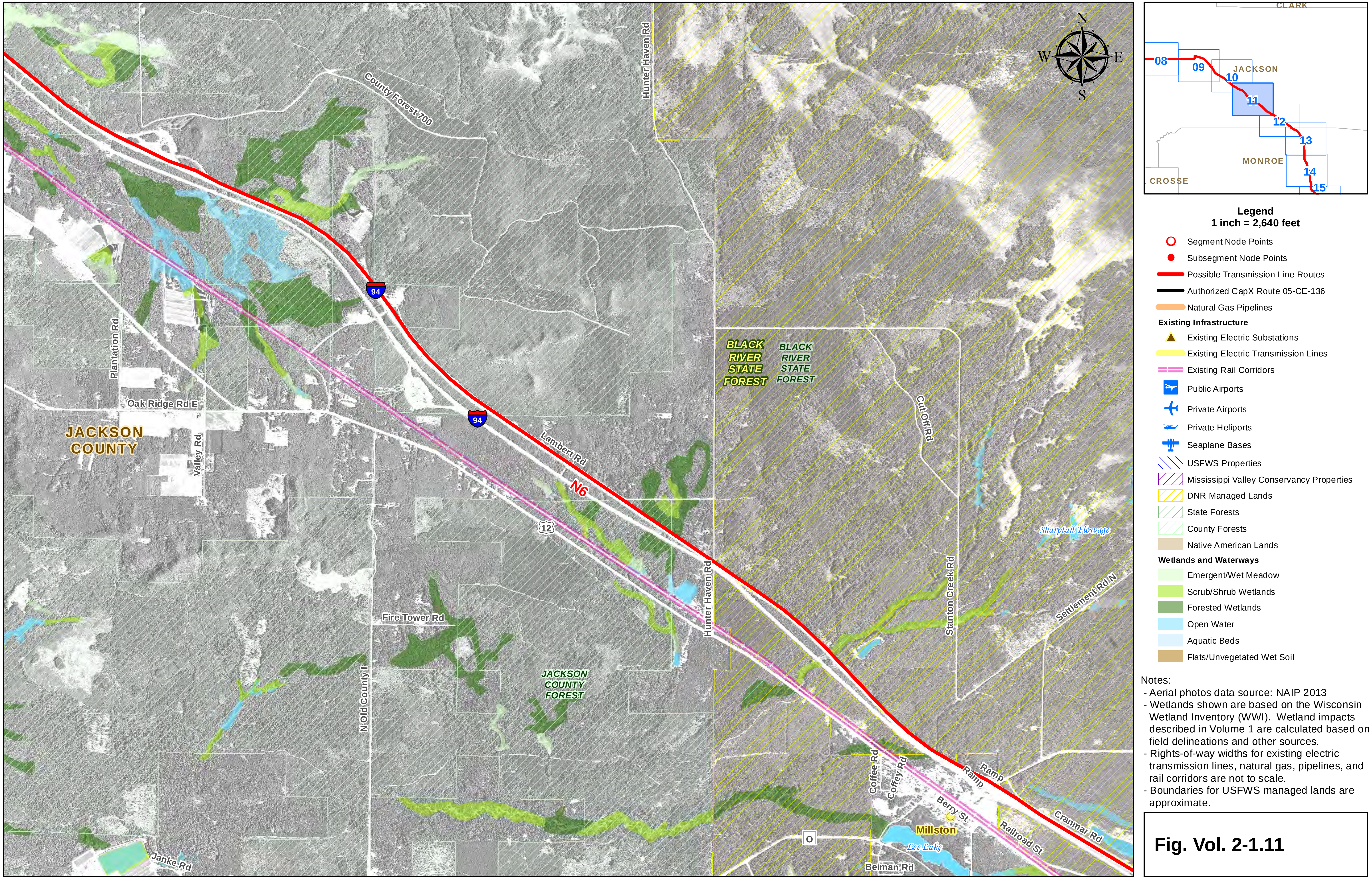

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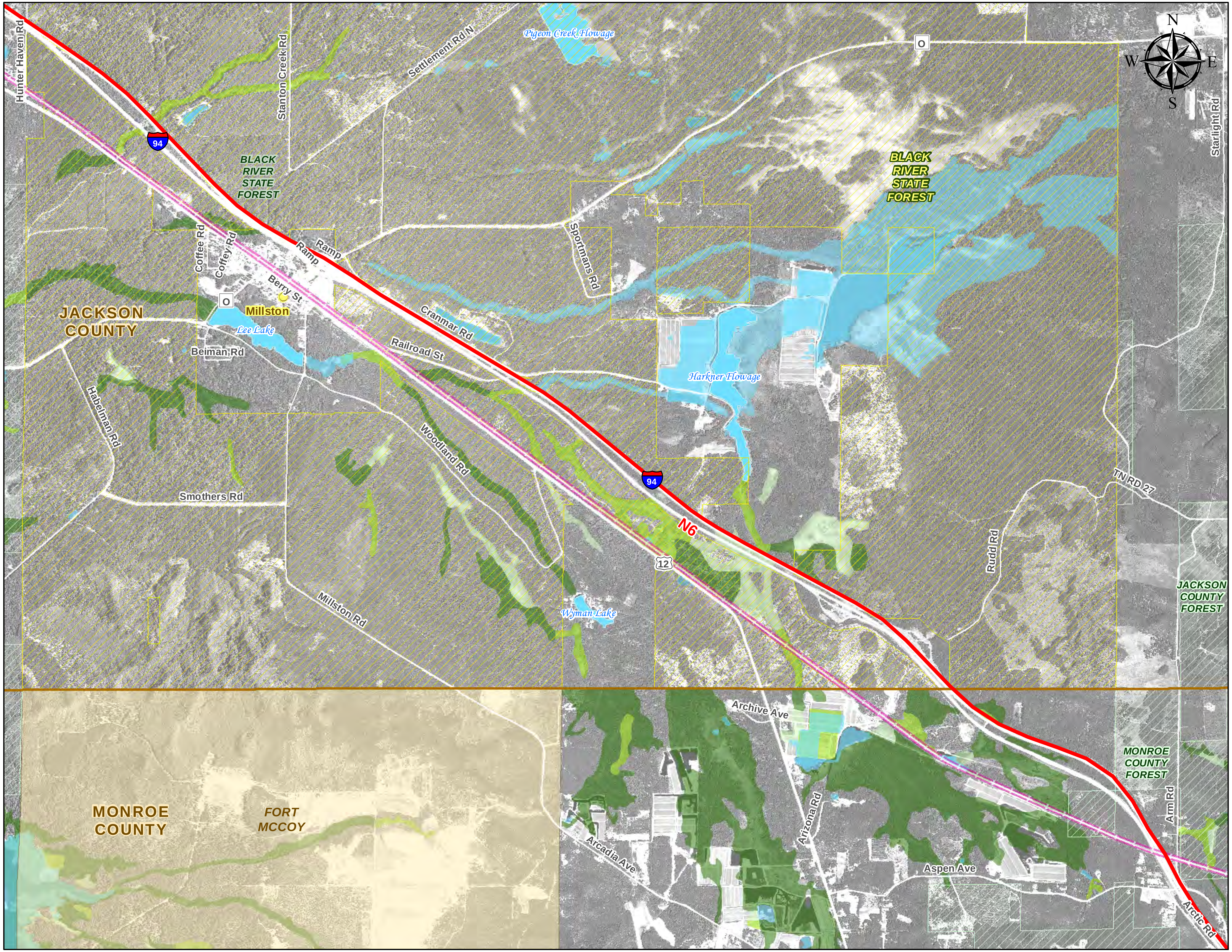
Fig. Vol. 2-1.11



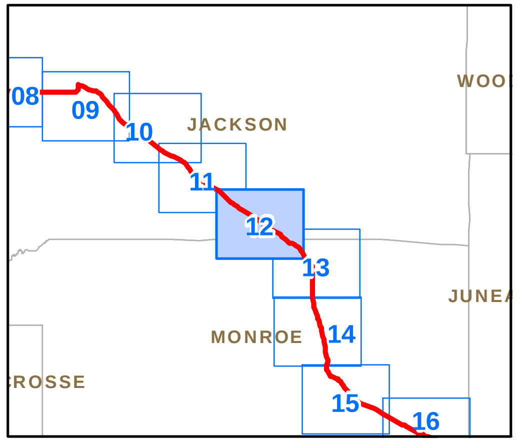


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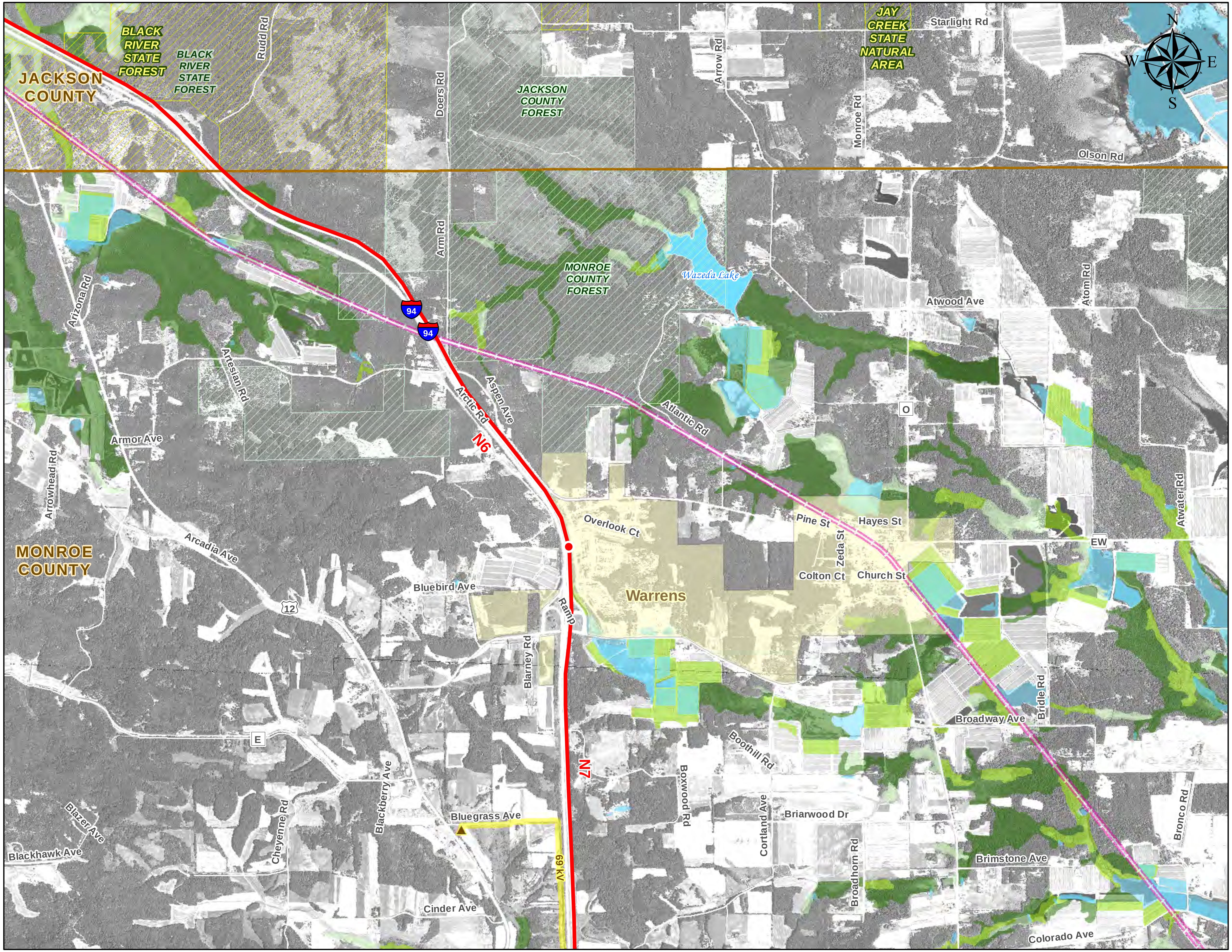
Fig. Vol. 2-1.12



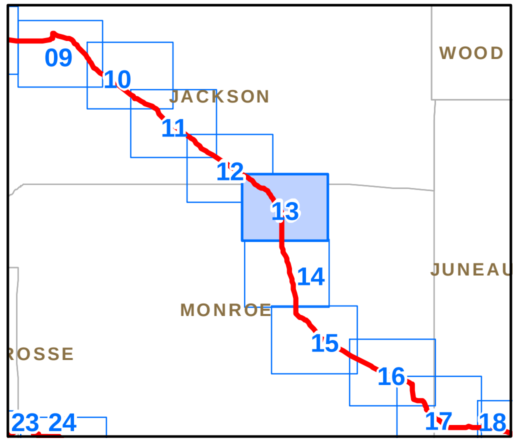


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Fig. Vol. 2-1.13

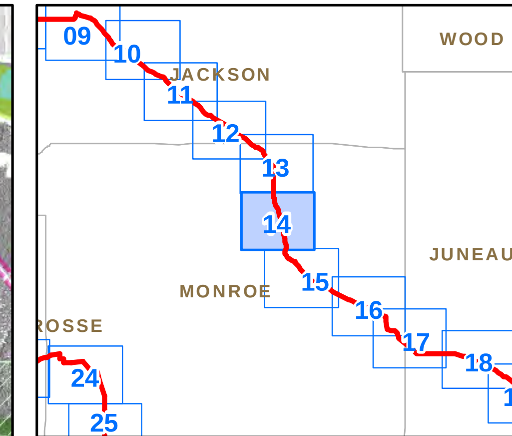

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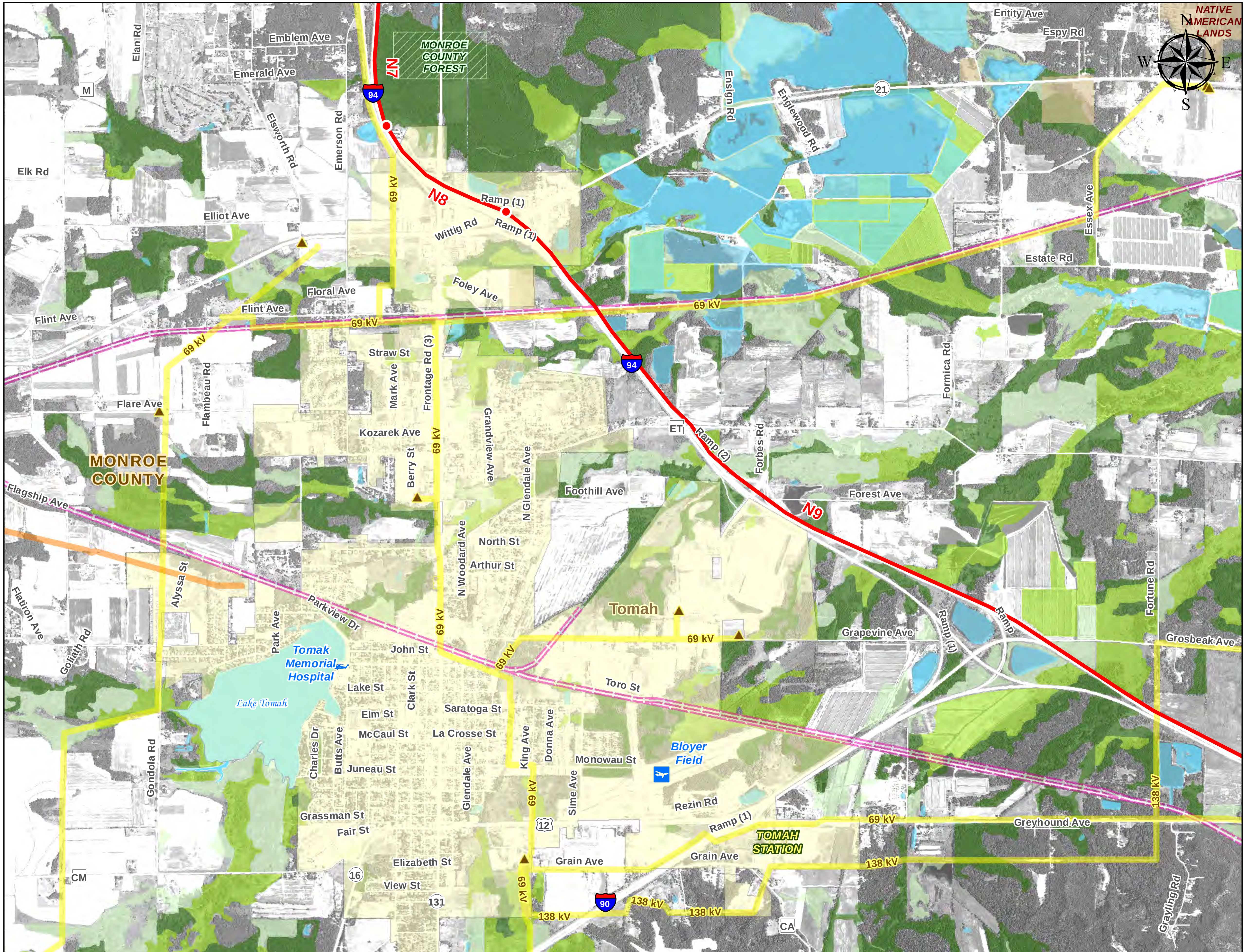
Fig. Vol. 2-1.14



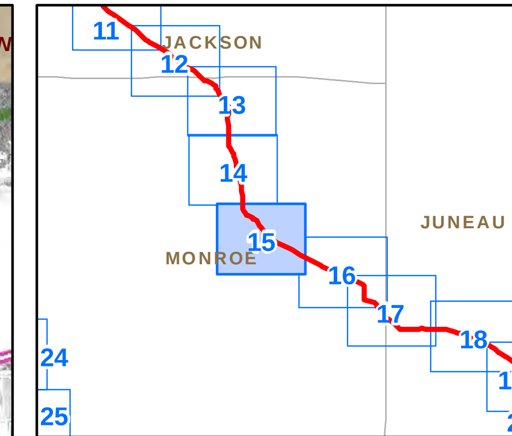


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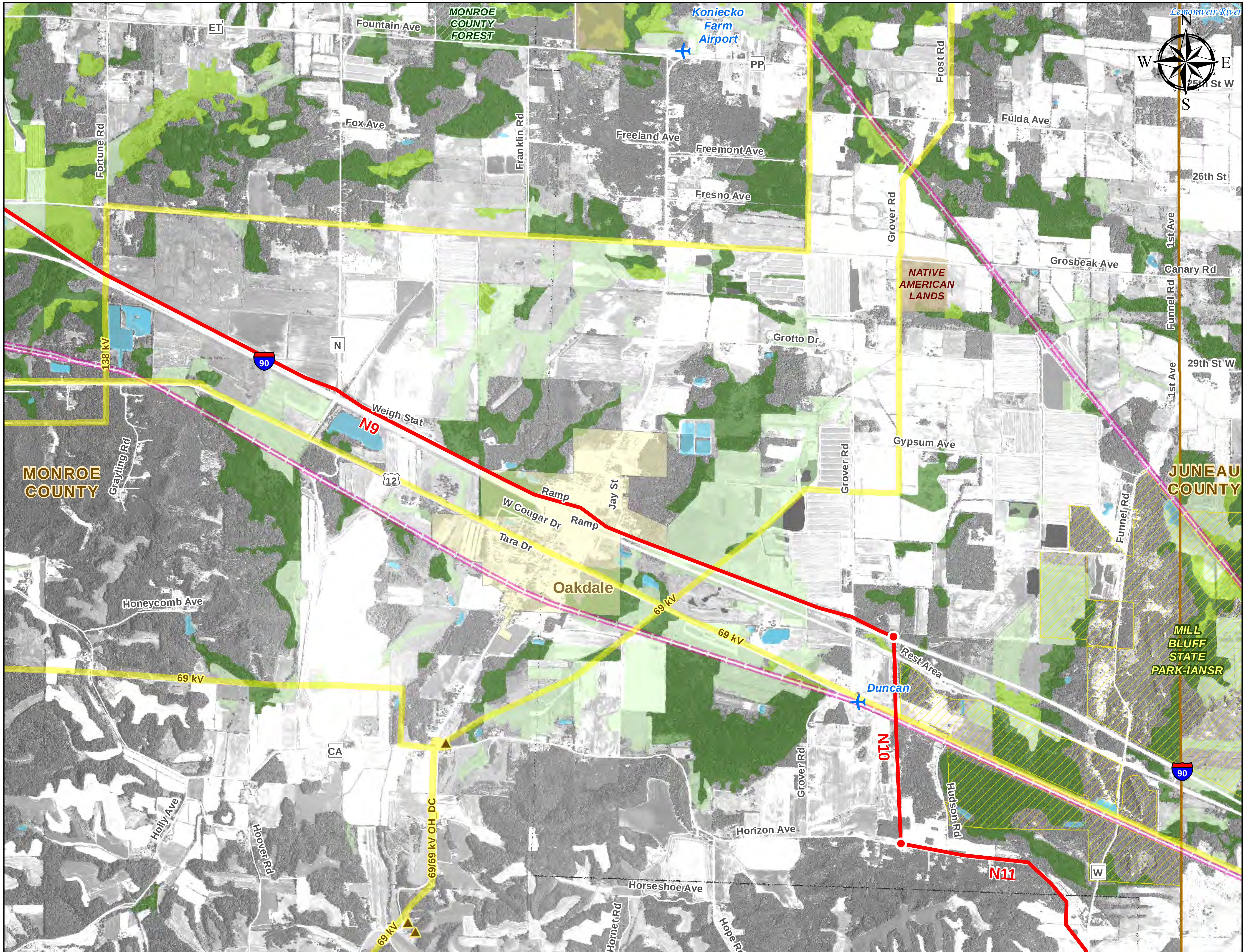
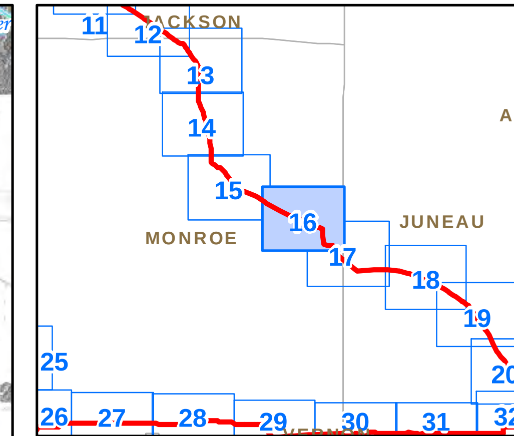
Fig. Vol. 2-1.15





Legend
1 inch = 2,640 feet

- Segment Node Points
- Subsegment Node Points
- Possible Transmission Line Routes
- Authorized CapX Route 05-CE-136
- Natural Gas Pipelines

Existing Infrastructure

- Existing Electric Substations
- Existing Electric Transmission Lines
- Existing Rail Corridors
- Public Airports
- Private Airports
- Private Heliports
- Seaplane Bases
- USFWS Properties
- Mississippi Valley Conservancy Properties
- DNR Managed Lands
- State Forests
- County Forests
- Native American Lands

Wetlands and Waterways

- Emergent/Wet Meadow
- Scrub/Shrub Wetlands
- Forested Wetlands
- Open Water
- Aquatic Beds
- Flats/Unvegetated Wet Soil

Notes:
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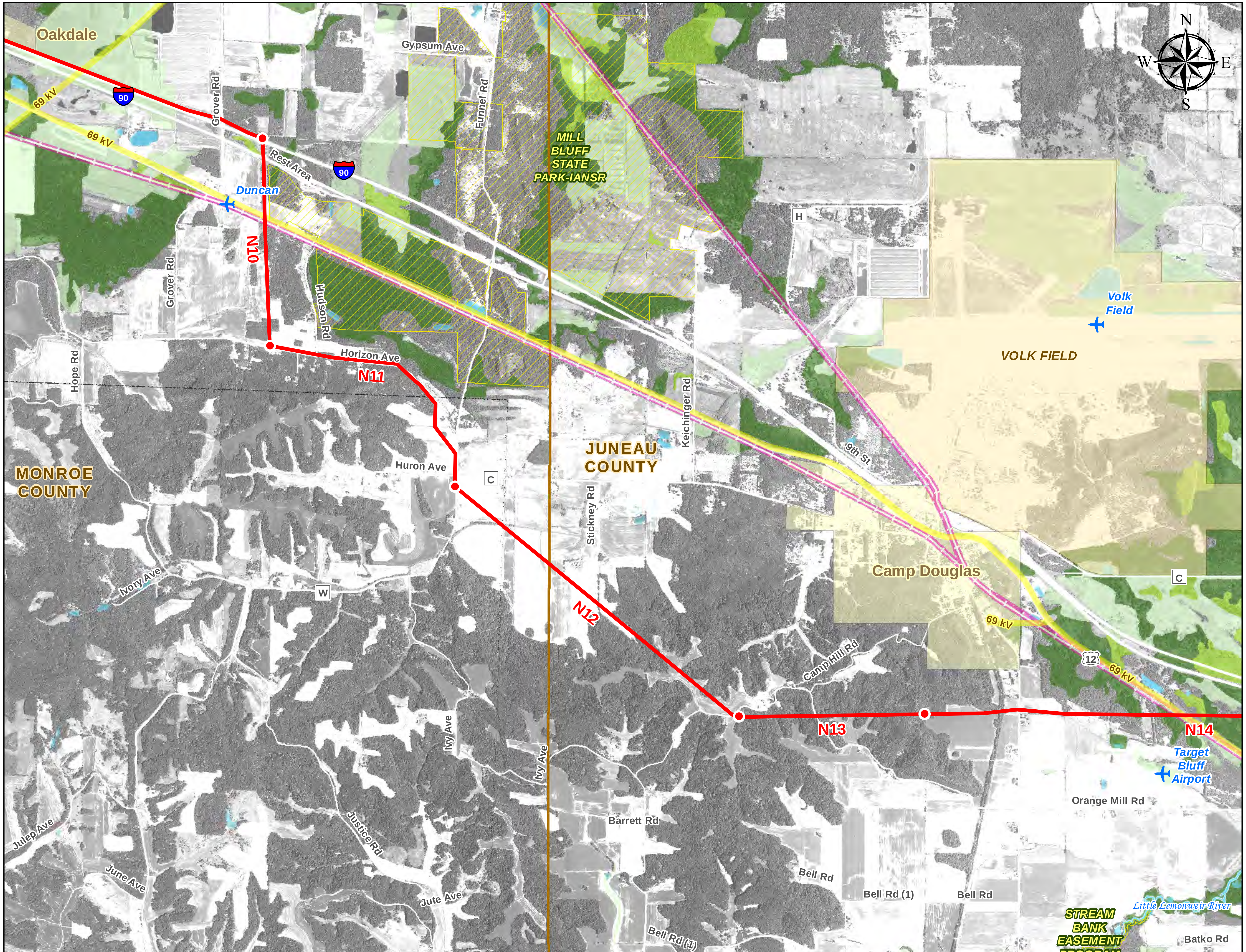
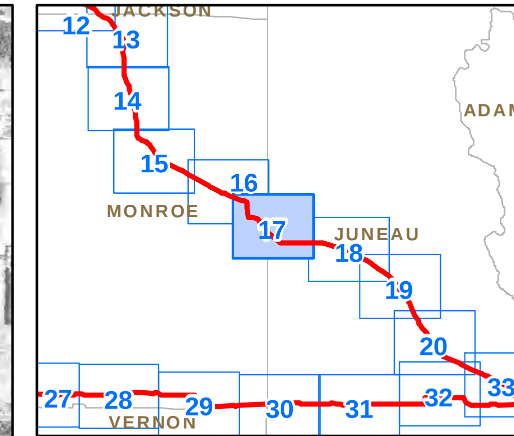
Fig. Vol. 2-1.16





Legend
1 inch = 2,640 feet

- Segment Node Points
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- Possible Transmission Line Routes
- Authorized CapX Route 05-CE-136
- Natural Gas Pipelines

Existing Infrastructure

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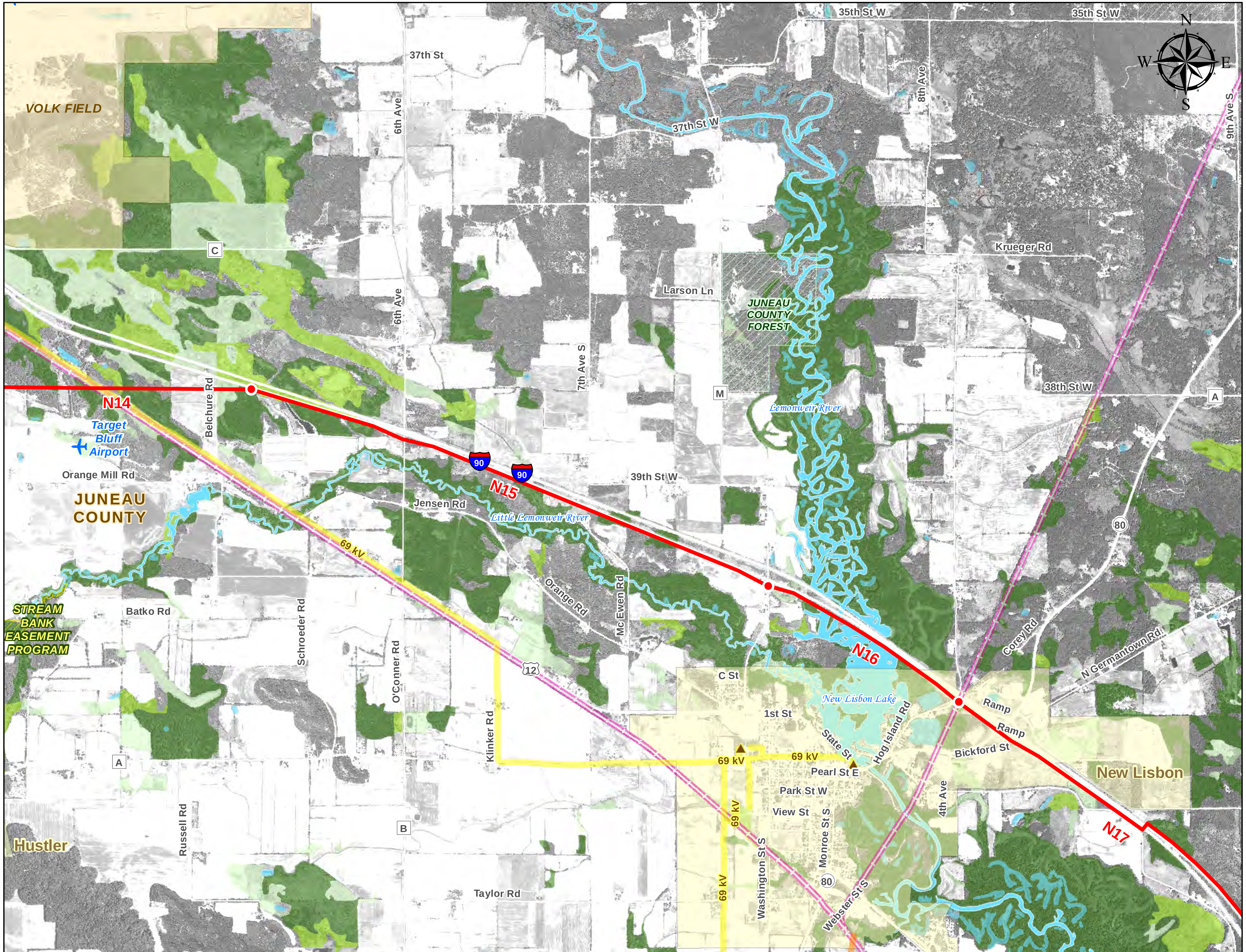
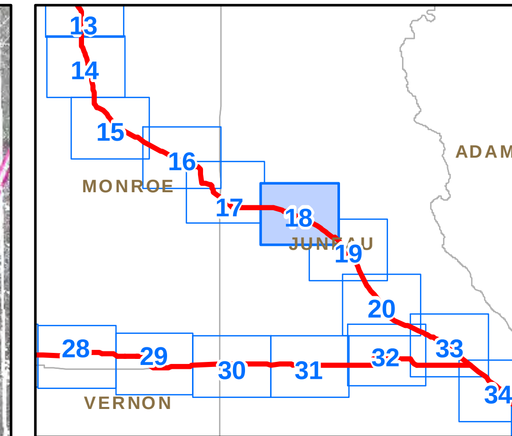
Fig. Vol. 2-1.17





Legend
1 inch = 2,640 feet

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- Authorized CapX Route 05-CE-136
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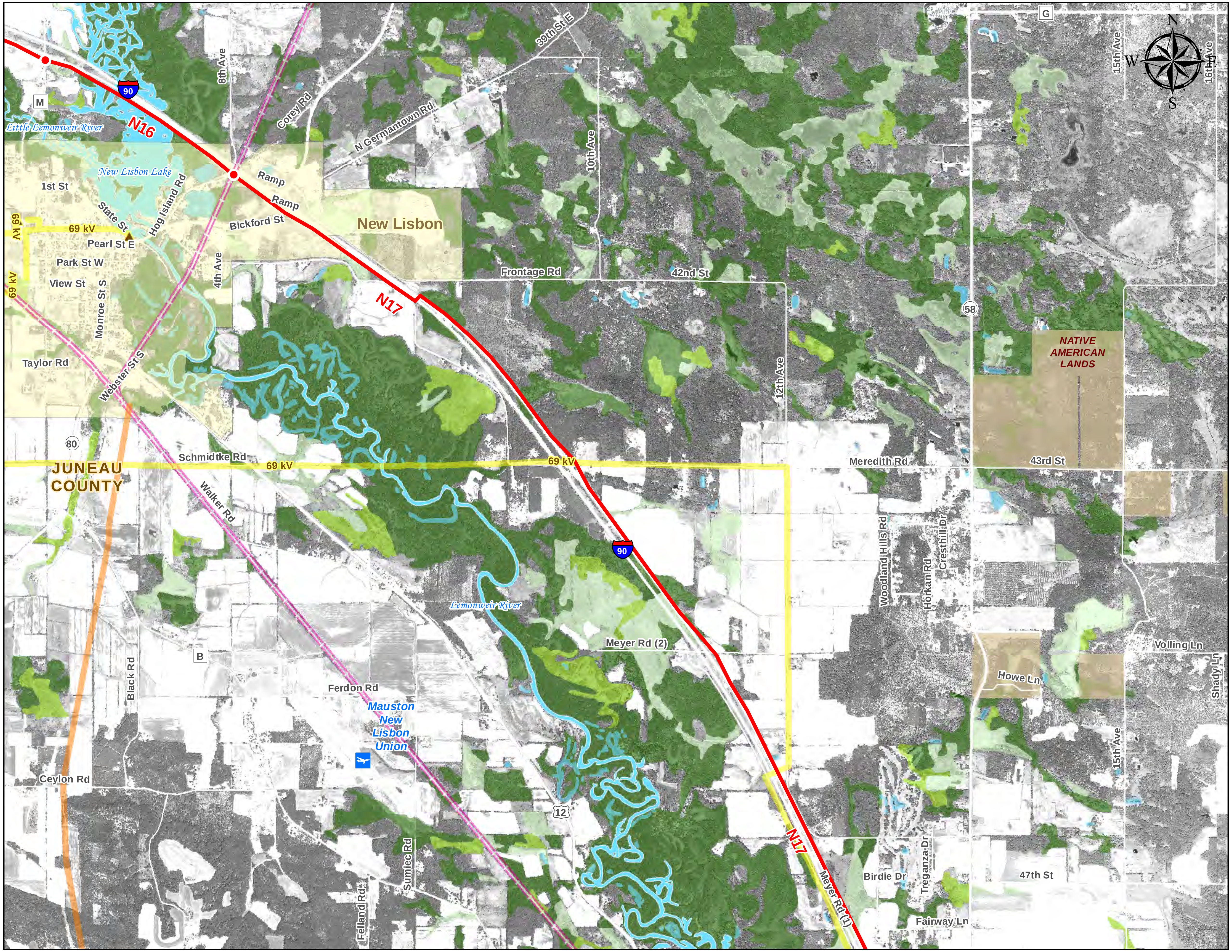
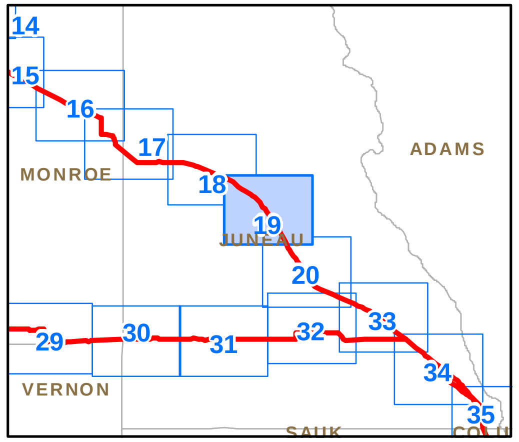
Fig. Vol. 2-1.18





Legend
1 inch = 2,640 feet

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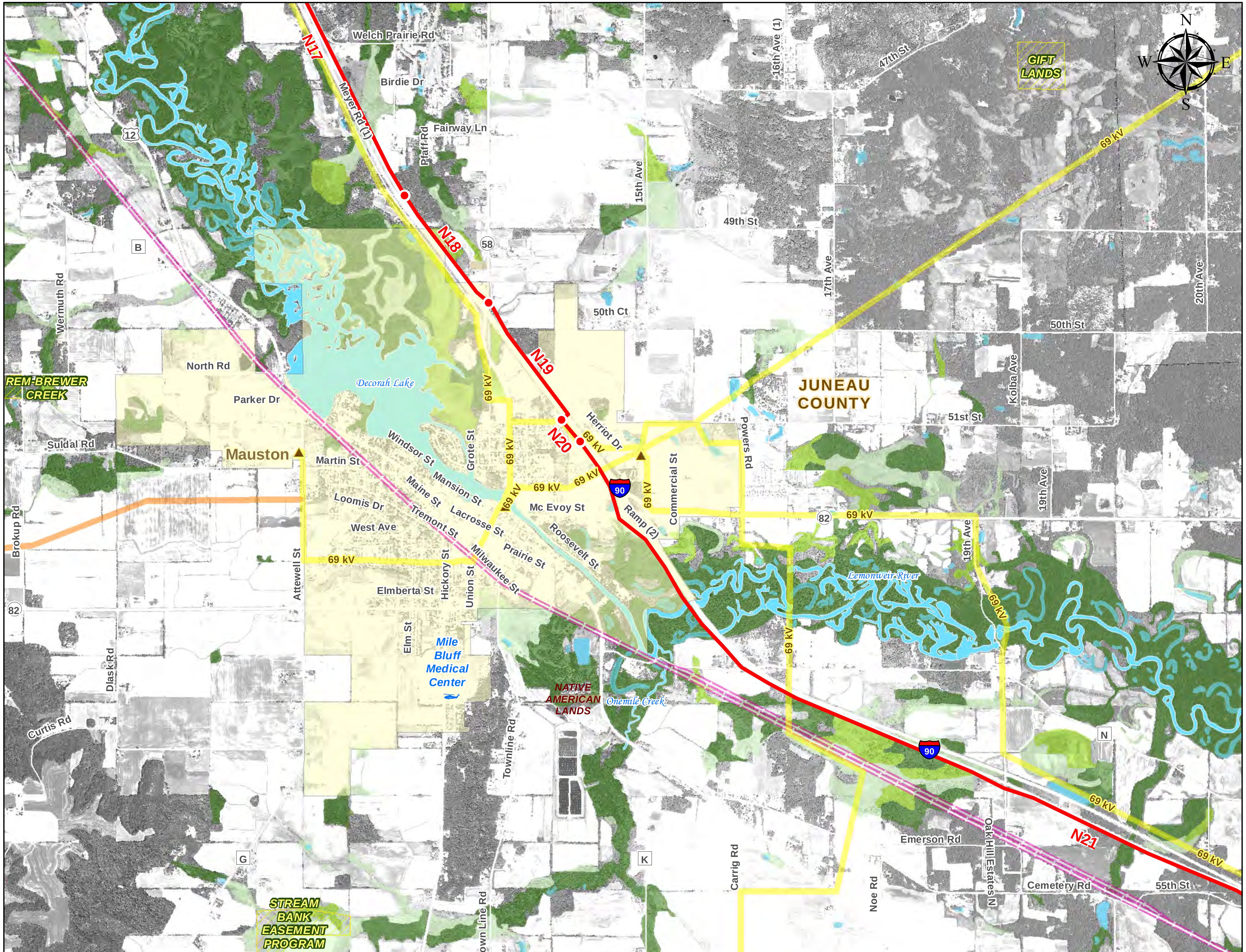
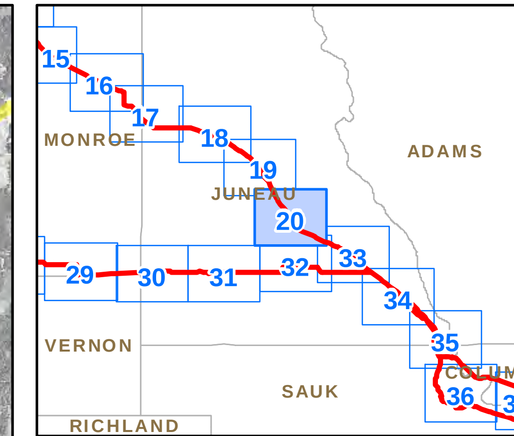
Fig. Vol. 2-1.19





Legend
1 inch = 2,640 feet

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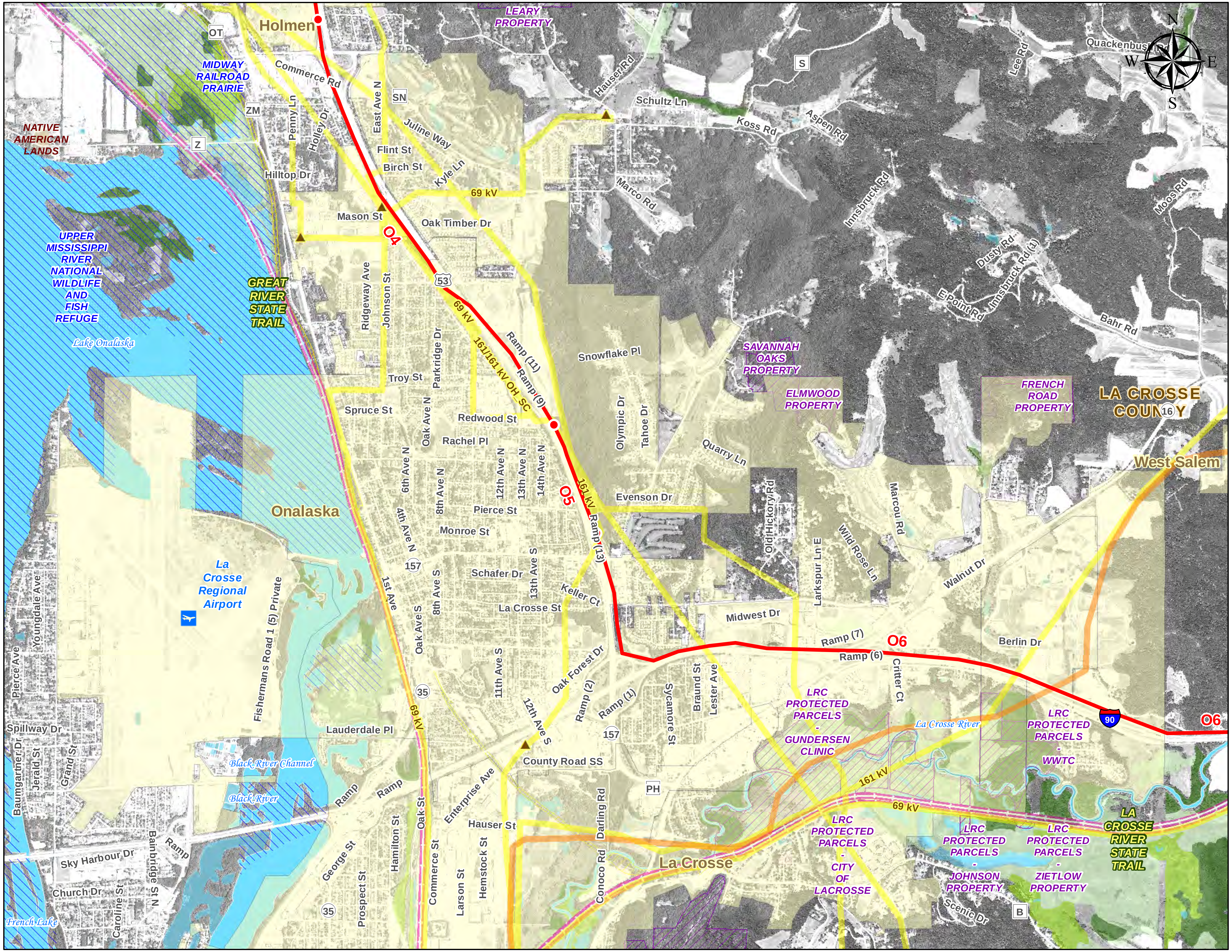
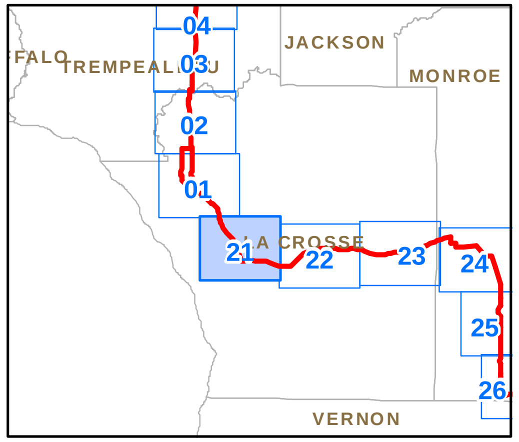
Fig. Vol. 2-1.20





Legend
1 inch = 2,640 feet

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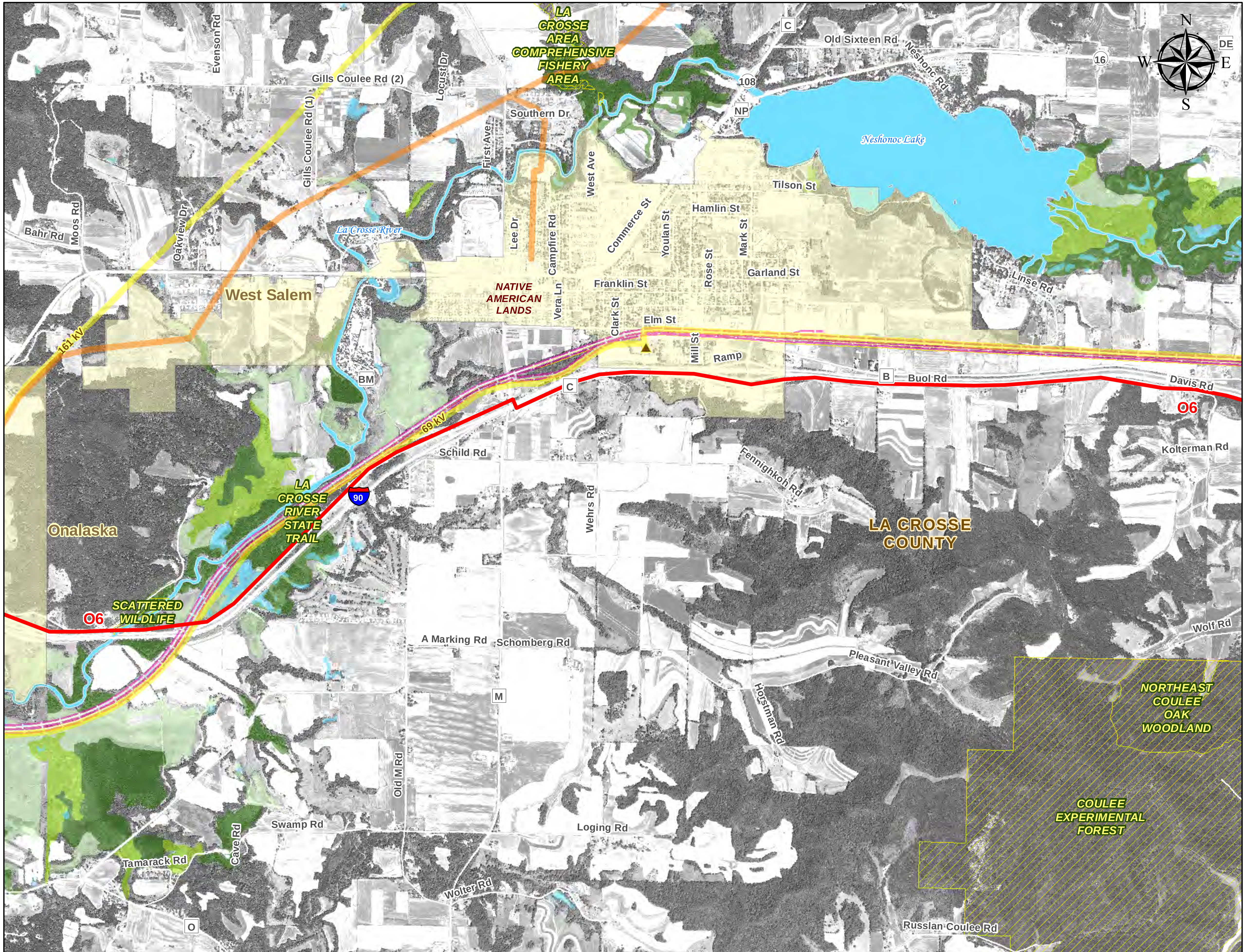
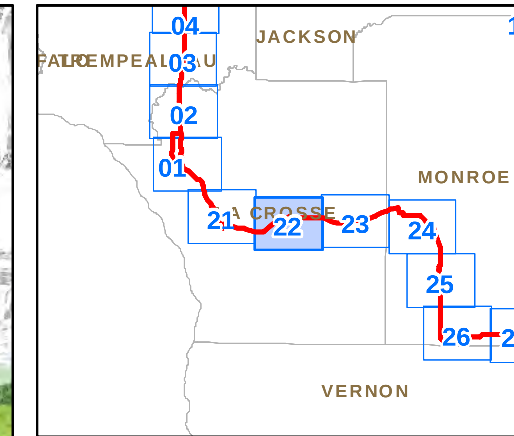
Fig. Vol. 2-1.21





Legend
1 inch = 2,640 feet

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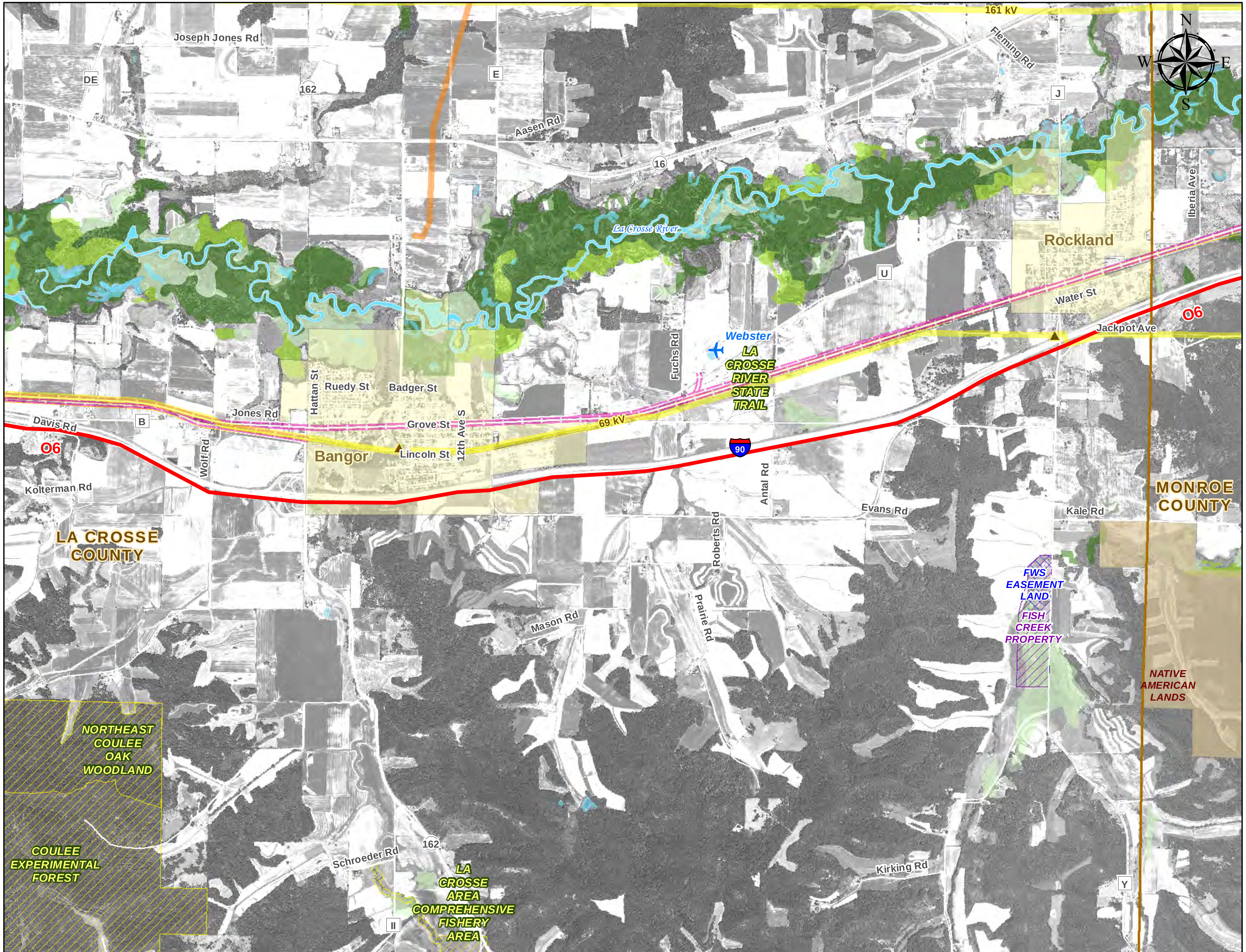
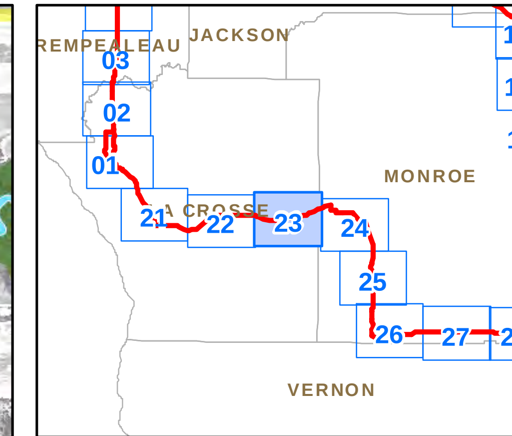
Fig. Vol. 2-1.22





Legend
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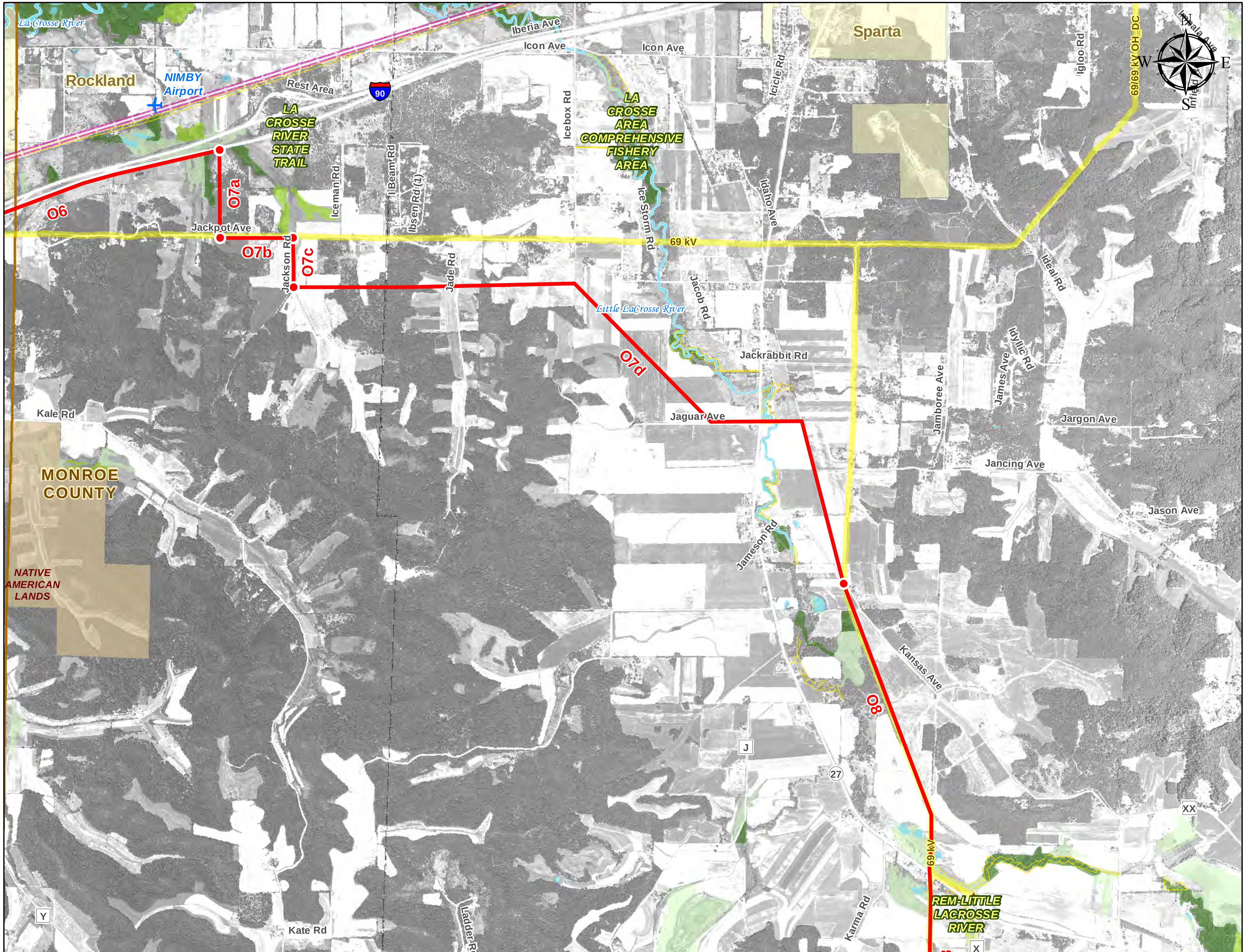
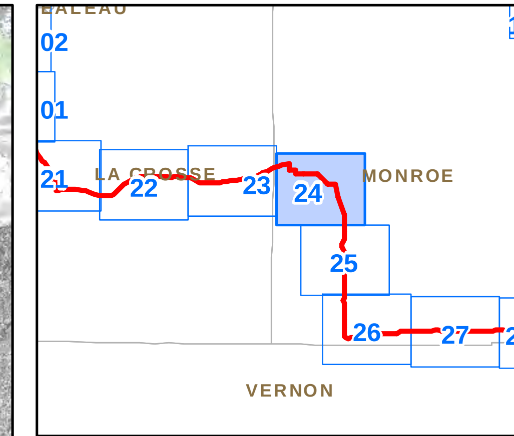
Fig. Vol. 2-1.23





Legend

1 inch = 2,640 feet

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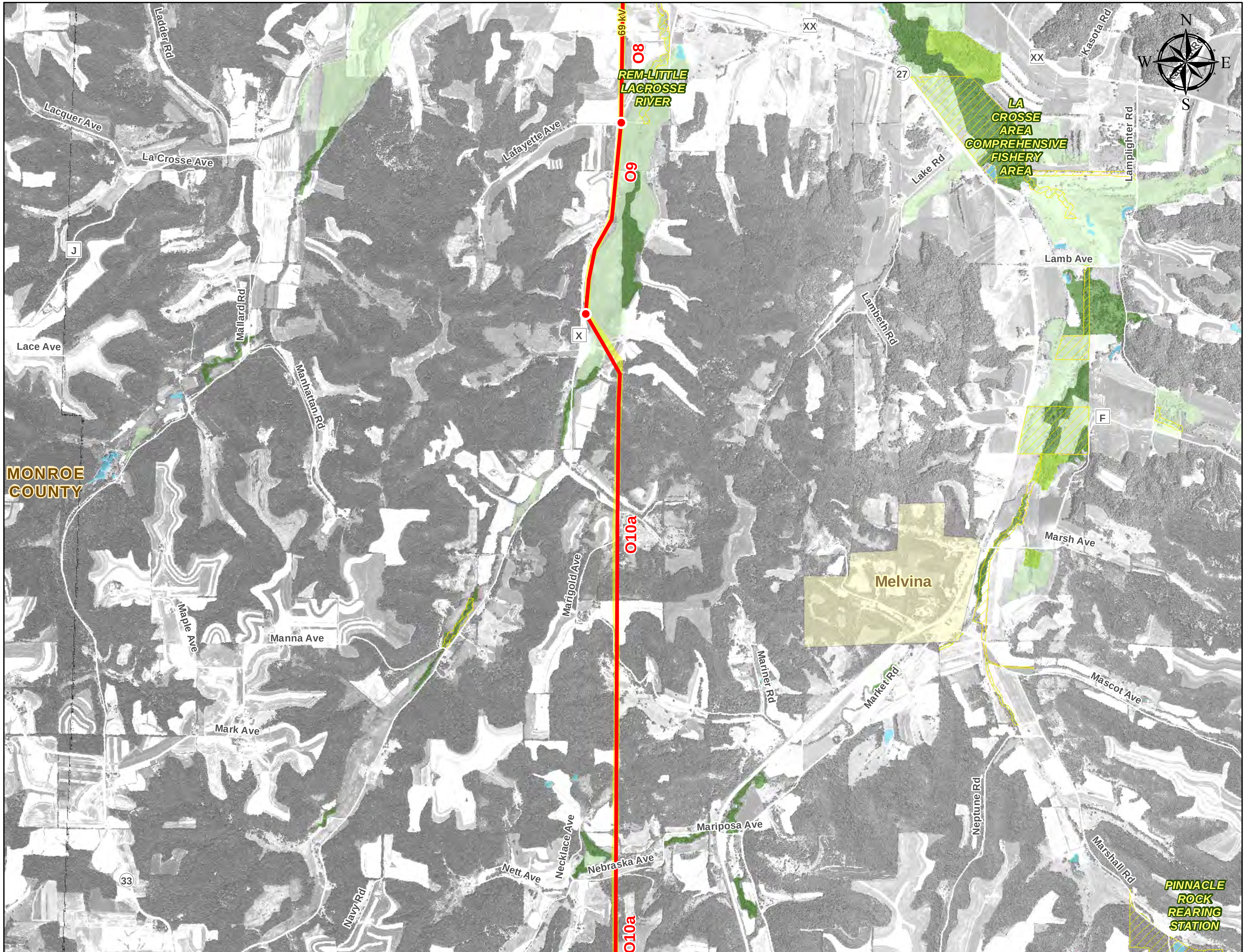
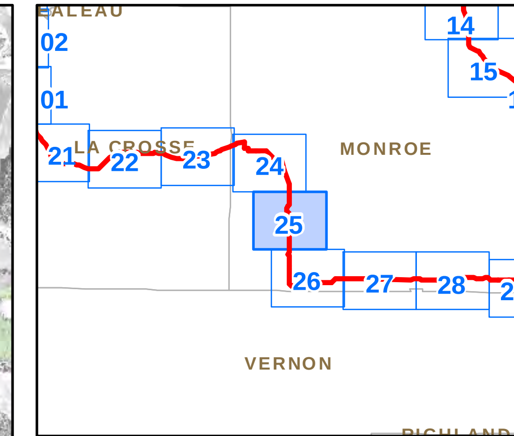
Fig. Vol. 2-1.24





Legend
1 inch = 2,640 feet

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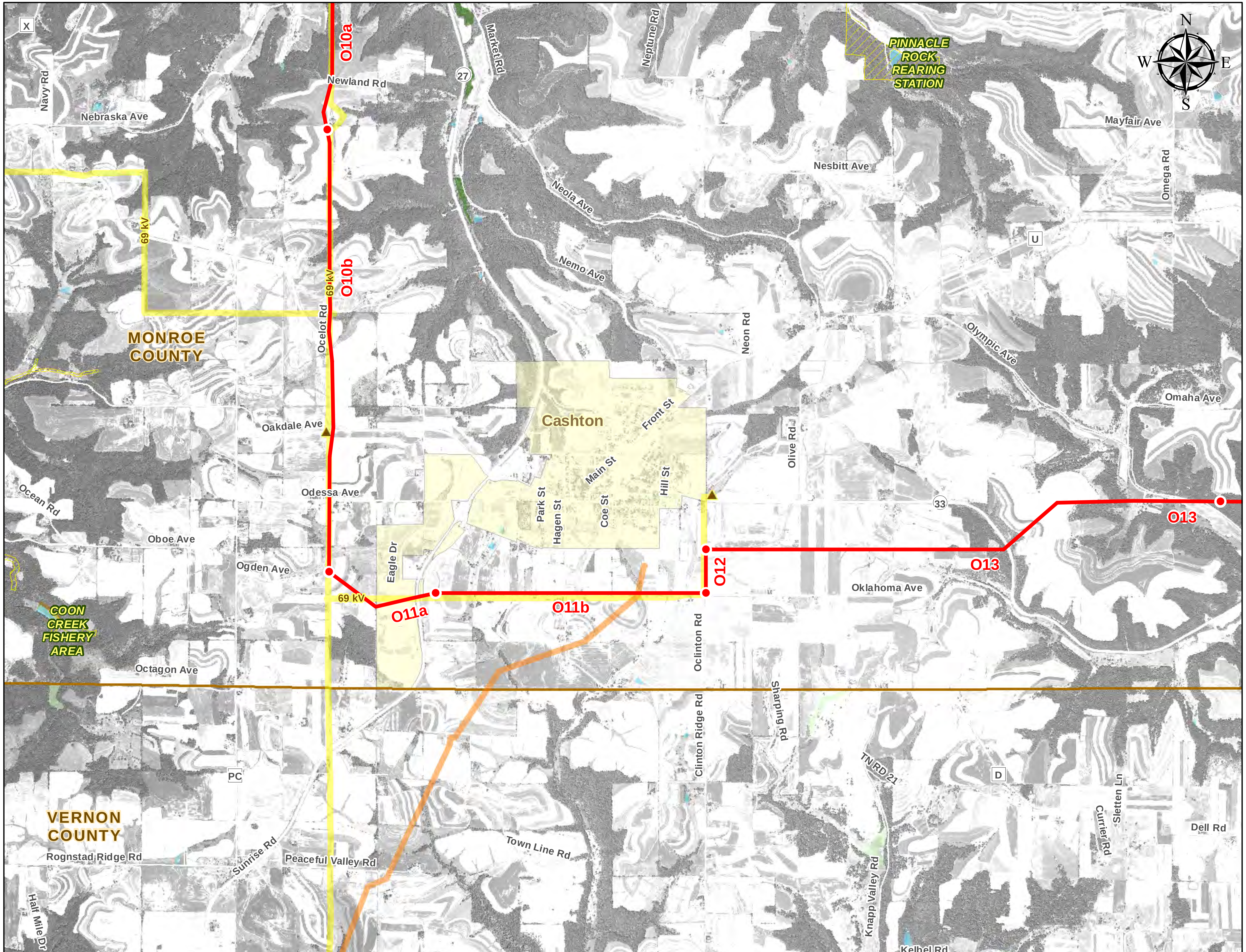
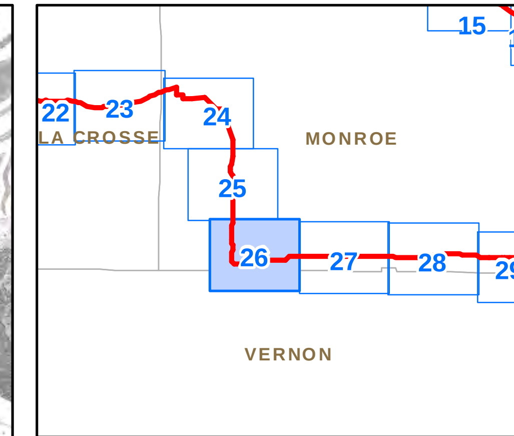
Fig. Vol. 2-1.25





Legend
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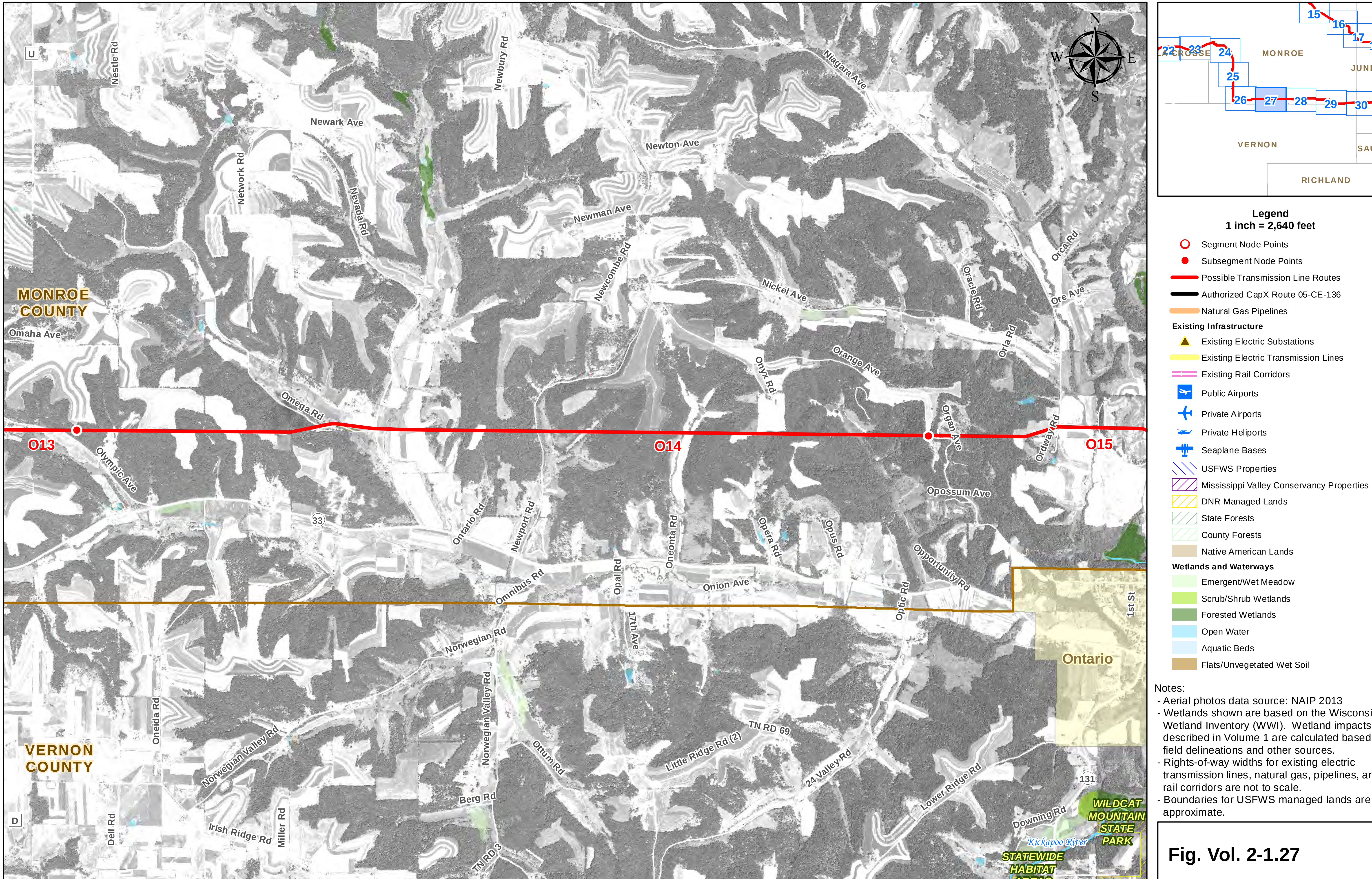
Fig. Vol. 2-1.26



Legend
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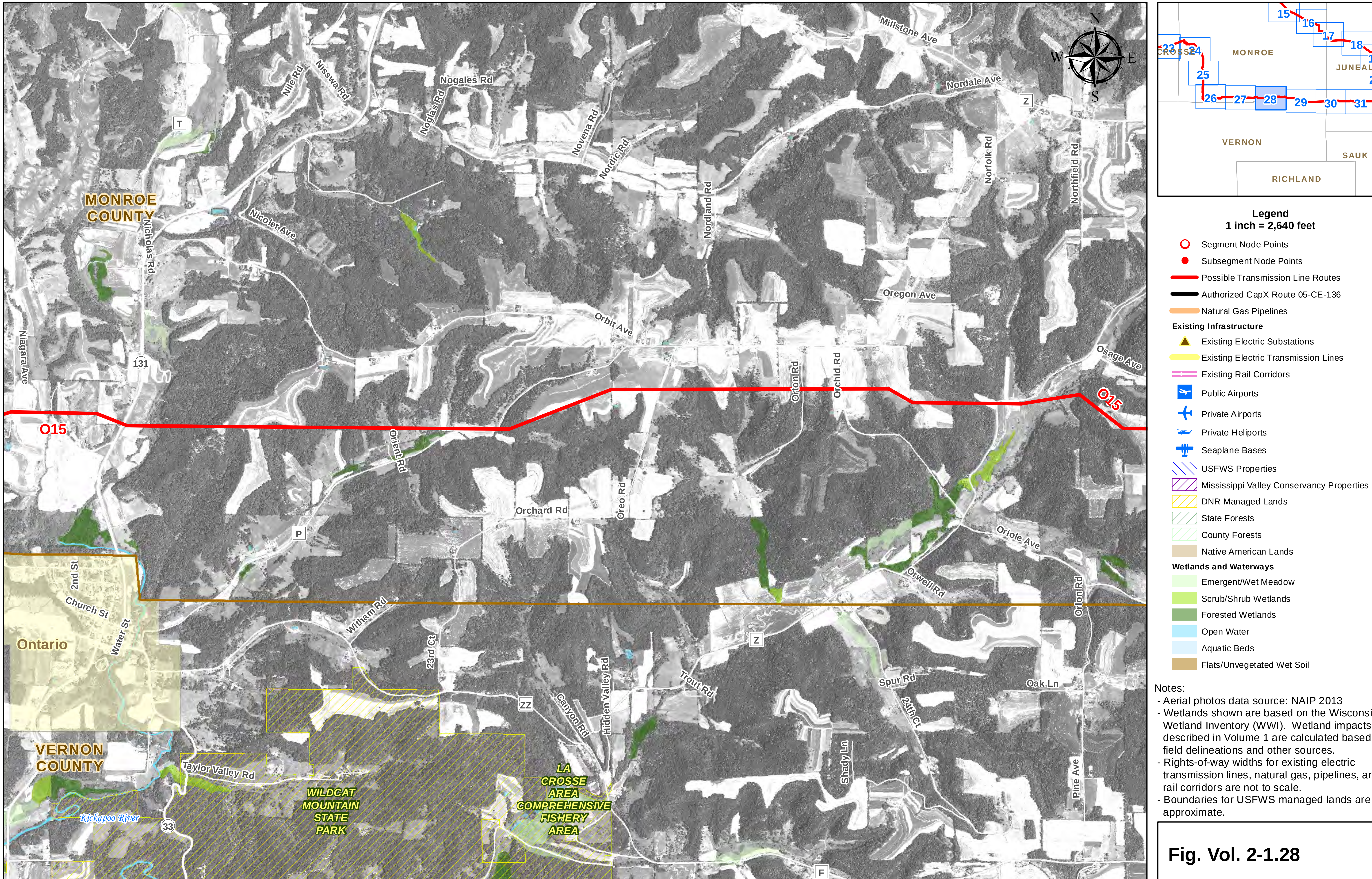
Fig. Vol. 2-1.27



Legend

1 inch = 2,640 feet

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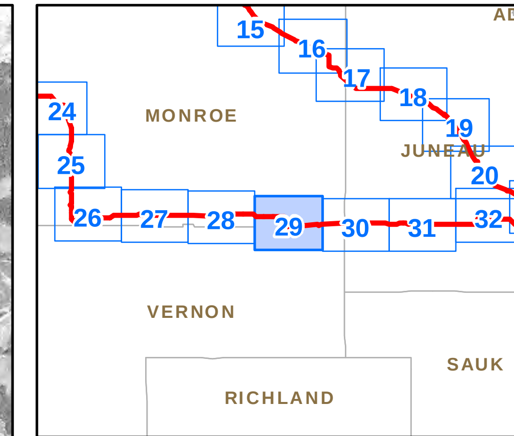
Fig. Vol. 2-1.28



Legend
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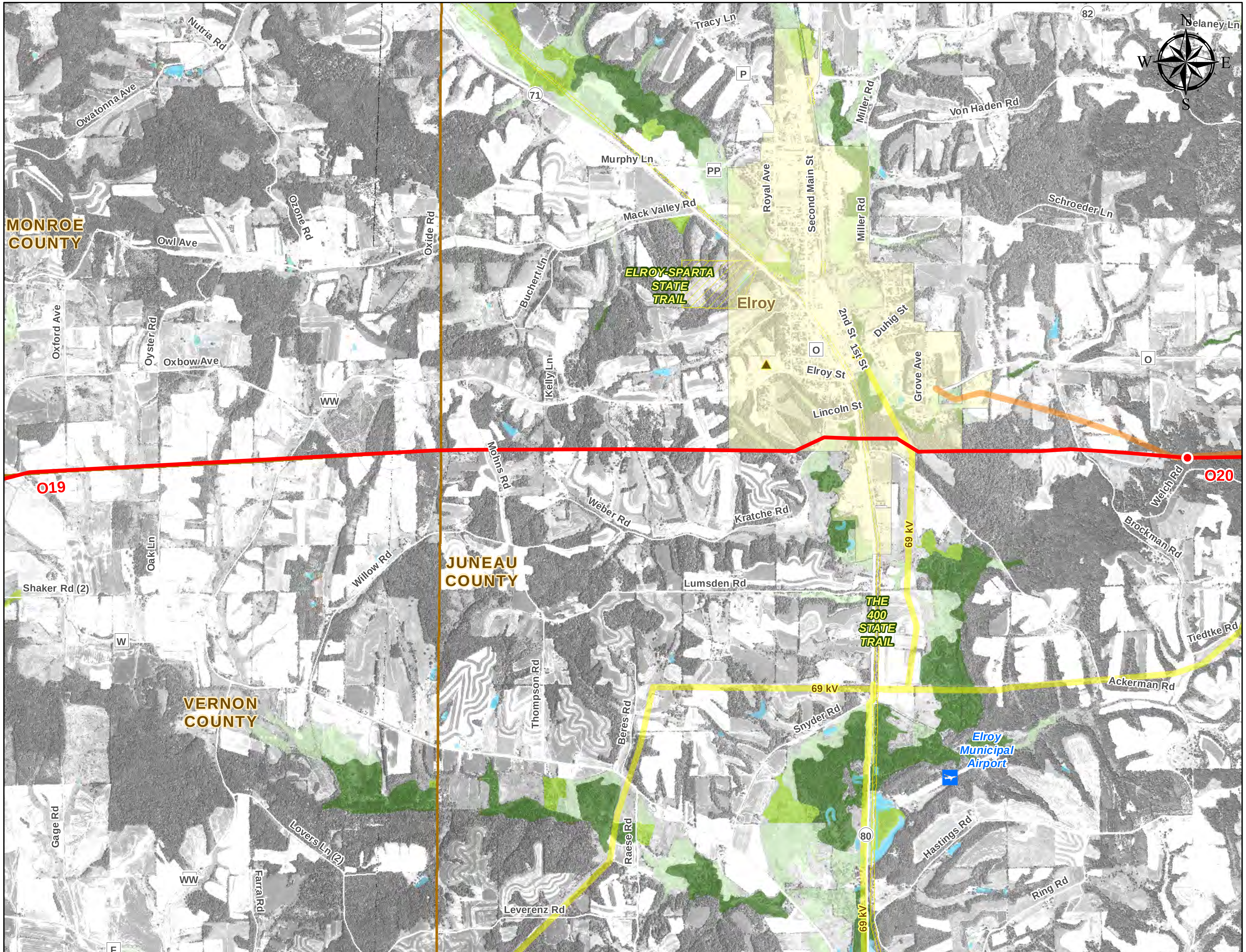
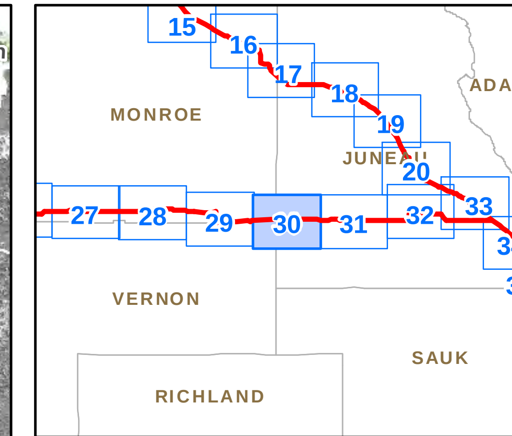
Fig. Vol. 2-1.29





Legend
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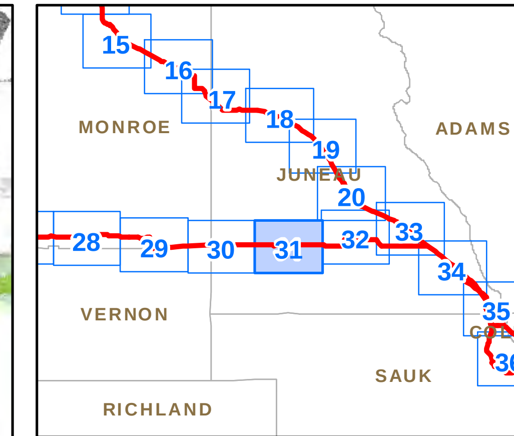
Fig. Vol. 2-1.30



Legend
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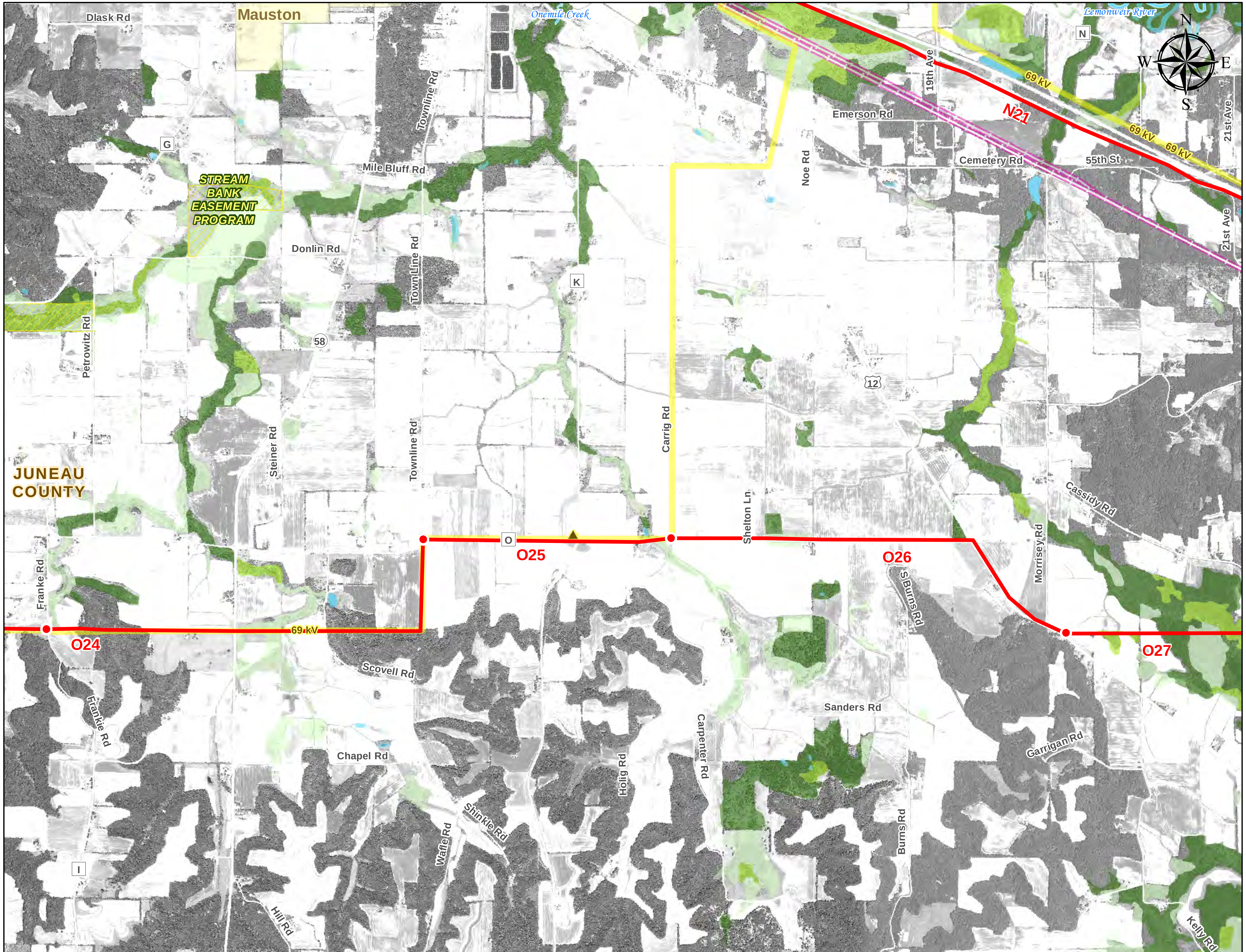
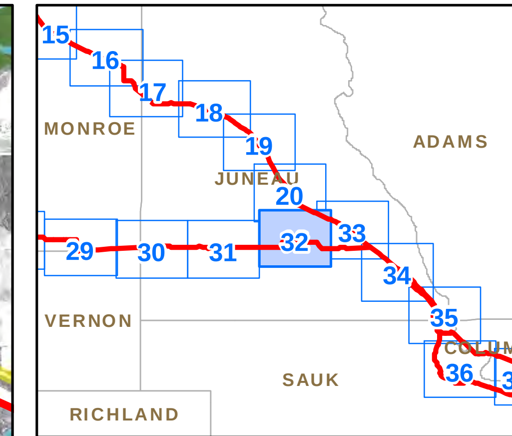
Fig. Vol. 2-1.31





Legend

1 inch = 2,640 feet

- Segment Node Points
- Subsegment Node Points
- Possible Transmission Line Routes
- Authorized CapX Route 05-CE-136
- Natural Gas Pipelines

Existing Infrastructure

- Existing Electric Substations
- Existing Electric Transmission Lines
- Existing Rail Corridors
- Public Airports
- Private Airports
- Private Heliports
- Seaplane Bases
- USFWS Properties
- Mississippi Valley Conservancy Properties
- DNR Managed Lands
- State Forests
- County Forests
- Native American Lands

Wetlands and Waterways

- Emergent/Wet Meadow
- Scrub/Shrub Wetlands
- Forested Wetlands
- Open Water
- Aquatic Beds
- Flats/Unvegetated Wet Soil

Notes:
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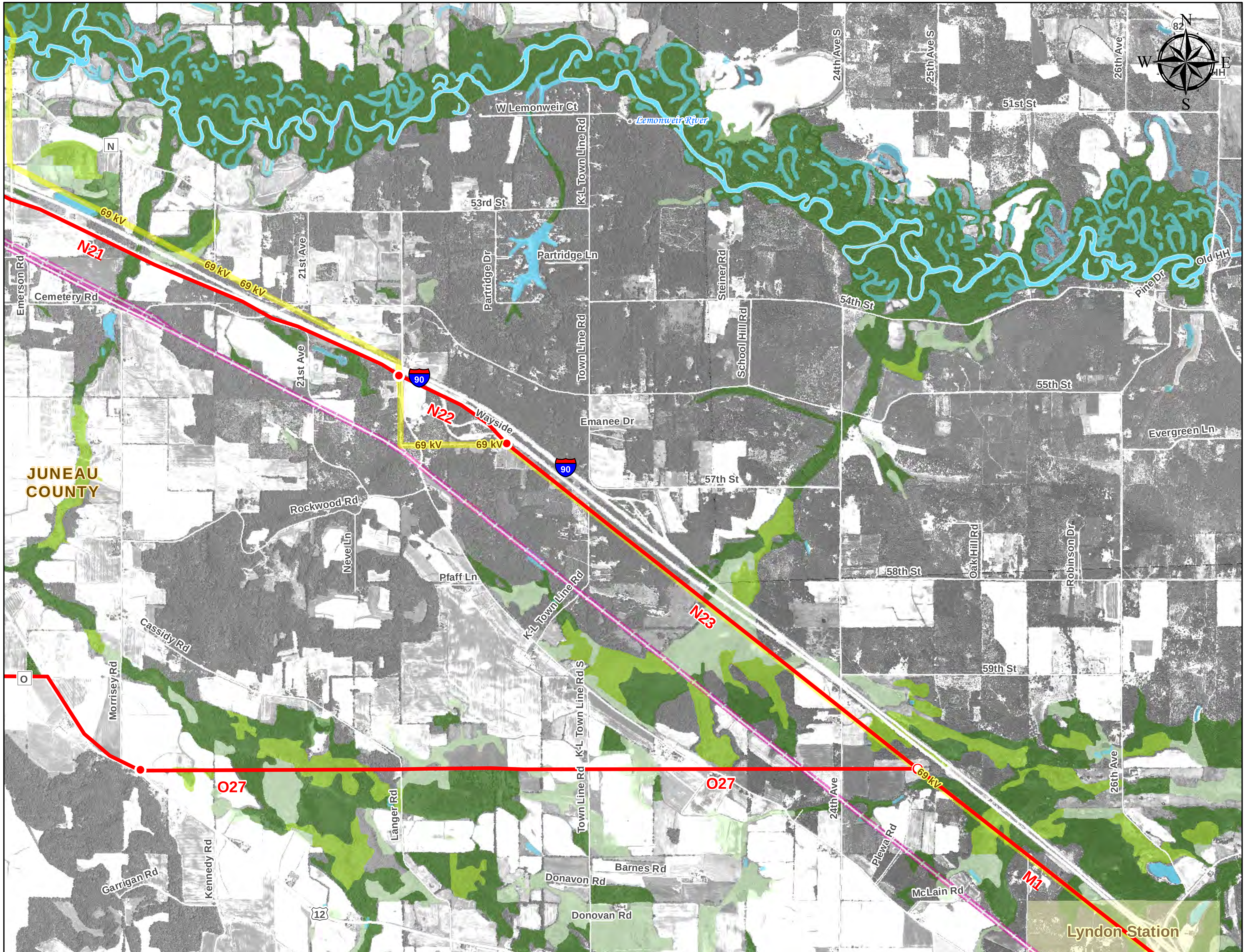
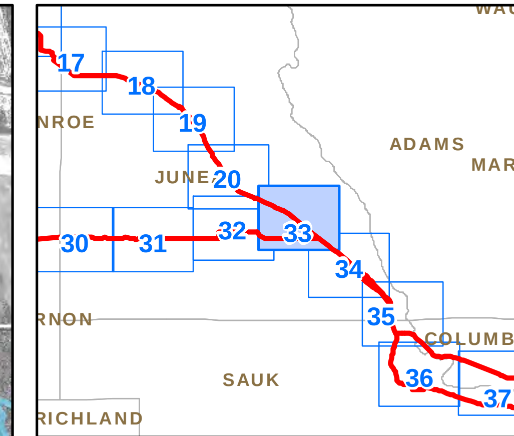
Fig. Vol. 2-1.32





Legend

1 inch = 2,640 feet

- Segment Node Points
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- Authorized CapX Route 05-CE-136
- Natural Gas Pipelines

Existing Infrastructure

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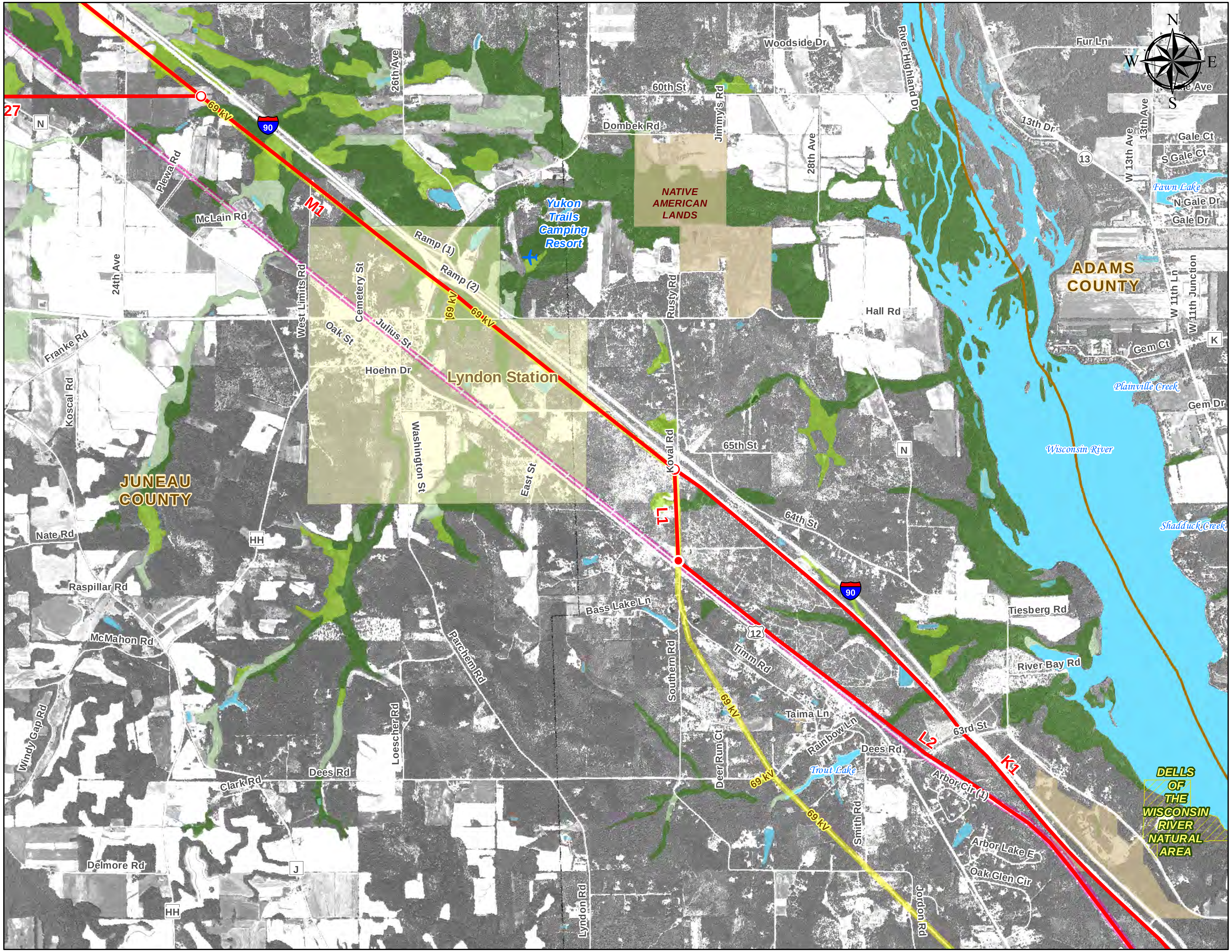
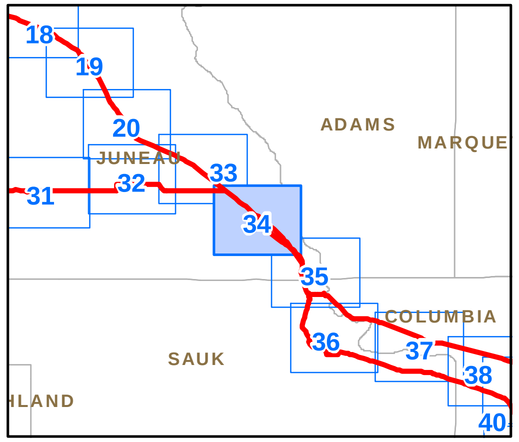
Fig. Vol. 2-1.33





Legend
1 inch = 2,640 feet

- Segment Node Points
- Subsegment Node Points
- Possible Transmission Line Routes
- Authorized CapX Route 05-CE-136
- Natural Gas Pipelines

Existing Infrastructure

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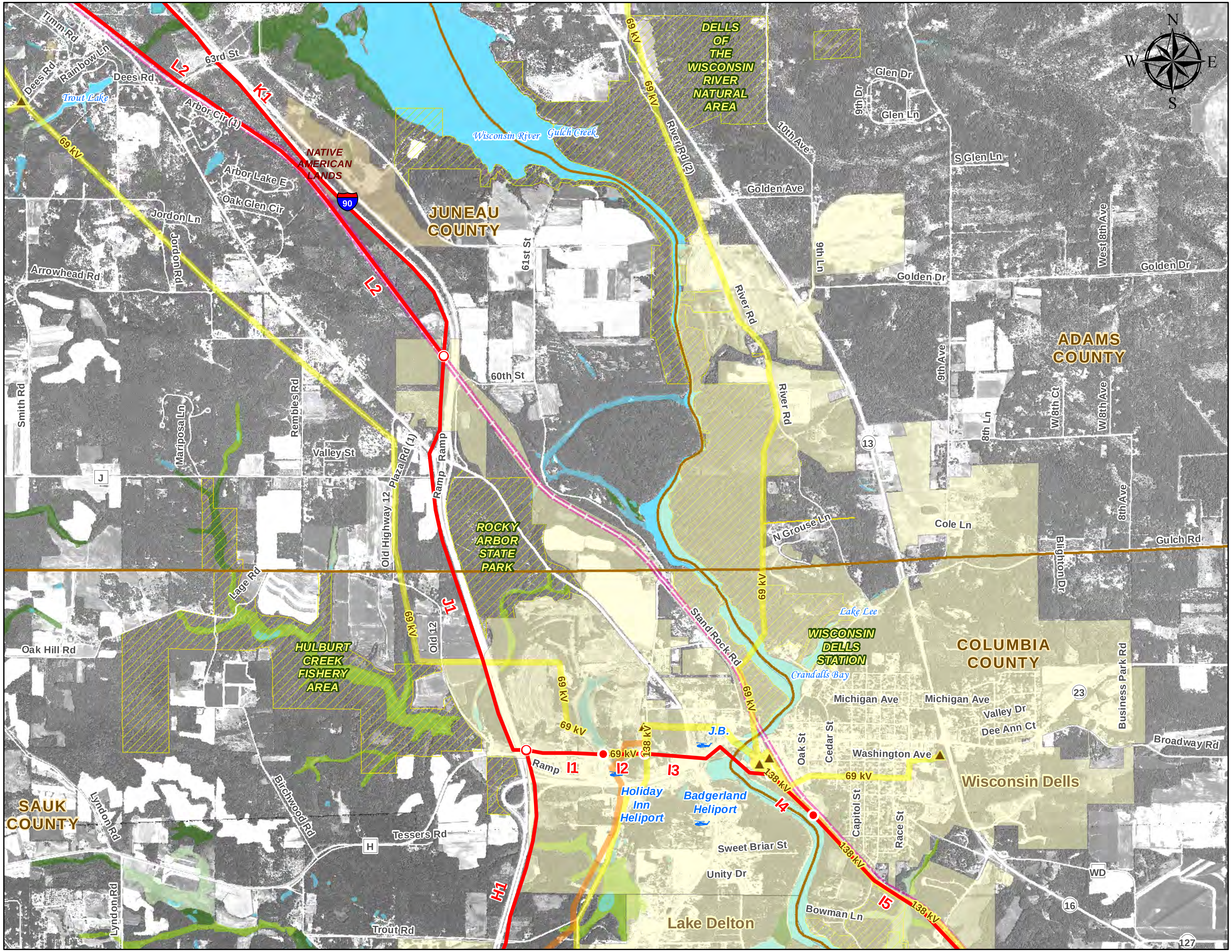
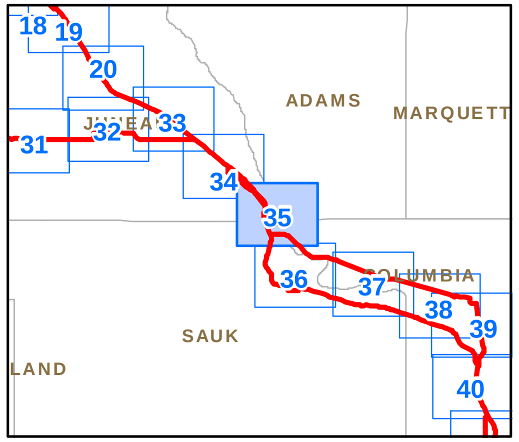
Fig. Vol. 2-1.34





Legend
1 inch = 2,640 feet

- Segment Node Points
- Subsegment Node Points
- Possible Transmission Line Routes
- Authorized CapX Route 05-CE-136
- Natural Gas Pipelines

Existing Infrastructure

- Existing Electric Substations
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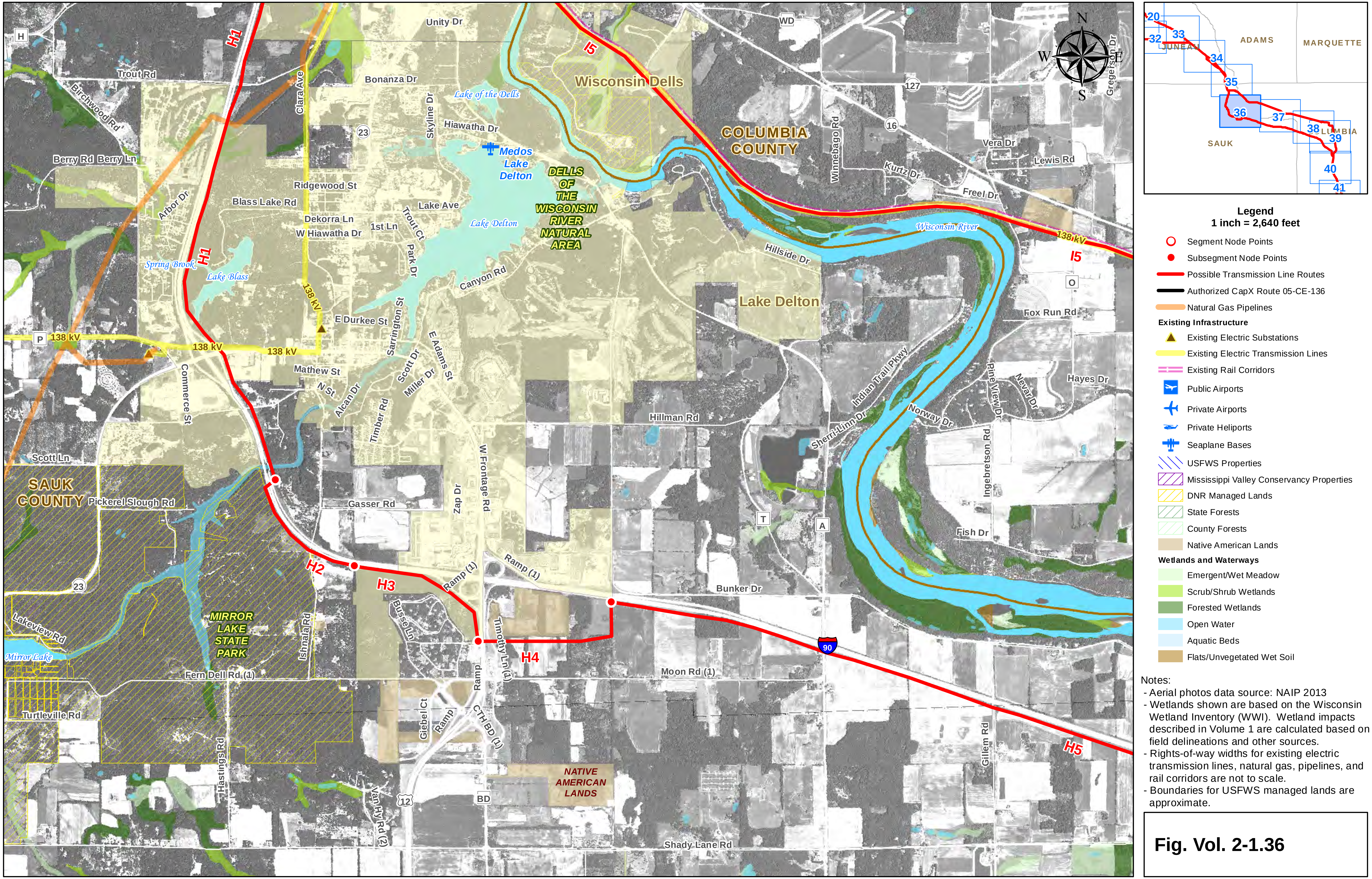
Fig. Vol. 2-1.35


Wisconsin Dells
COLUMBIA COUNTY
SAUK COUNTY
Lake Delton
Medos Lake Delton
DELLS OF THE WISCONSIN RIVER NATURAL AREA
MIRROR LAKE STATE PARK
NATIVE AMERICAN LANDS
Lake of the Dells
Wisconsin River
Lake Blass
Spring Brook
Mirror Lake
H1
H2
H3
H4
H5
I5
138 kV
ADAMS
MARQUETTE
JUNEAU
SAUK
COLUMBIA
20
32
33
34
35
36
37
38
39
40
41
Legend
1 inch = 2,640 feet
Segment Node Points
Subsegment Node Points
Possible Transmission Line Routes
Authorized CapX Route 05-CE-136
Natural Gas Pipelines
Existing Infrastructure
Existing Electric Substations
Existing Electric Transmission Lines
Existing Rail Corridors
Public Airports
Private Airports
Private Heliports
Seaplane Bases
USFWS Properties
Mississippi Valley Conservancy Properties
DNR Managed Lands
State Forests
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Scrub/Shrub Wetlands
Forested Wetlands
Open Water
Aquatic Beds
Flats/Unvegetated Wet Soil
Notes:
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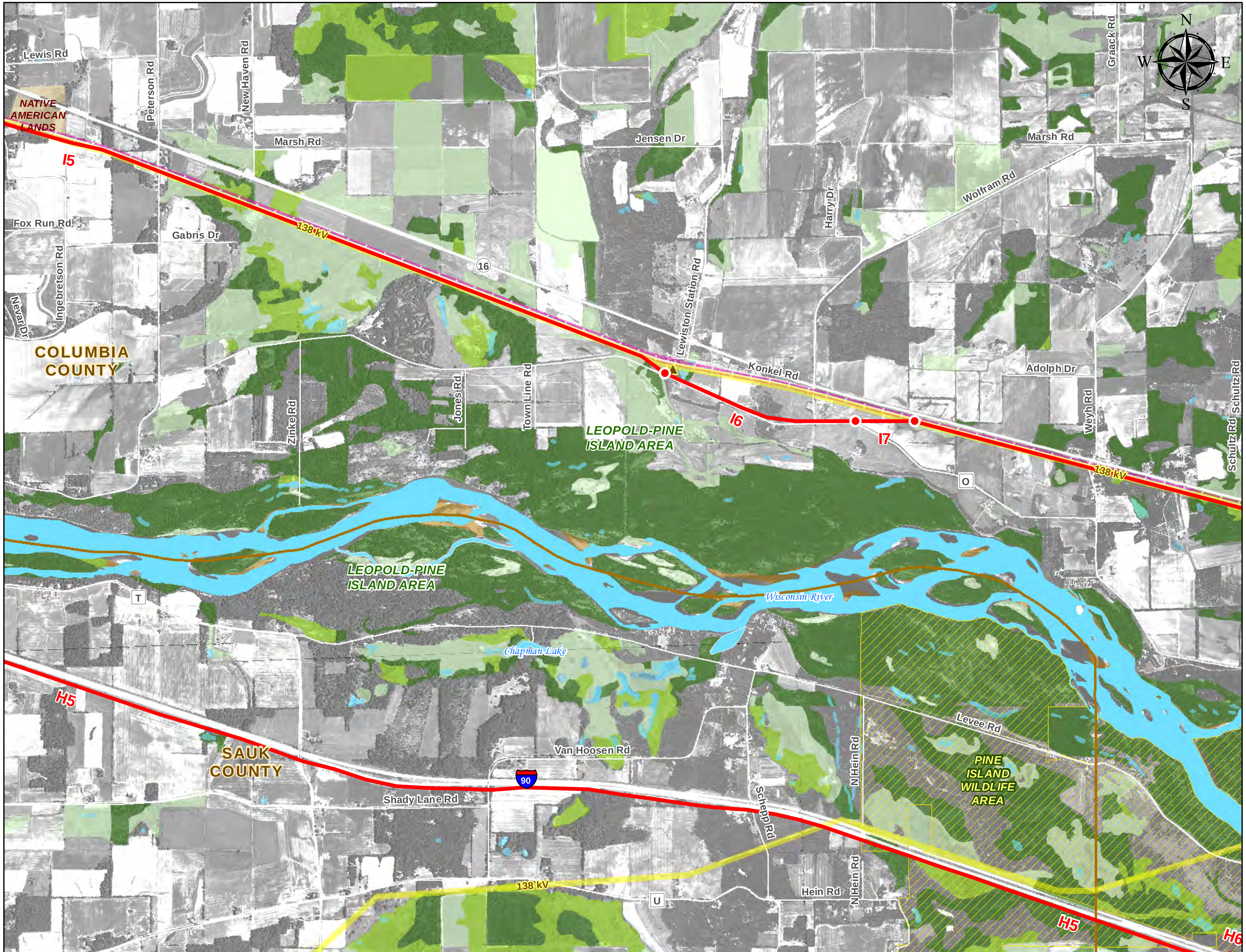
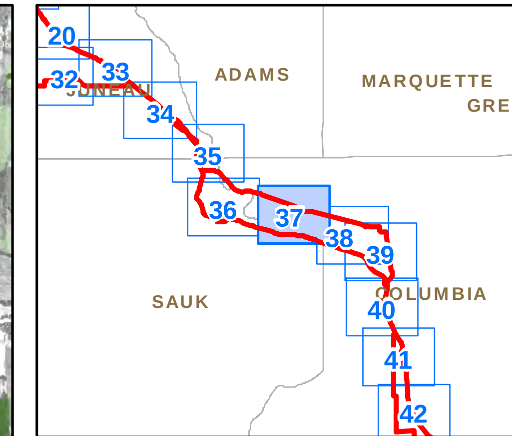
Fig. Vol. 2-1.36





Legend
1 inch = 2,640 feet

- Segment Node Points
- Subsegment Node Points
- Possible Transmission Line Routes
- Authorized CapX Route 05-CE-136
- Natural Gas Pipelines

Existing Infrastructure

- Existing Electric Substations
- Existing Electric Transmission Lines
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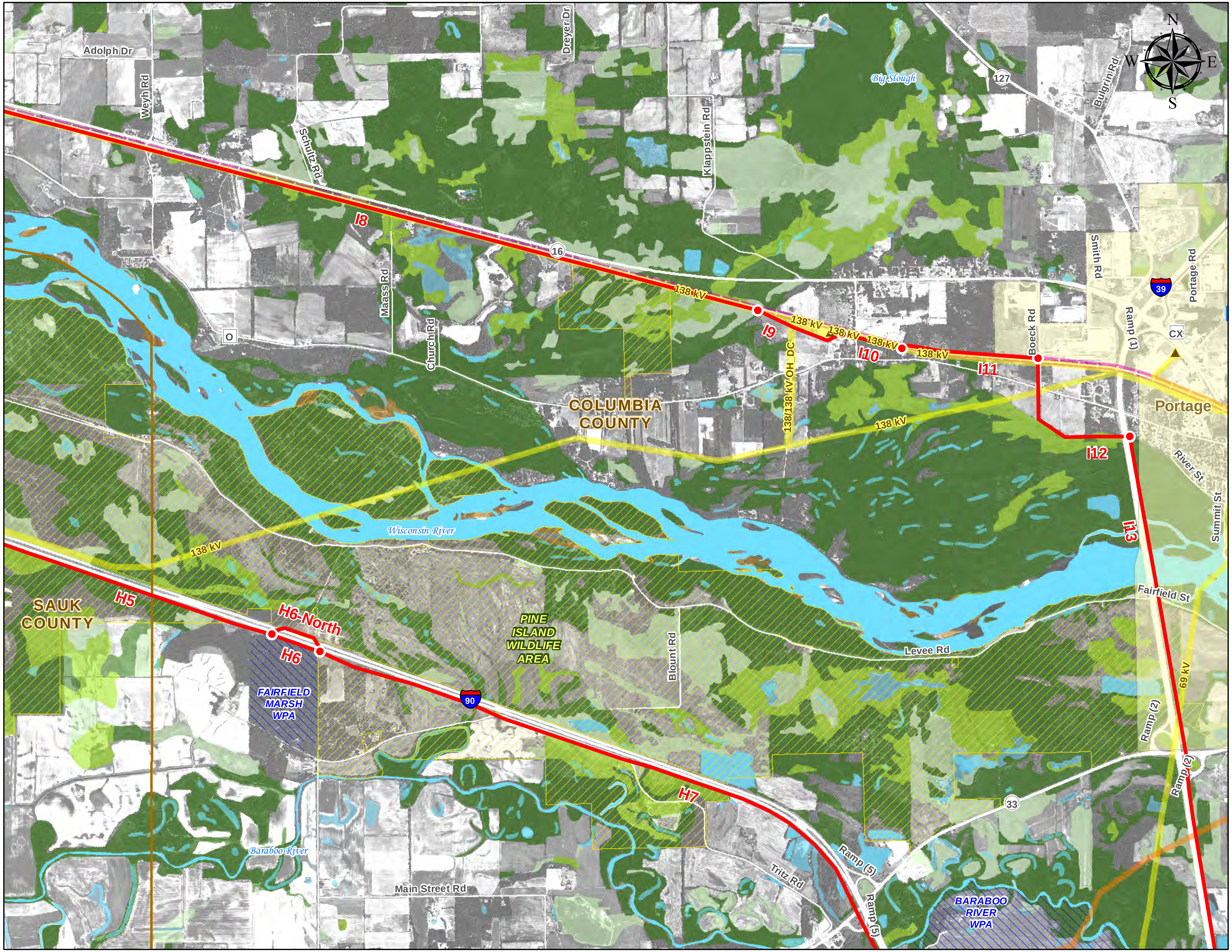
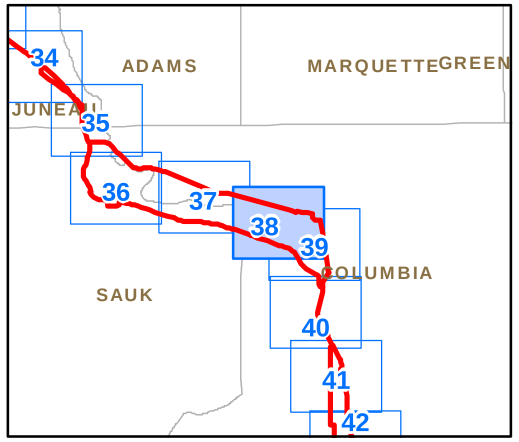
Fig. Vol. 2-1.37





Legend
1 inch = 2,640 feet

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- Subsegment Node Points
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- Authorized CapX Route 05-CE-136
- Natural Gas Pipelines

Existing Infrastructure
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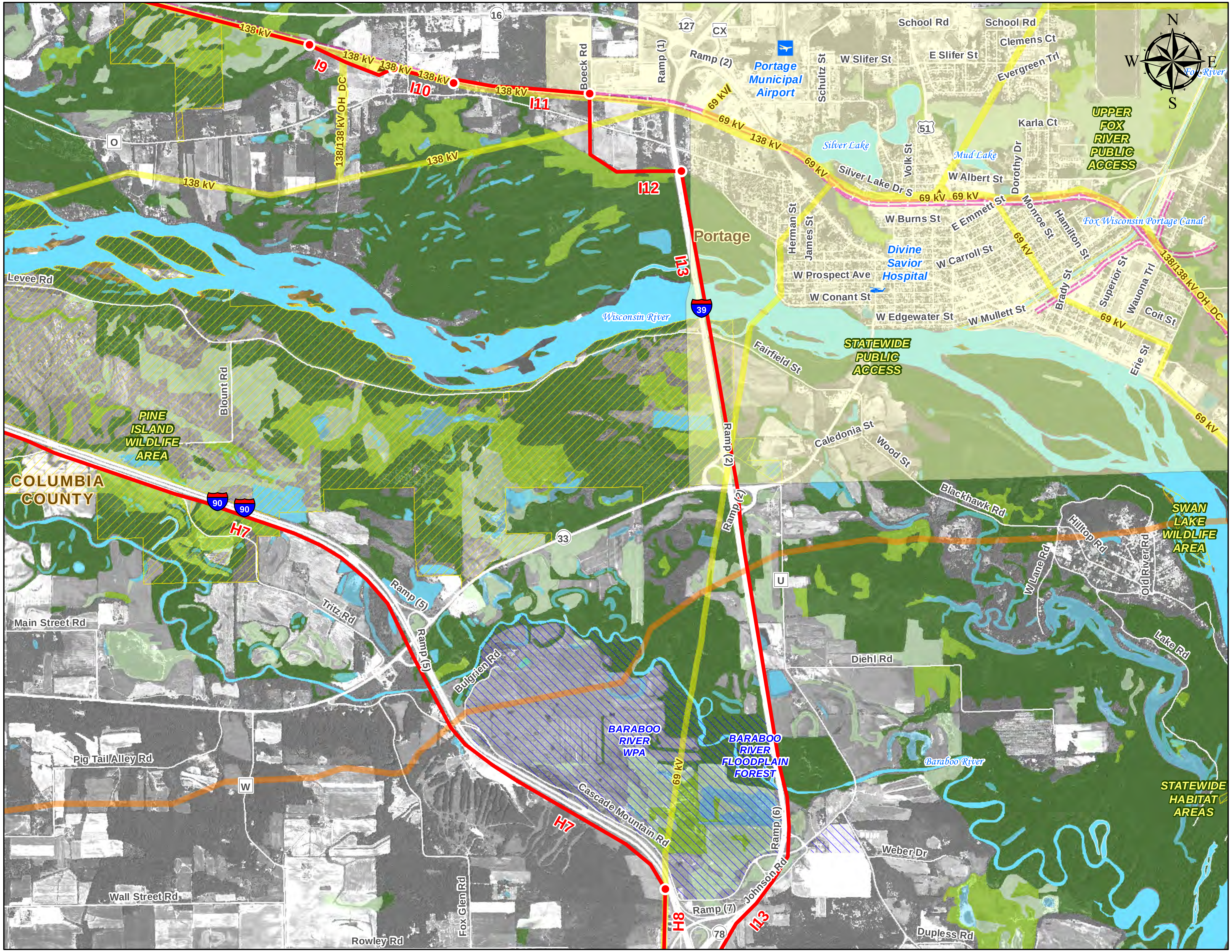
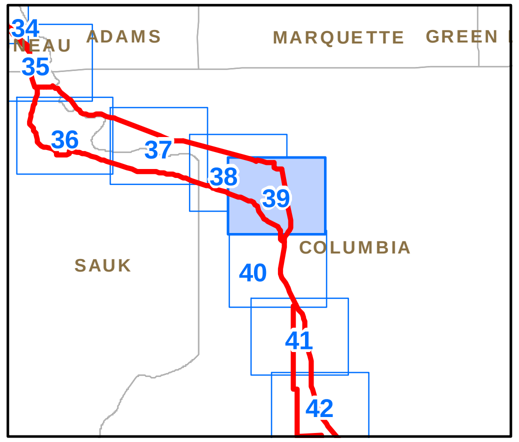
Fig. Vol. 2-1.38





Legend

1 inch = 2,640 feet

- Segment Node Points
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Existing Infrastructure

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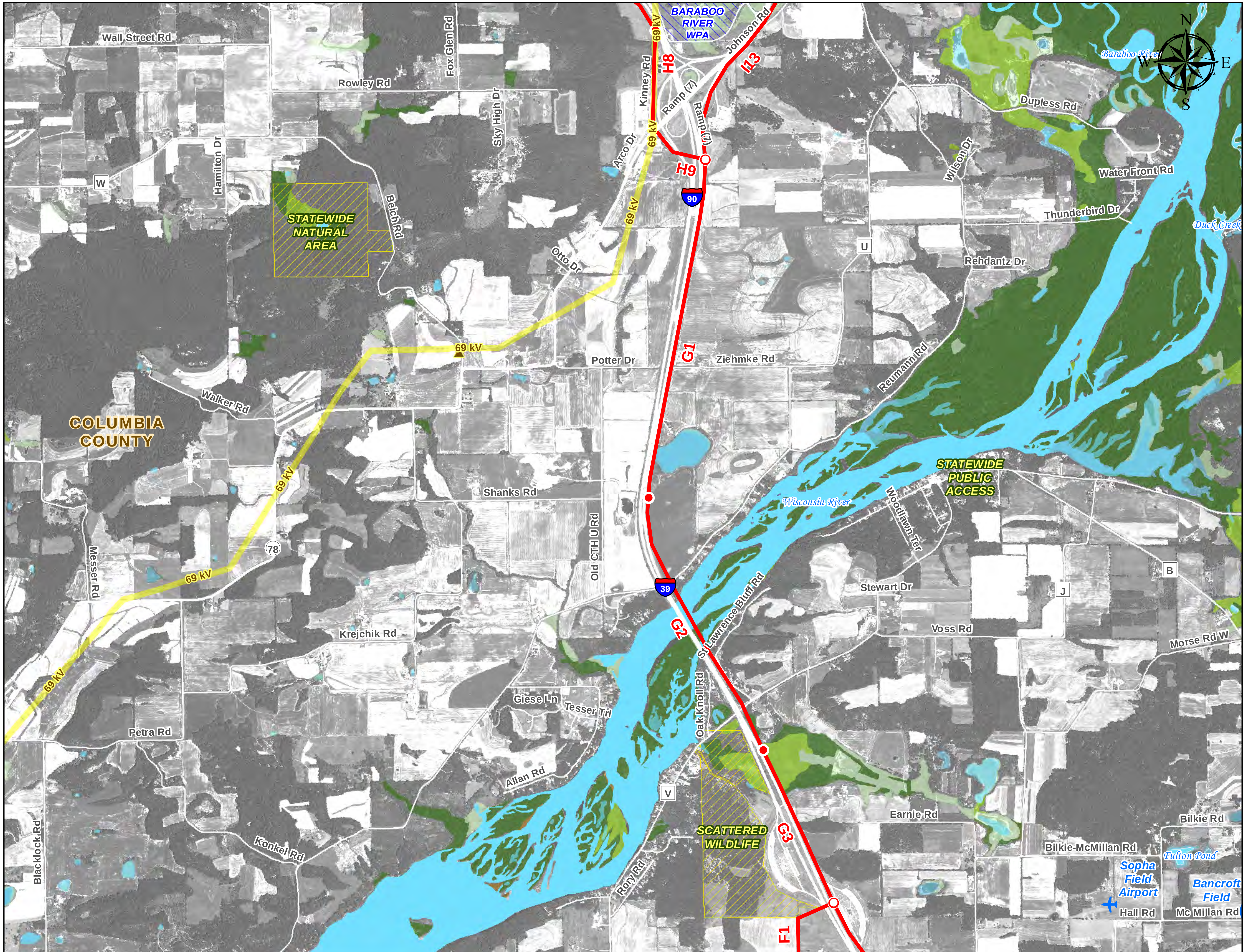
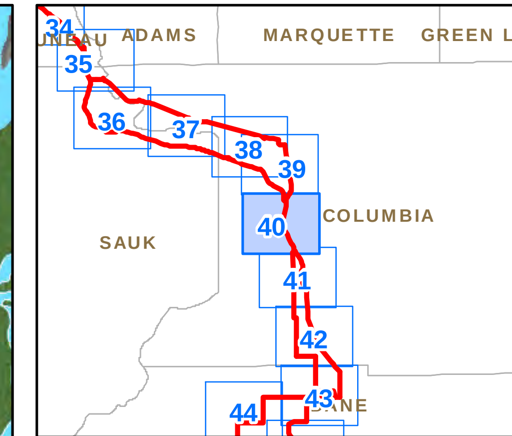
Fig. Vol. 2-1.39





Legend
1 inch = 2,640 feet

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Existing Infrastructure

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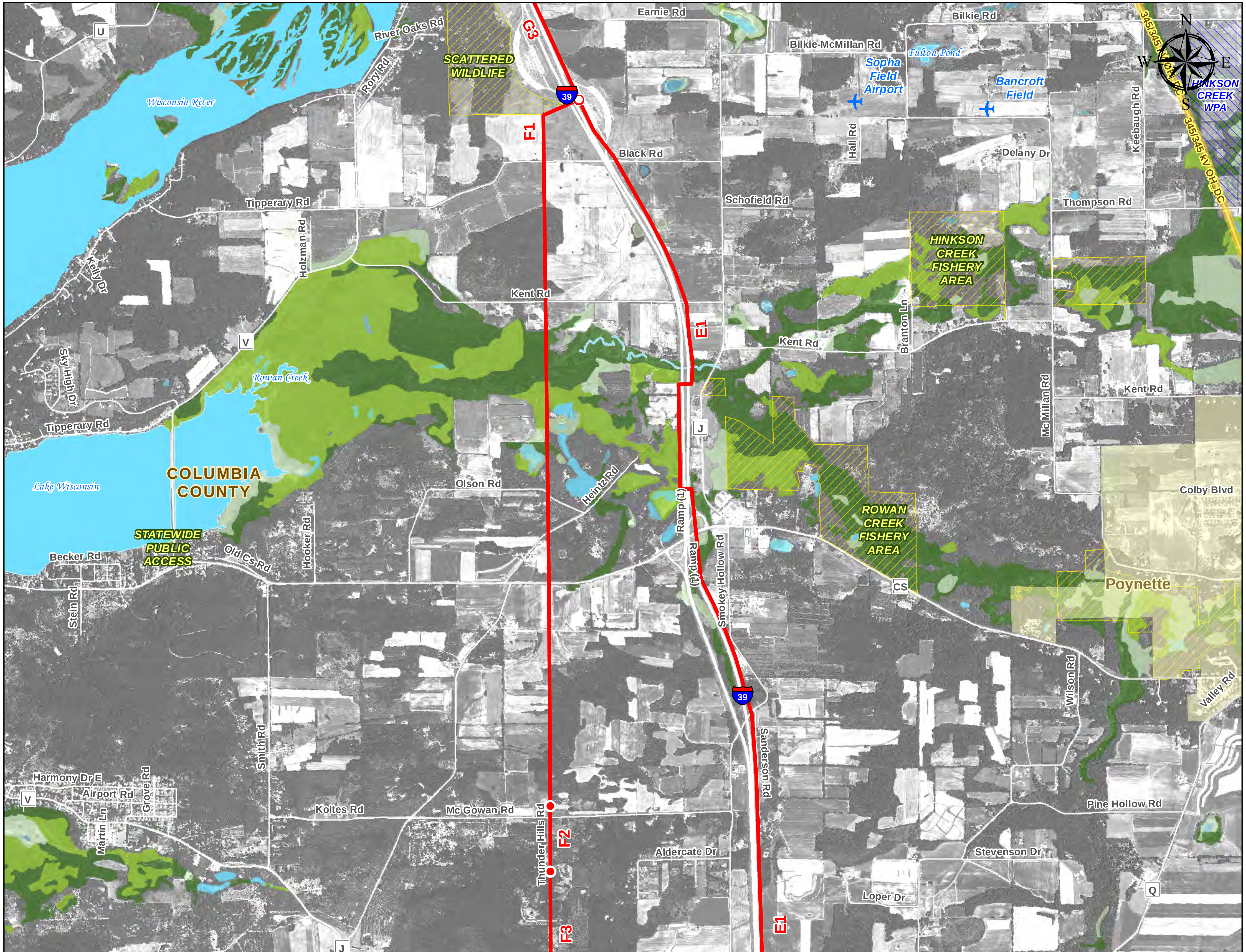
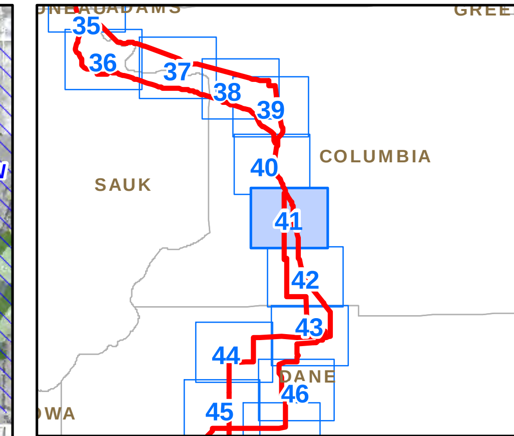
Fig. Vol. 2-1.40





Legend
1 inch = 2,640 feet

- Segment Node Points
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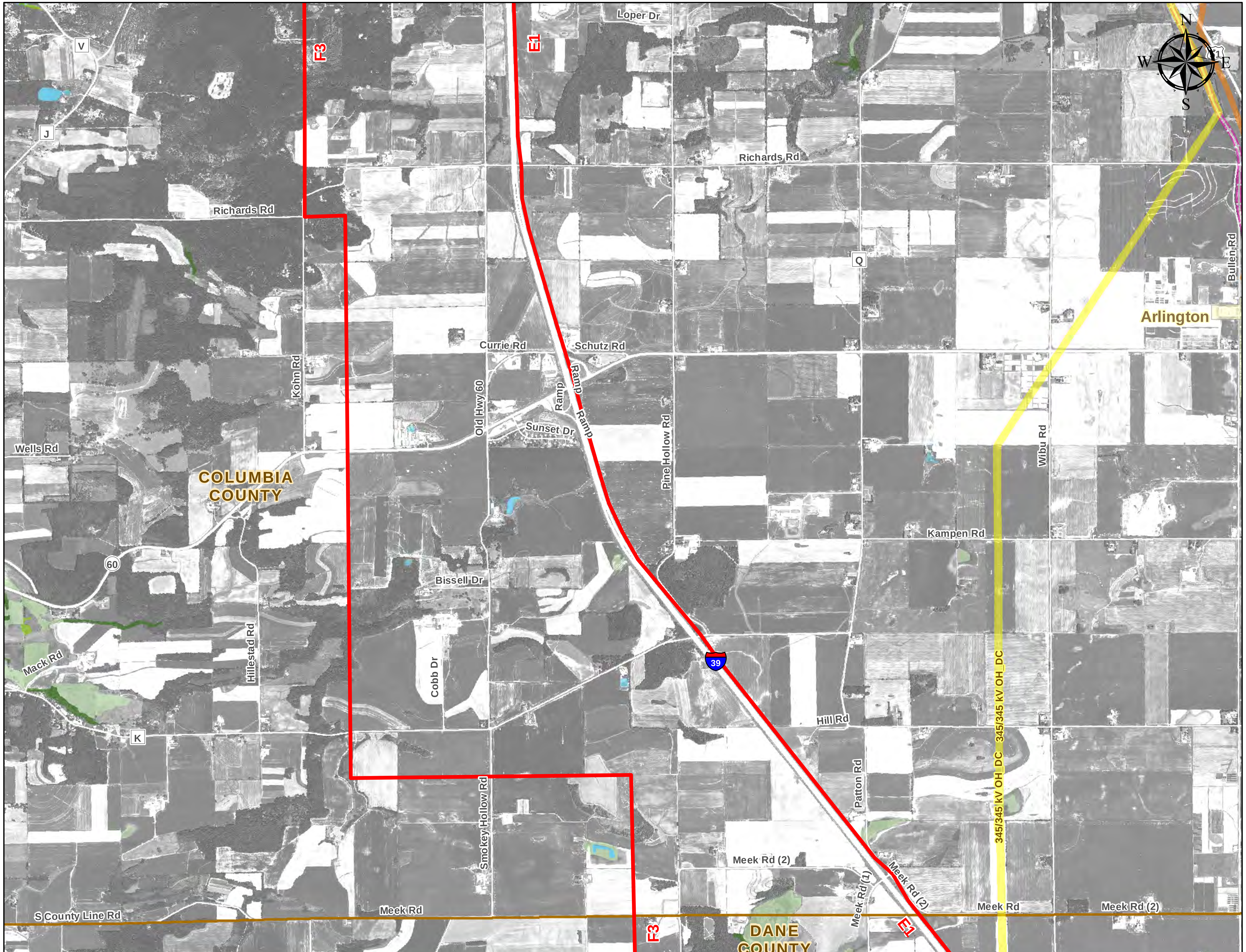
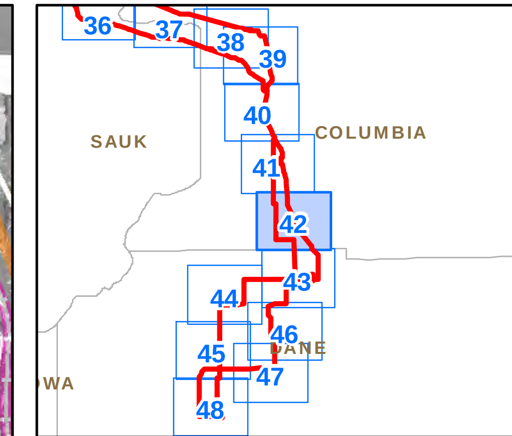
Fig. Vol. 2-1.41





Legend

1 inch = 2,640 feet

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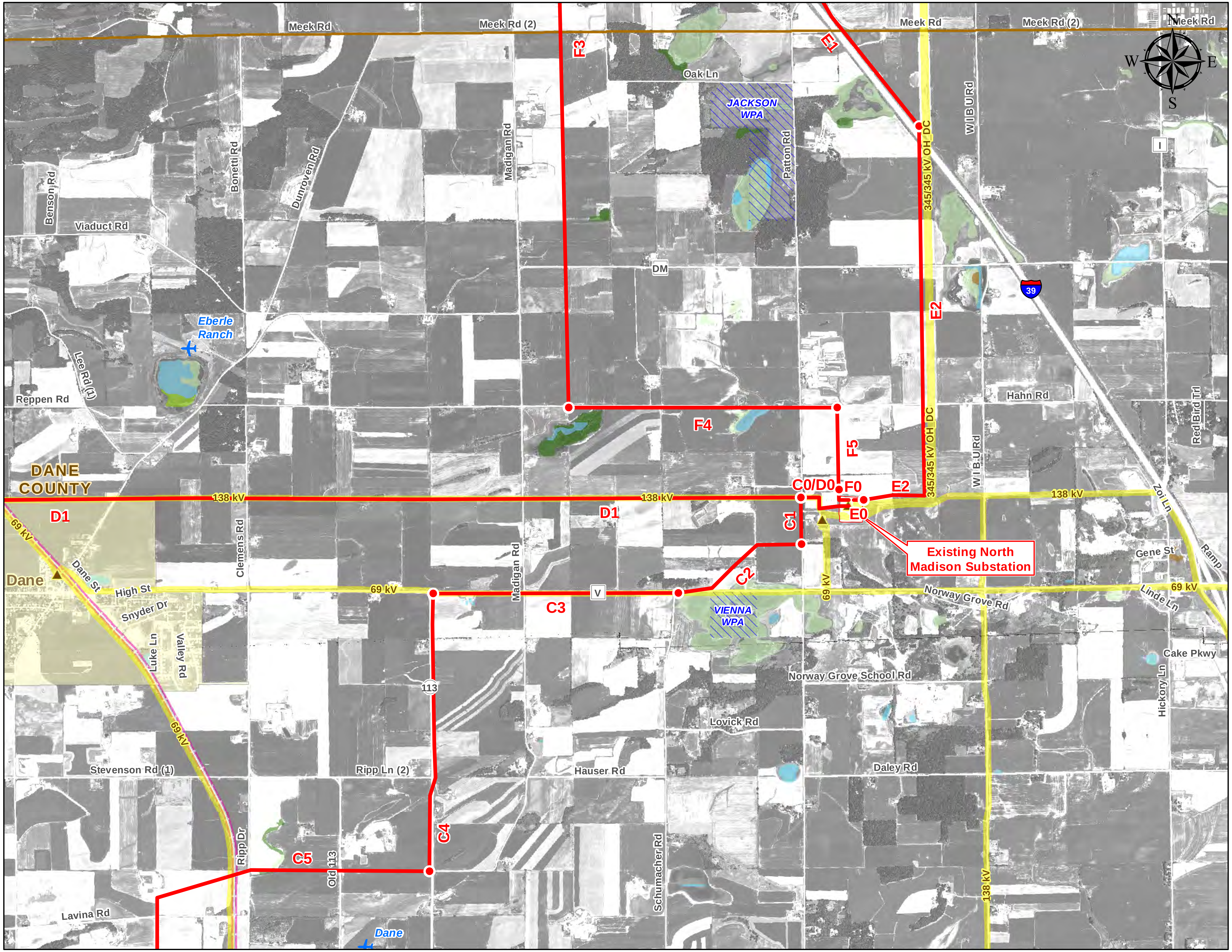
Fig. Vol. 2-1.42



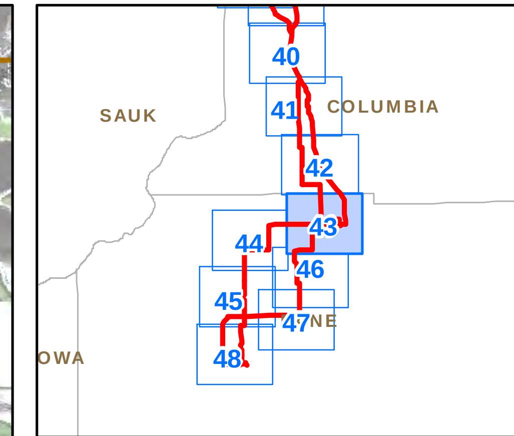


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Fig. Vol. 2-1.43

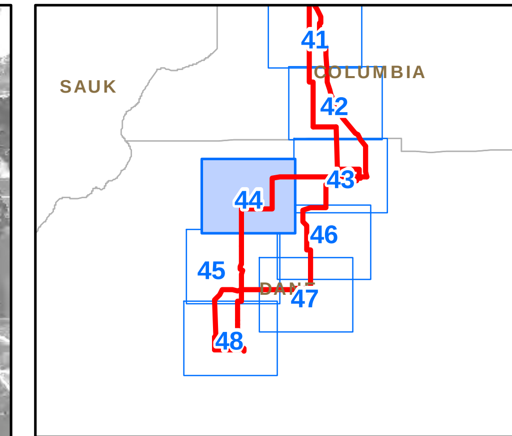

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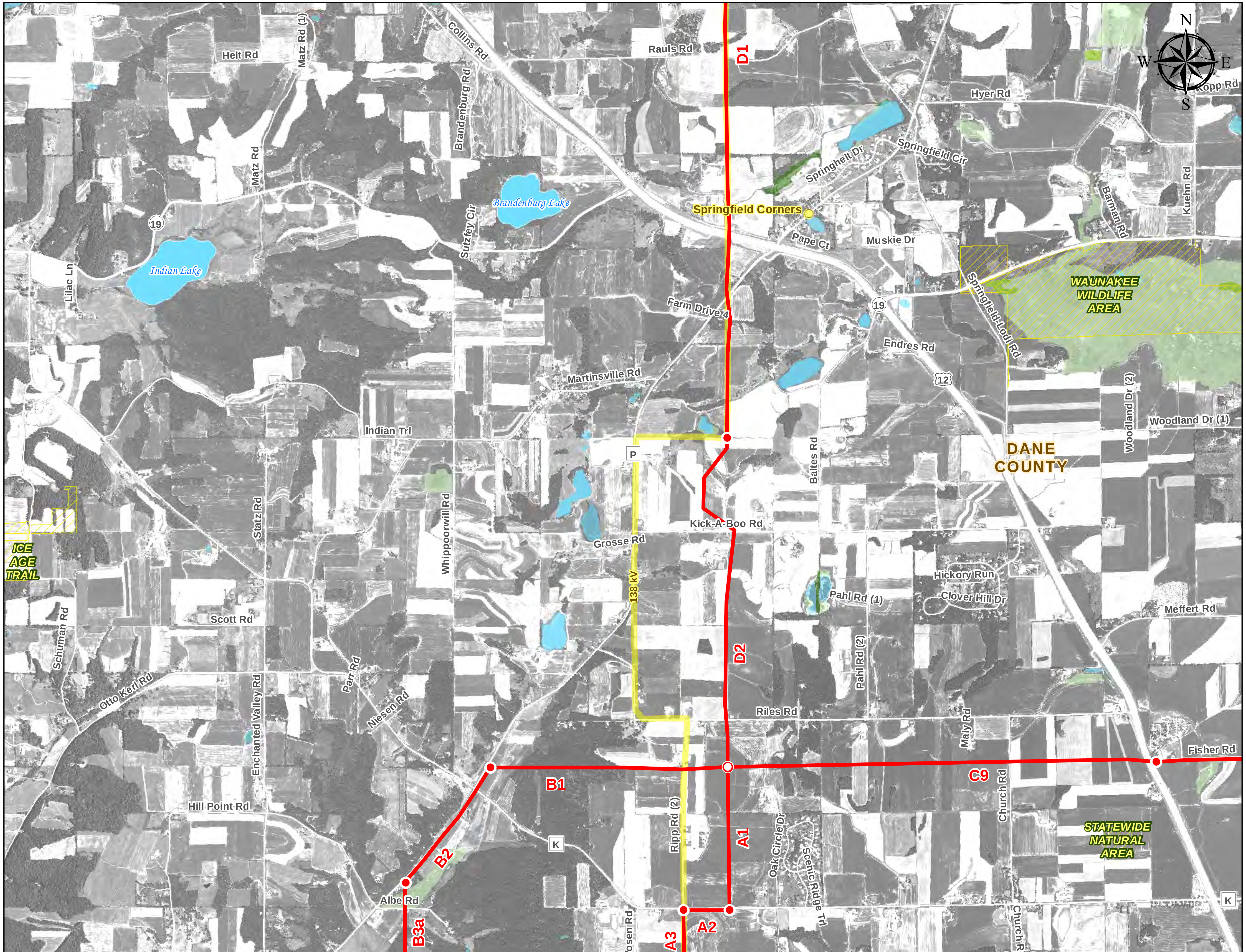
Fig. Vol. 2-1.44



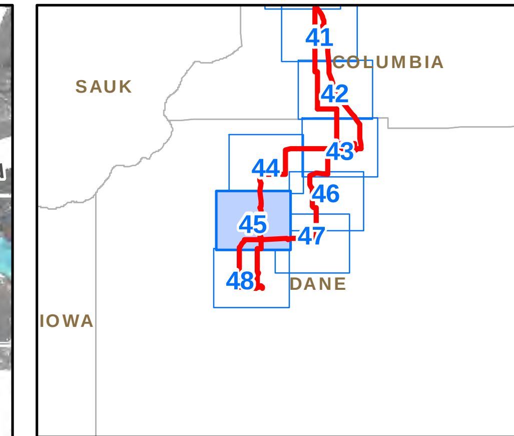


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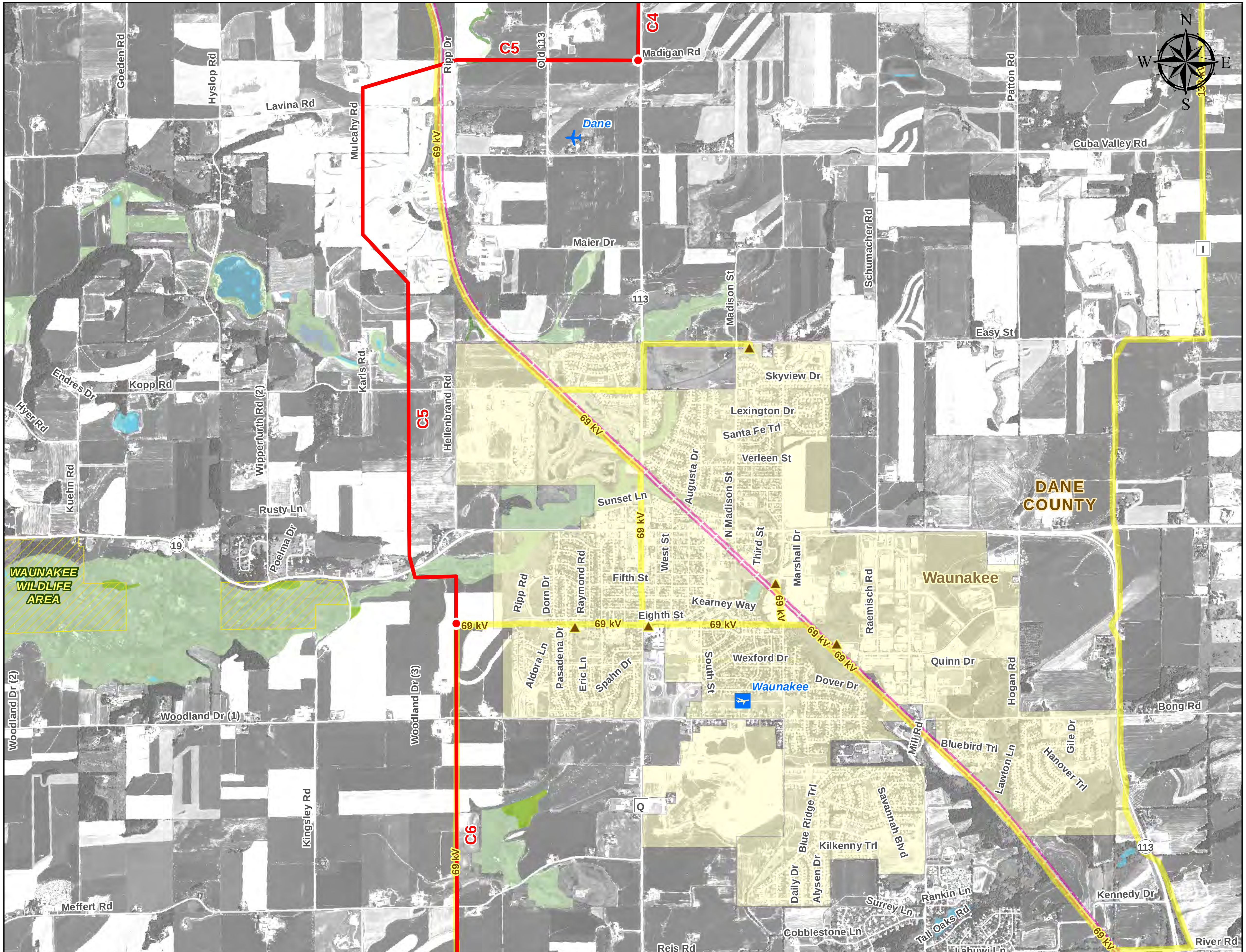
Fig. Vol. 2-1.45



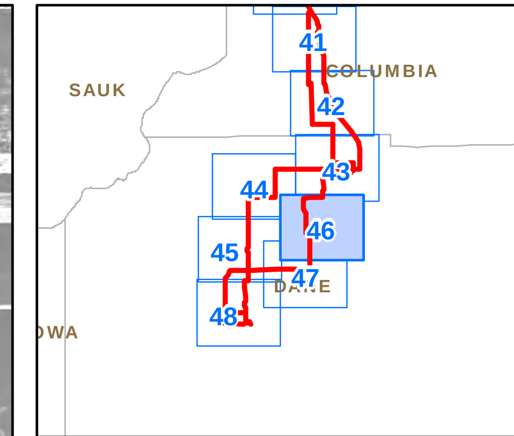


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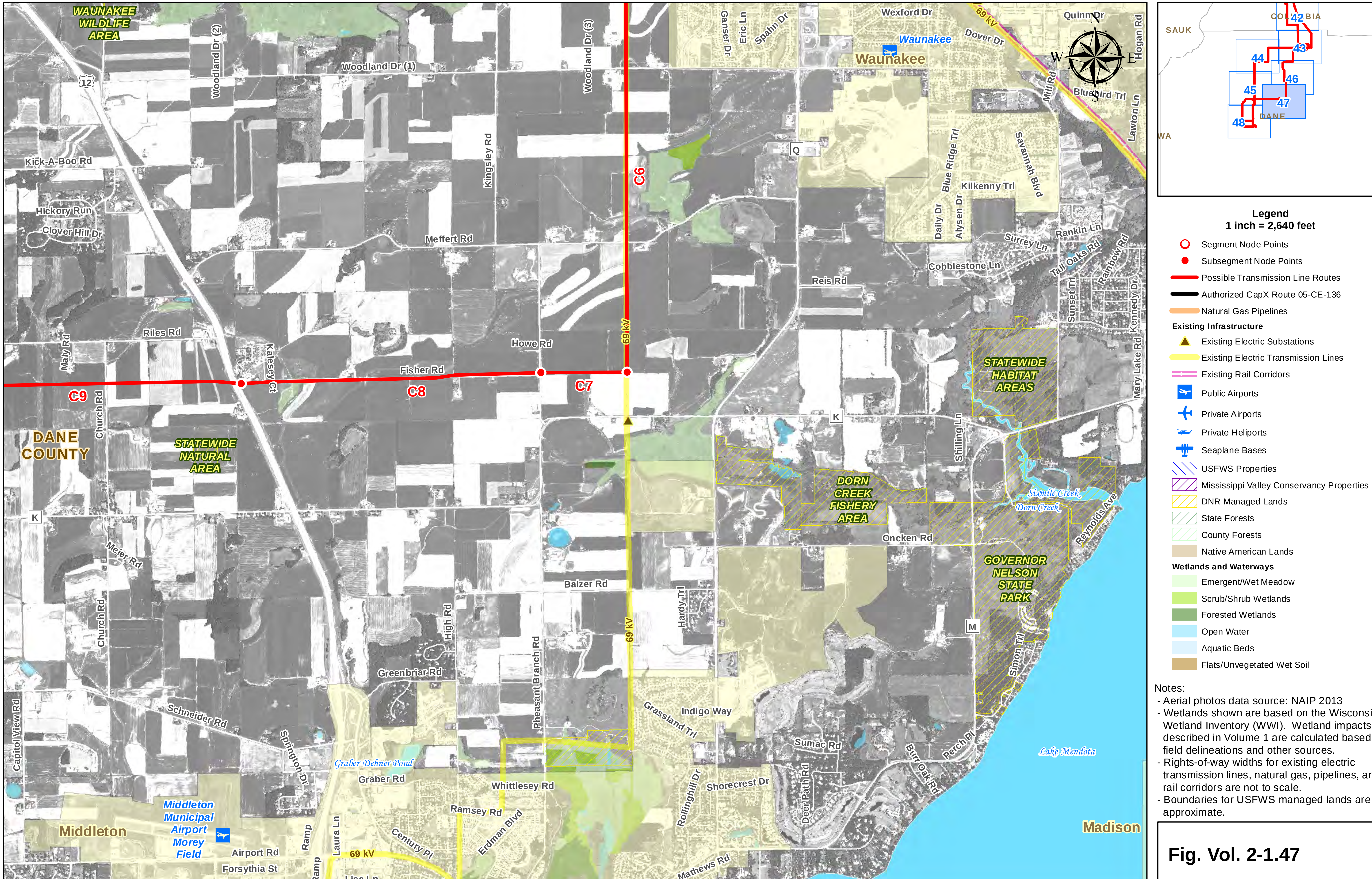
Fig. Vol. 2-1.46



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- Aerial photos data source: NAIP 2013
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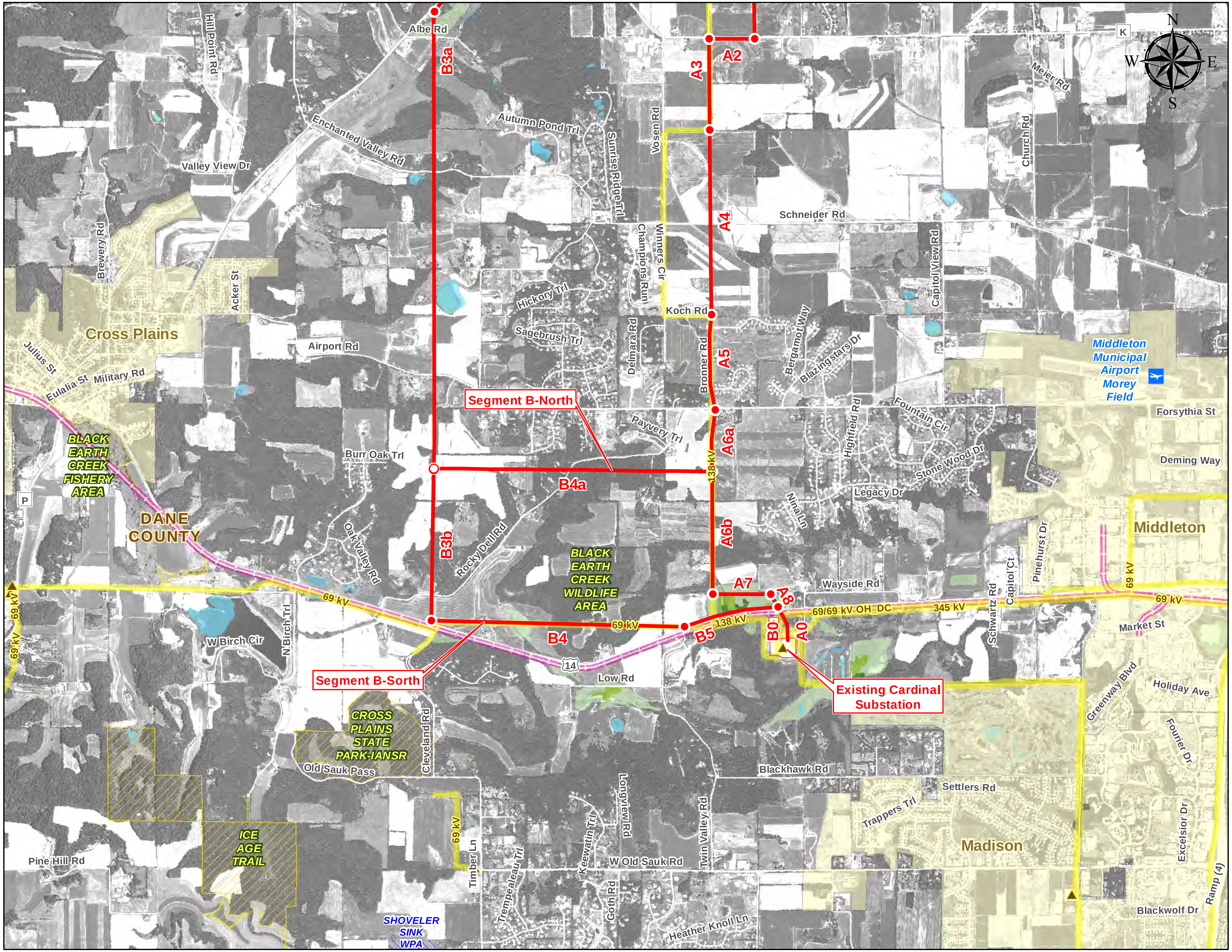
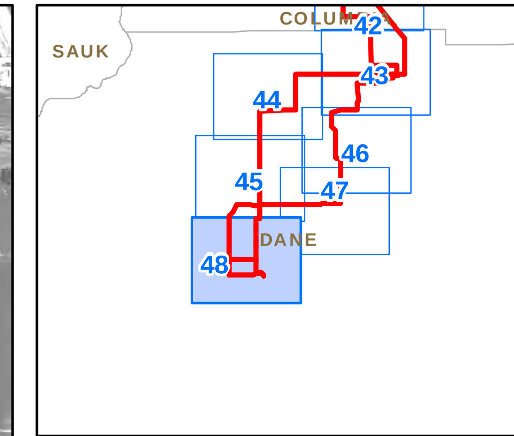
Fig. Vol. 2-1.47





Legend

1 inch = 2,640 feet

- Segment Node Points
- Subsegment Node Points
- Possible Transmission Line Routes
- Authorized CapX Route 05-CE-136
- Natural Gas Pipelines

Existing Infrastructure

- Existing Electric Substations
- Existing Electric Transmission Lines
- Existing Rail Corridors
- Public Airports
- Private Airports
- Private Heliports
- Seaplane Bases
- USFWS Properties
- Mississippi Valley Conservancy Properties
- DNR Managed Lands
- State Forests
- County Forests
- Native American Lands

Wetlands and Waterways

- Emergent/Wet Meadow
- Scrub/Shrub Wetlands
- Forested Wetlands
- Open Water
- Aquatic Beds
- Flats/Unvegetated Wet Soil

Notes:
- Aerial photos data source: NAIP 2013
- Wetlands shown are based on the Wisconsin Wetland Inventory (WWI). Wetland impacts described in Volume 1 are calculated based on field delineations and other sources.
- Rights-of-ways widths for existing electric transmission lines, natural gas, pipelines, and rail corridors are not to scale.
- Boundaries for USFWS managed lands are approximate.

Fig. Vol. 2-1.48

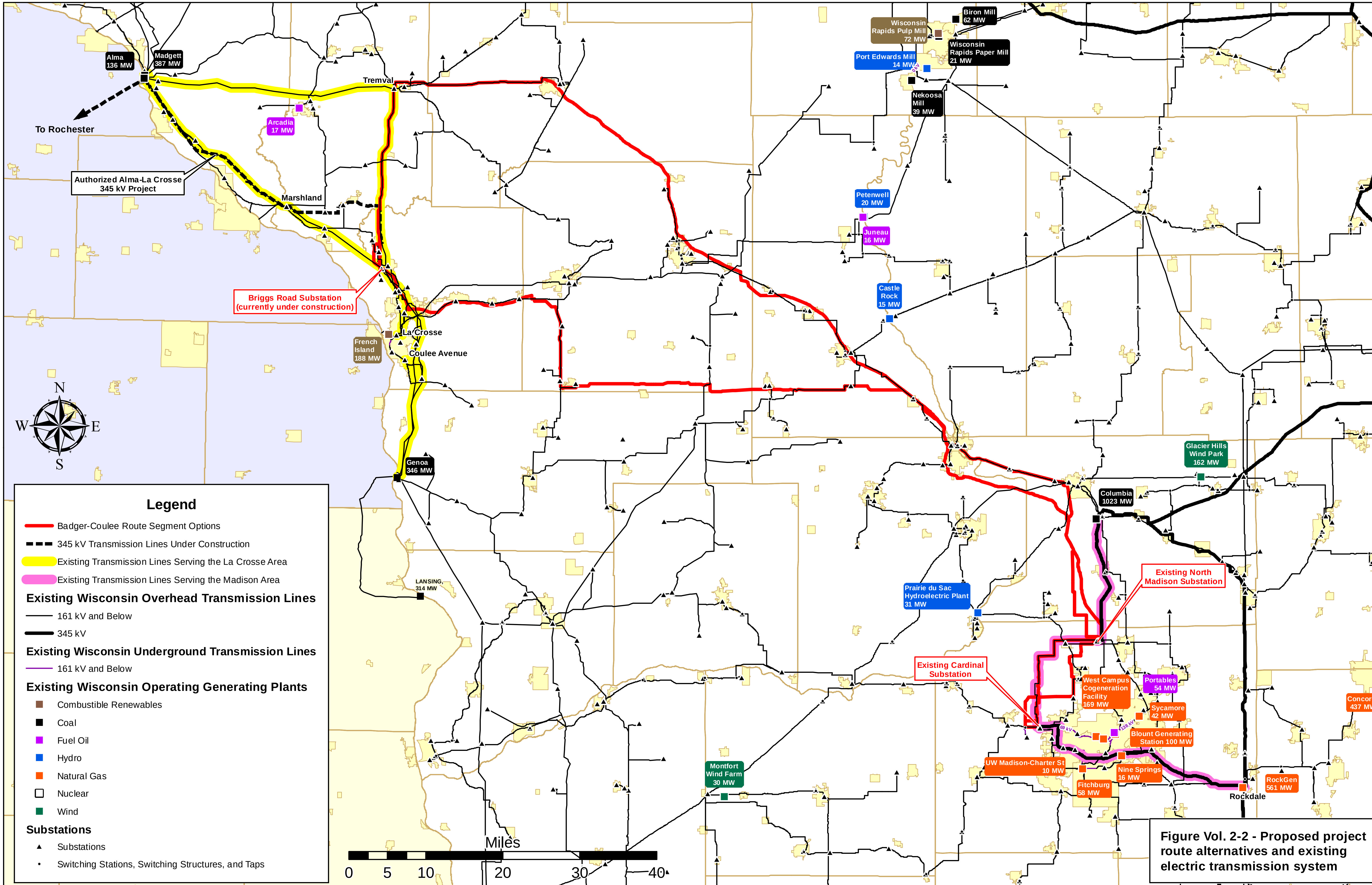


Figure Vol. 2-2 - Proposed project route alternatives and existing electric transmission system

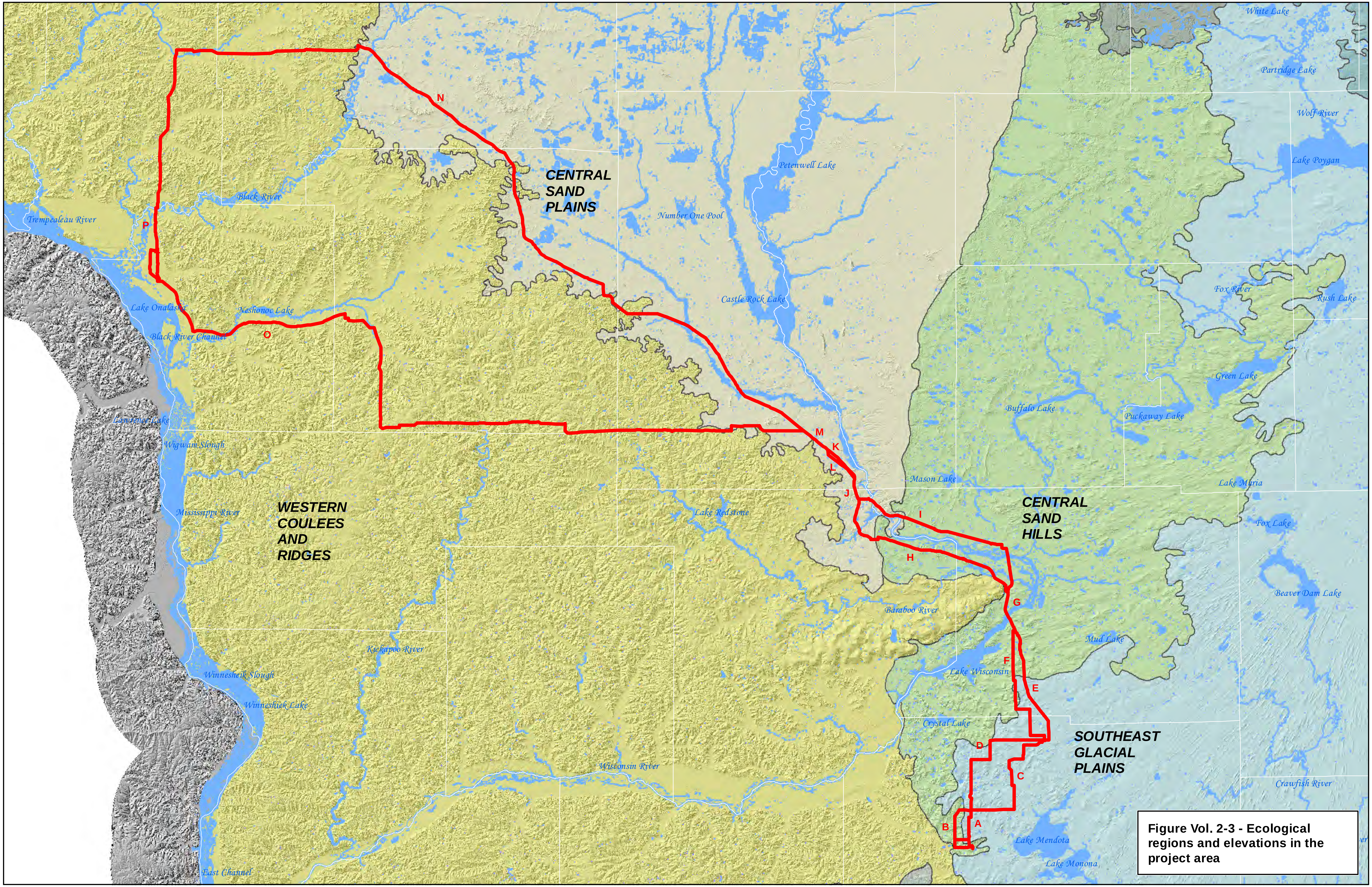


Figure Vol. 2-3 - Ecological regions and elevations in the project area

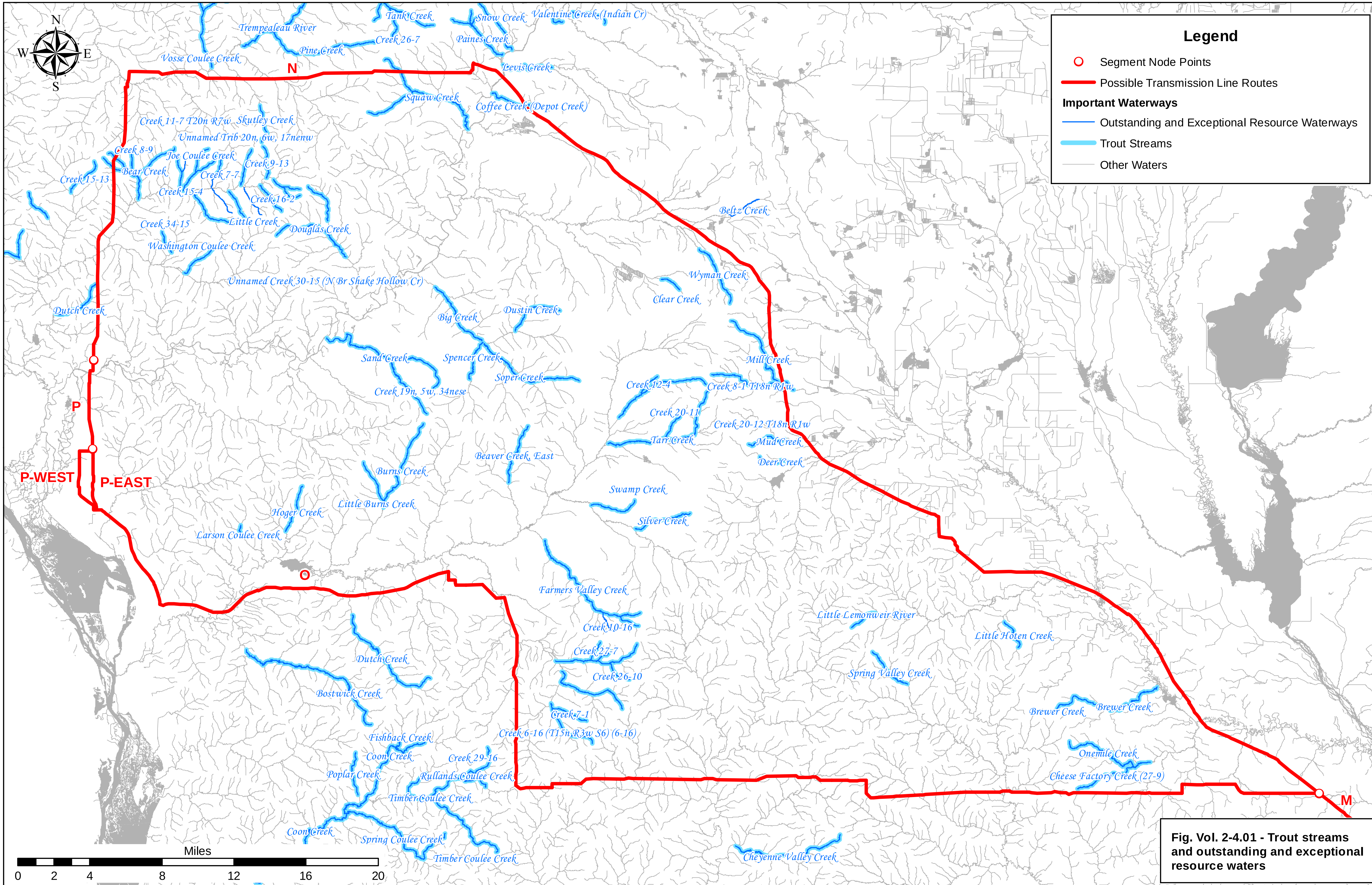


Fig. Vol. 2-4.01 - Trout streams and outstanding and exceptional resource waters

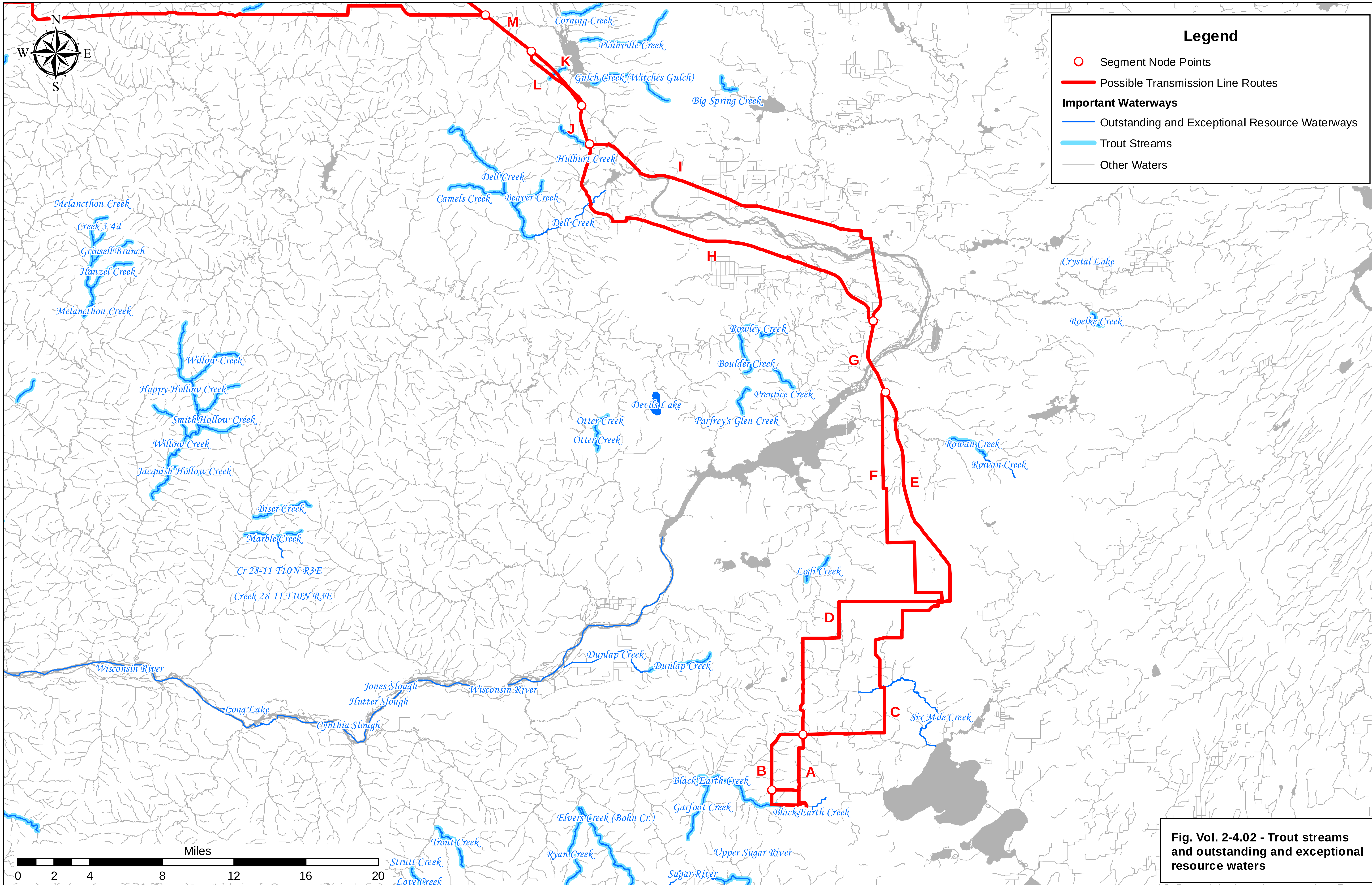


Fig. Vol. 2-4.02 - Trout streams and outstanding and exceptional resource waters

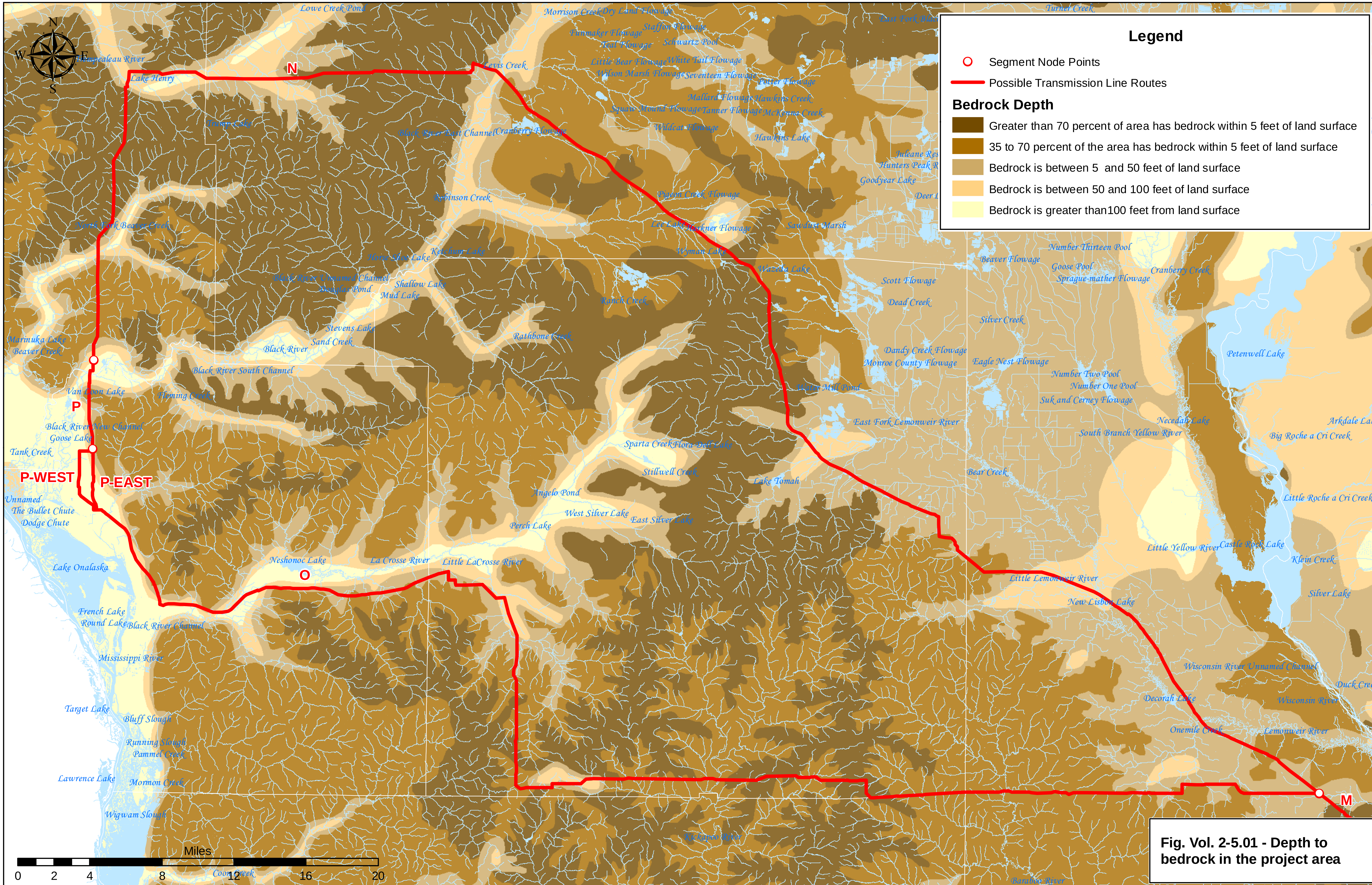


Fig. Vol. 2-5.01 - Depth to bedrock in the project area

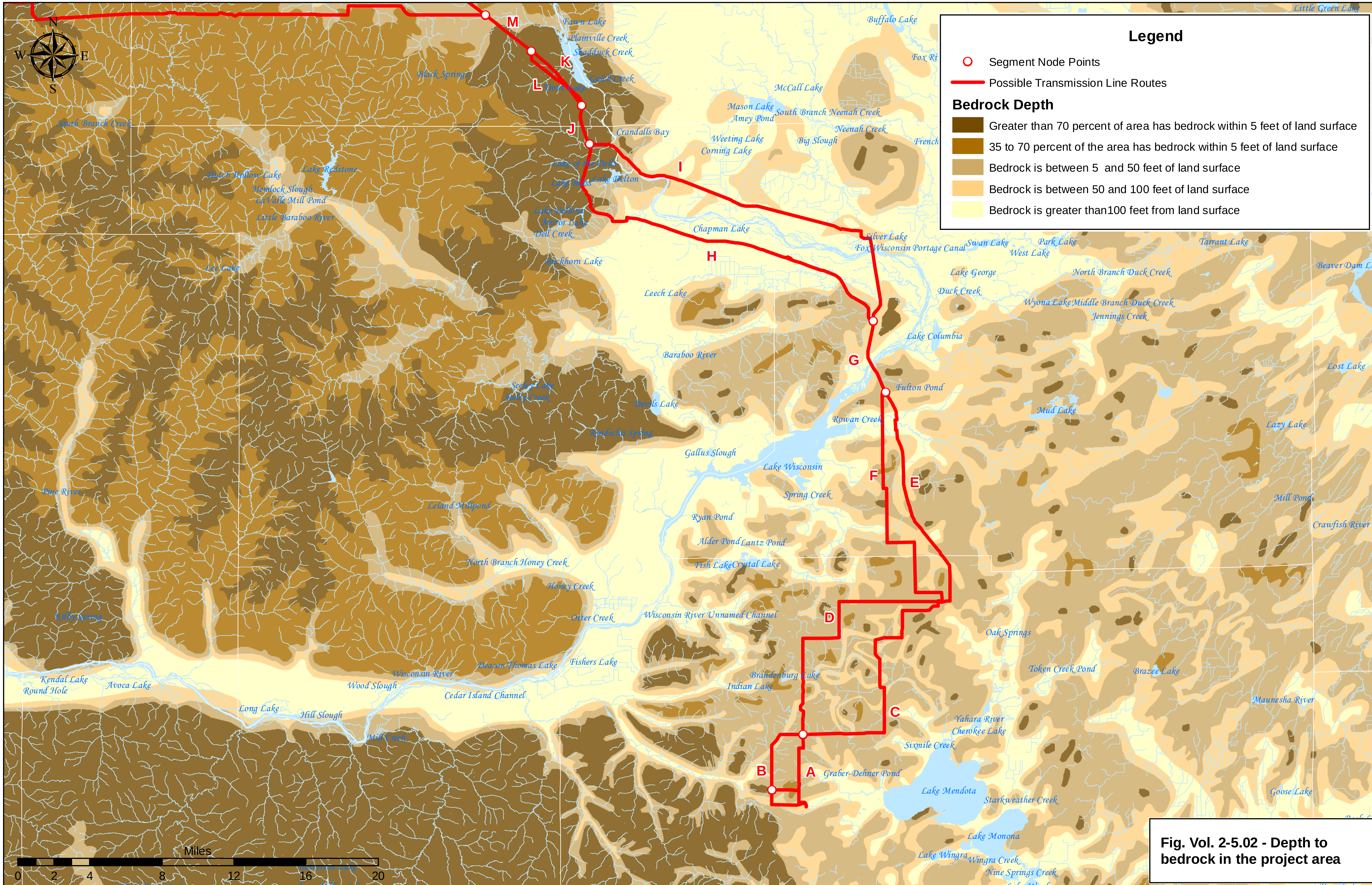


Fig. Vol. 2-5.02 - Depth to bedrock in the project area

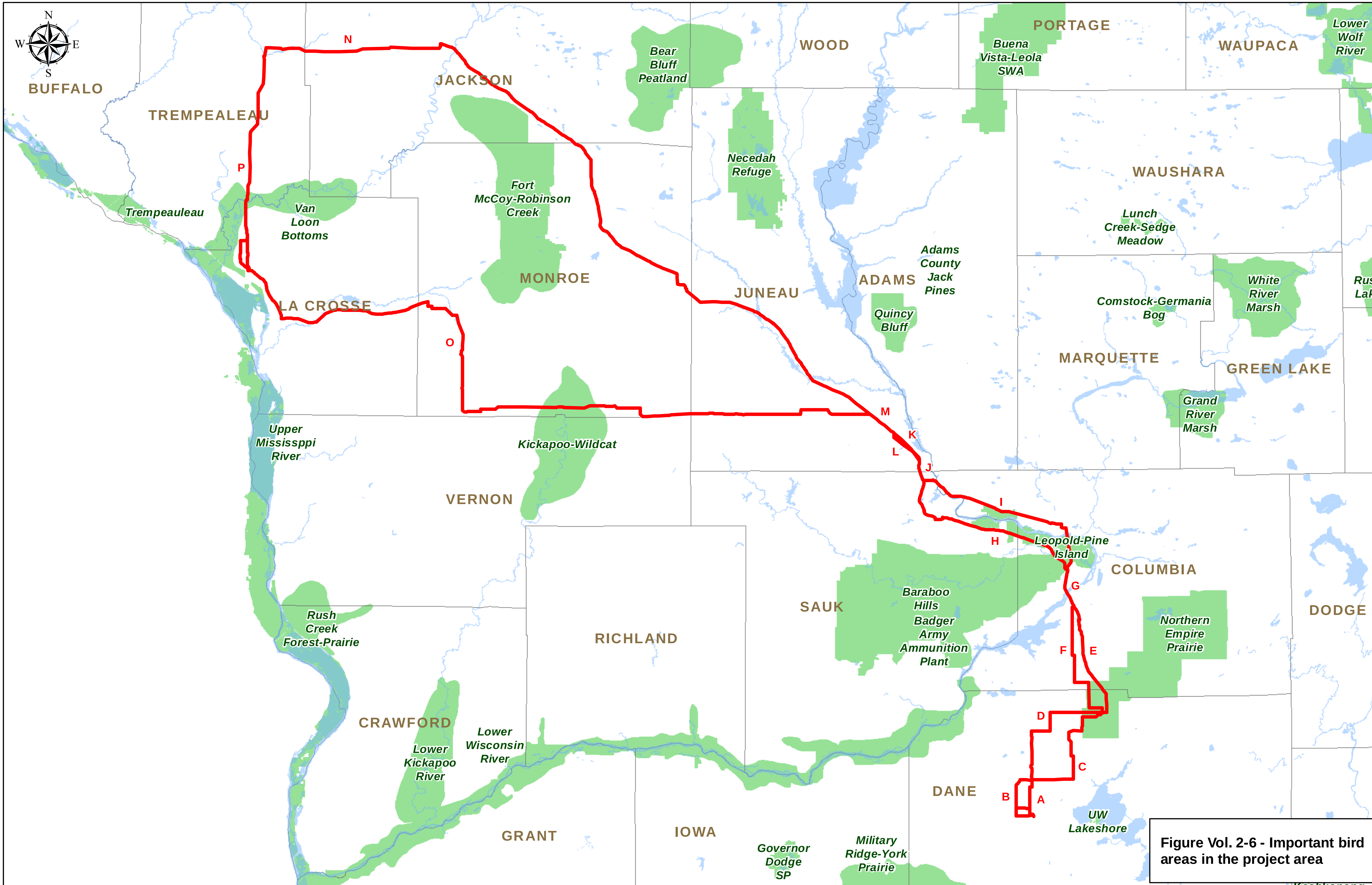
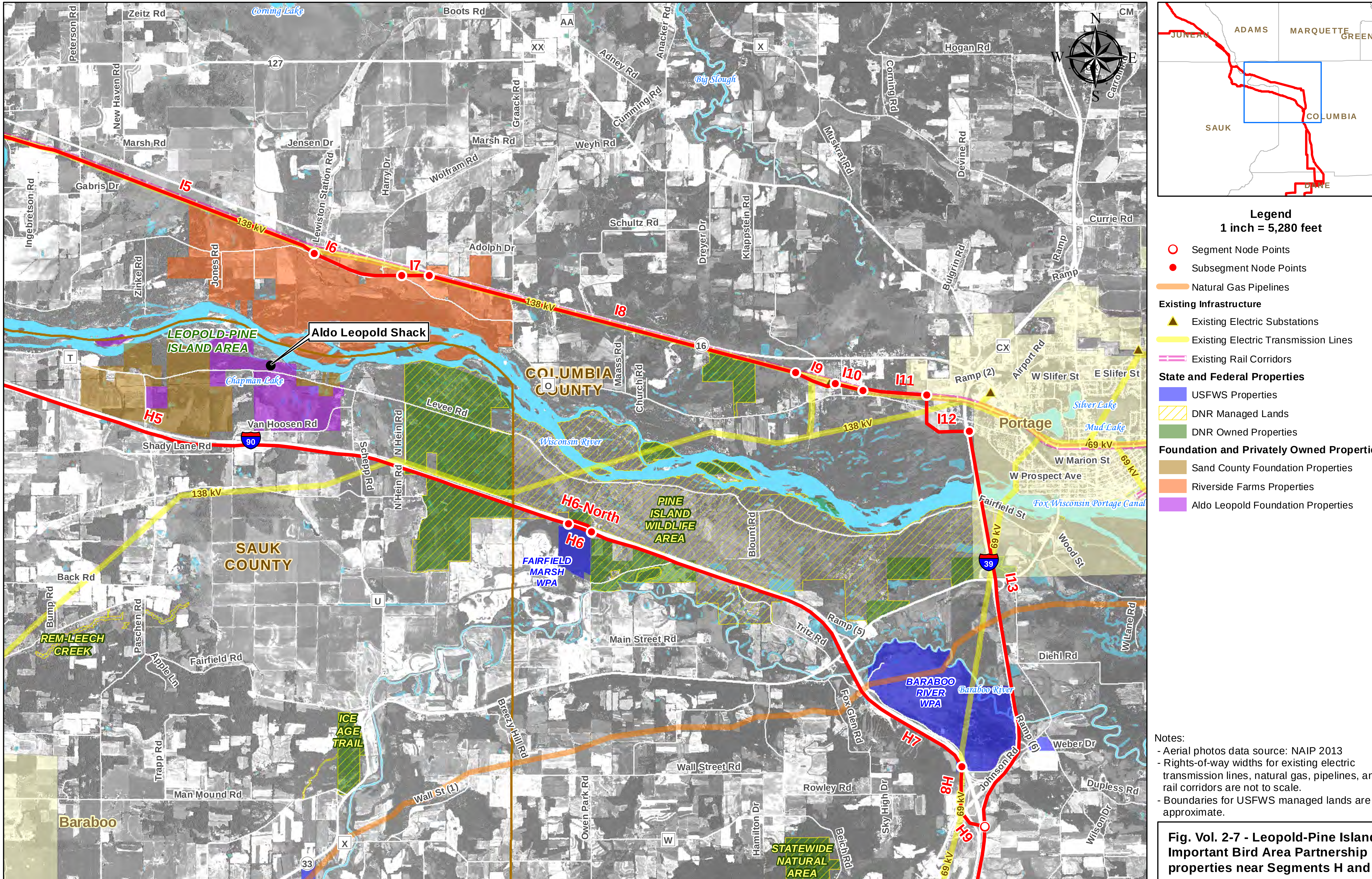


Figure Vol. 2-6 - Important bird areas in the project area



Notes:
- Aerial photos data source: NAIP 2013
- Rights-of-way widths for existing electric transmission lines, natural gas, pipelines, and rail corridors are not to scale.
- Boundaries for USFWS managed lands are approximate.

Fig. Vol. 2-7 - Leopold-Pine Island Important Bird Area Partnership properties near Segments H and I

Figure Vol. 2-8 Typical two-pole H-frame structures

Figure Vol. 2-9 Typical single-pole double circuit structures

Figure Vol. 2-10 Tree processor used for clearing – capable of cutting a standing tree, de-limbing it, and sawing it into logs

Figure Vol. 2-11 Hand-clearing along a flood channel


Figure Vol. 2-12 Chipping slash on upland ROW


Figure Vol. 2-13 Timber piled on edge of ROW

Figure Vol. 2-14 Augering a foundation excavation in dry upland soils

Figure Vol. 2-15 Structure location in wetland – matted work platform, foundation, spoil pile (to be removed), and erosion control

Figure Vol. 2-16 Augering in unconsolidated material (i.e gravel) – flooding of the excavation is necessary to prevent the sides from collapsing

Figure Vol. 2-17 Prepared blast location – topsoil stripped and stockpiled off to side prior to blast and blasting mats in place

Figure Vol. 2-18 Blasting mats and post-blast soil/rubble pile

Figure Vol. 2-19 Augering rocky subsoils

Figure Vol. 2-20 Placing foundation cage inside the excavated hole

Figure Vol. 2-21 Final rebar work in preparation for concrete pour

Figure Vol. 2-22 Pouring the concrete foundation

Figure Vol. 2-23 Completed foundation after initial cleanup

Figure Vol. 2-24 Upland ROW seeded with oats and rye grass for quick soil stabilization while native vegetation re-establishes

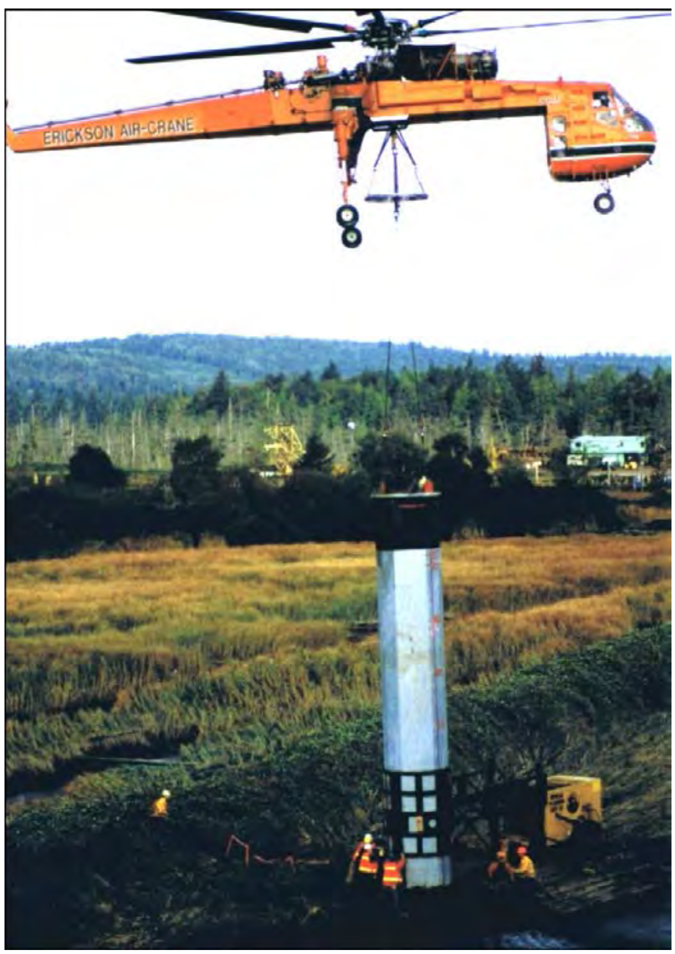


Figure Vol. 2-25 Helicopter-based vibratory caisson and hammer unit

Figure Vol. 2-26 Installation of a helical pier foundation in a wetland with a marsh buggy

Figure Vol. 2-27 Installing the top section of the tower

Figure Vol. 2-28 Bolting tower to concrete foundation

Figure Vol. 2-29 Helicopter setting tower on foundation

Figure Vol. 2-30 Pulling cable through structure arms

Figure Vol. 2-31 Wire stringing with a helicopter

Figure Vol. 2-32 Minor soil rutting in pasture land

Figure Vol. 2-33 Rutting of topsoil in cropland – no soil mixing

Figure Vol. 2-34 Ruts being smoothed with blade

Figure Vol. 2-35 Smoothing out ruts by backblading with a dozer

Figure Vol. 2-36 Turtle exclusion fence

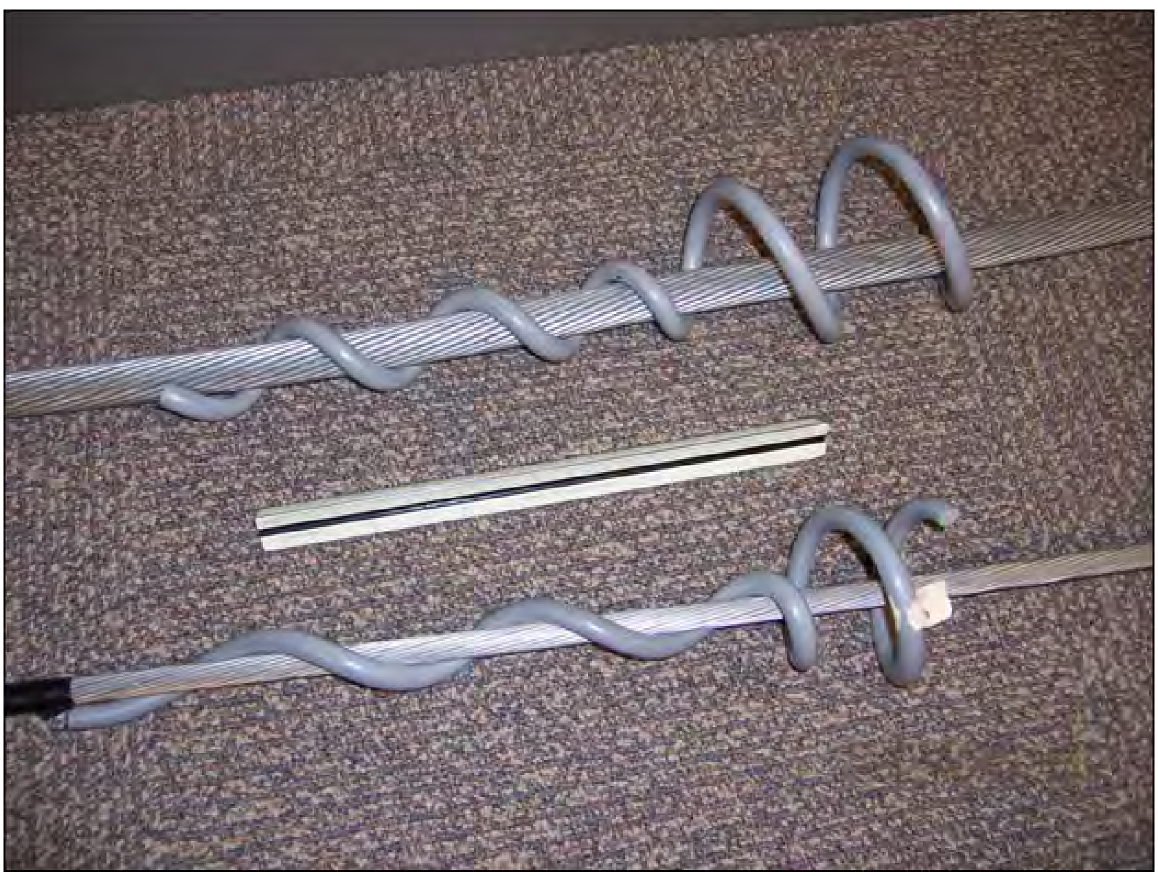


Figure Vol. 2-37 Close-up of bird flight diverters that can be placed on conductors or shield wires of a transmission line

Figure Vol. 2-38 Timber mat equipment bridge at stream crossing


Figure Vol. 2-39 Mats in wet meadow

Figure Vol. 2-40 Timber mats being placed in wooded wetland