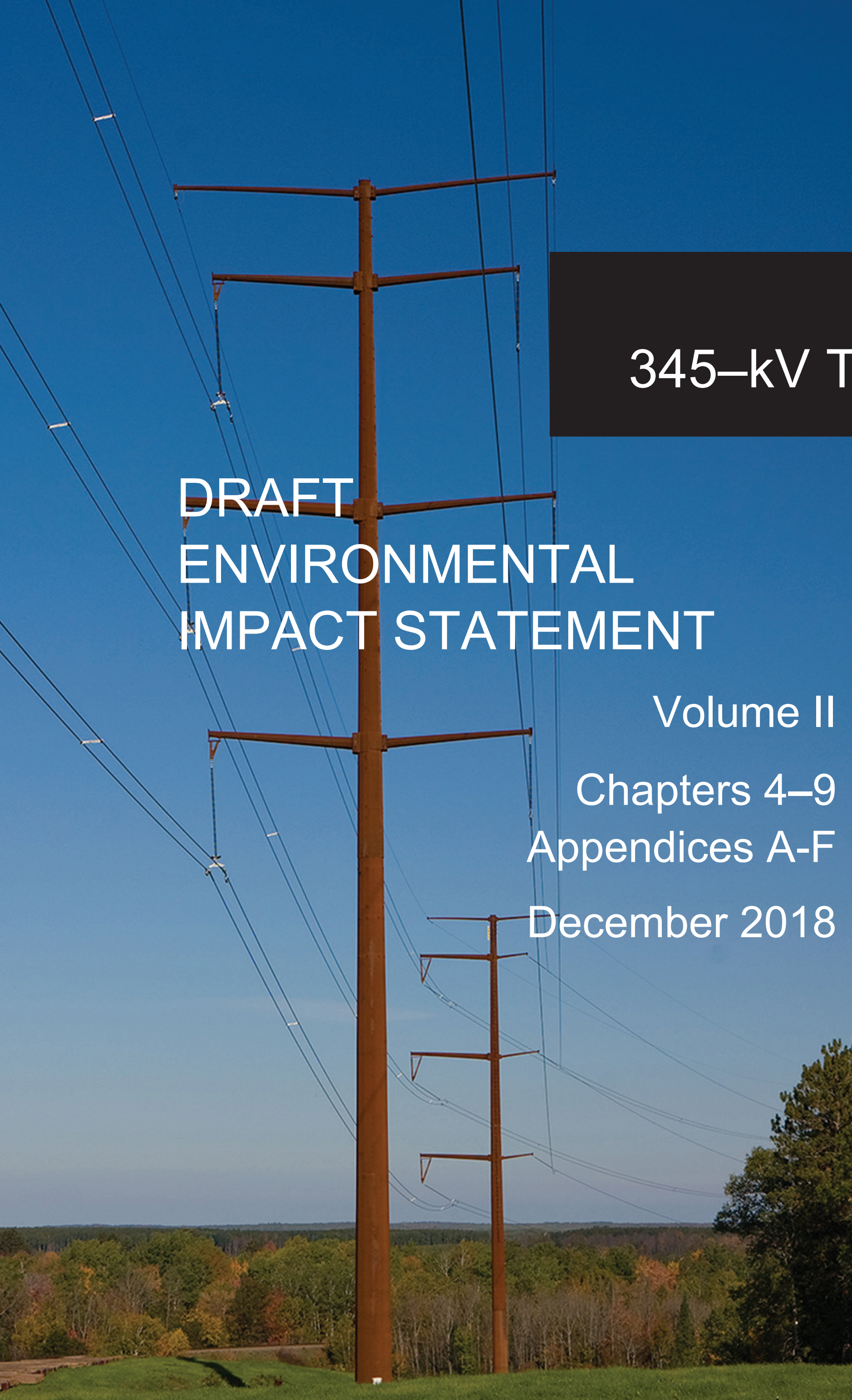

Cardinal– Hickory Creek 345–kV Transmission Line Project

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Volume II

Chapters 4–9
Appendices A-F

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U.S. Department of Agriculture,
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Cooperating Agencies:

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U.S. Fish and Wildlife Service
U.S. Environmental Protection Agency

USDA

US Army Corps of Engineers

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CHAPTER 4. CUMULATIVE IMPACTS AND OTHER REQUIRED CONSIDERATIONS

4.1 INTRODUCTION

Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertake such other actions" (40 CFR 1508.7). CEQ regulations implementing NEPA require the assessment of cumulative impacts be taken into consideration in the decision-making process for Federal projects, plans, and programs. Cumulative impacts need to be analyzed in a meaningful manner that considers the specific resource, ecosystem, and human community being affected by the alternatives and should be considered for all alternatives, including the No Action Alternative (CEQ 1997).

4.2 CUMULATIVE IMPACTS METHODOLOGY

The cumulative impacts analysis done for this DEIS is consistent with CEQ regulations and considers the environmental impacts of the alternatives when added to impacts of past, present, and reasonably foreseeable future actions for each resource for which direct and indirect impacts were identified in Chapter 3. These steps were followed to analyze cumulative impacts in this DEIS:

1. Identify resources affected and summarize the types of direct and indirect impacts to each resource from the C-HC Project, as described in Chapter 3.
2. Establish resource-specific spatial and temporal boundaries for analyzing cumulative impacts. Spatial boundaries delineate the area where past, present, and reasonably future actions have taken place, are taking place, or could take place and result in cumulative impacts on the affected resource when combined with the impacts of the alternatives being considered. Table 4.2-1 provides an overview of the spatial boundary for each resource area. The temporal boundary describes how far into the past and forward into the future actions should be considered in the impact analysis. The temporal boundary for all the resources analyzed in the EIS is the estimated life of the C-HC Project, which is 40 years.
3. Identify the cumulative action scenario (presented in Section 4.3), which includes looking at the past, present, and reasonably foreseeable future actions to be included in the impact analysis for each specific resource identified. The cumulative effects of past actions are accounted for in the description of the affected environment presented for each resource in Chapter 3; therefore, no past projects are included in the cumulative action scenario. Section 4.3.8 summarizes the potential impacts to each resource from the projects listed in the cumulative action scenario.
4. Identify the types of impacts that would result in a cumulative (incremental) impact to each resource impacted by the C-HC Project.

Table 4.2-1. Cumulative Impact Spatial Boundaries by Resource Area

Affected Resource	Spatial Boundary
Geology and Soils	The spatial boundary includes those projects that occur within Wisconsin and Iowa.
Vegetation, including Wetlands	The spatial includes those projects that occur within Dane, Grant, Iowa, and Lafayette Counties in Wisconsin, and Clayton and Dubuque Counties, Iowa.
Wildlife, including Special Status Species	The spatial boundary includes those projects that occur within Wisconsin and Iowa.
Water Resources and Quality	The spatial boundary includes those projects that occur within Wisconsin and Iowa.
Air Quality	The spatial boundary includes those projects that occur within Wisconsin and Iowa.
Noise	The spatial boundary includes those projects that occur within the analysis area of 300 feet in all directions of the transmission line and substation, as described in Section 3.7.
Transportation	The spatial boundary includes those projects that occur within the analysis area of a 5-mile area surrounding the proposed action alternatives, as described in Section 3.8.
Cultural and Historic Resources	The spatial boundary includes those projects that occur within Wisconsin and Iowa.
Land Use, including Agriculture and Recreation	The spatial boundary includes those projects that occur within Dane, Grant, Iowa, and Lafayette Counties in Wisconsin, and Clayton and Dubuque Counties, Iowa.
Visual Quality and Aesthetics	The spatial boundary includes those projects that occur within the analysis area ranging from within the ROW to upwards of 2 miles from the ROW, as described in Section 3.11.
Socioeconomics and Environmental Justice	The spatial boundary includes those projects that occur within the analysis area of four counties in Wisconsin (Dane, Iowa, Lafayette, and Grant Counties) and two counties in Iowa (Clayton and Dubuque Counties), as described in Section 3.12.
Public Health and Safety	The spatial boundary includes those projects that occur within the analysis area of the area in and adjacent to the proposed transmission line corridors, to include land extending 150 feet on either side of the transmission line (i.e., a 300-foot-wide area spanning the center of the transmission line), as described in Section 3.13.
Upper Mississippi River National Wildlife and Fish Refuge	The spatial boundary includes those projects that occur between Mississippi River miles 606 and 608 (see Figure 3.14-1 in Section 3.14).

4.3 CUMULATIVE ACTION SCENARIO

The cumulative action scenario describes the types of present and reasonably foreseeable future actions that are included in the cumulative impact analysis area for each affected resource identified in Chapter 3. The cumulative effects of past actions are accounted for in the description of the affected environment presented for each resource in Chapter 3; therefore, no past projects are included in the cumulative action scenario. For the C-HC Project, the following types of projects were identified for the cumulative action scenario: energy generation (renewable and non-renewable), other electric transmission projects, major transportation improvements, and pipelines.

4.3.1 Renewable Generation Projects

4.3.1.1 WIND

The Wind XI project is currently being developed in Iowa and comprises three separate wind farm projects: the 170-MW Beaver Creek wind project (Boone and Greene Counties), the 168-MW Prairie wind project (Mahaska County), and the North English wind project (Poweshiek County). The Beaver Creek project consists of 85 turbines and was placed into service in fourth quarter 2017. The Prairie project consists of 84 turbines and was placed into service in January 2018. Construction at the North

English project began in October 2017, and is expected to be complete in December 2018. The 2,000-MW Wind XI project would be fully complete in late 2019.

The Heartland Divide Wind Farm is currently being developed in Iowa and is expected to be completed in late 2018. This is a 104-MW facility and would directly connect into Central Iowa Power Cooperative's network.

The J855 wind farm project is being developed in the southwestern corner of Wisconsin. The 100-MW facility is expected to be in service by August 1, 2019.

4.3.1.2 Solar

A solar energy site is currently being proposed for just north of the Dane County Regional Airport in south-central Wisconsin. The project site is 41 acres, and the project is anticipated to generate 8 MW of electricity.

The Badger Hollow Solar Farm is in the development stages and is anticipated to be a 300-MW project. The 1.1 million solar panels needed for this project would be on approximately 3,500 acres within Mifflin, Eden, and Linden Townships in Iowa County, Wisconsin. C-HC Project alternatives 4, 5, and 6 would intersect this project just southeast of Montfort, Wisconsin. Construction is anticipated to begin in 2019, and the project is expected to be operational by 2020.

The J870 and J871 solar projects are being developed in southwestern Wisconsin. The J870 is a 200-MW facility and the J871 is a 100-MW facility. Both are expected to be in service by September 10, 2021.

Two Creeks Solar, LLC, is in the process of developing a 150-MW project in Kewaunee and Manitowoc Counties, Wisconsin, approximately 130 miles northeast of the eastern termini of the C-HC Project. The solar farm would be on approximately 700 acres in the town of Two Creeks and the city of Two Rivers, Wisconsin, and an approximately 5-mile, 138-kV transmission line would be constructed to tie the solar farm into the Kewaunee switchyard.

4.3.2 Nemadji Trail Energy Center

Dairyland Power Cooperative and Minnesota Power, a utility division of ALLETE, based in Duluth are proposing a 550 MW gas plant in the City of Superior, Douglas County, Wisconsin. The site is approximately 30 acres in size and is located in an industrial site. Site development is expected to begin in 2020. The in-service date for the Project is December 2024 depending on regulatory approvals.

A new 345-kV collector bus would be constructed adjacent to the power plant to transfer the output from the generating plant to a new offsite 345-kV substation via a new radial 345-kV transmission line. The proposed radial transmission line would be approximately 3.3 to 5.5 miles in length depending on the route selected.

The plant would be designed to burn natural gas with fuel oil as a backup. New facilities for the natural gas infrastructure would include a hot tap and new meter station at the Great Lakes interstate Pipeline. The new 16-inch diameter lateral pipeline will extend 6.8 miles from this meter station to the preferred site.

4.3.3 Multi-Value Portfolio Projects in Wisconsin and Iowa

There are four transmission projects proposed by MISO as part of the MVP portfolio (described in Chapter 1) that are expected to be built in Iowa and Wisconsin over the next several years. The projects include:

- the Lakefield Jct. – Winnebago – Winco – Burt area and Sheldon – Burt area – Webster project
- the Winco – Lime Creek – Emery – Black Hawk – Hazelton project
- the Adair – Ottumwa project
- the N. LaCrosse – N. Madison – Cardinal project. (This project is the sister project to Cardinal-Hickory Creek, and is also known as the Badger-Coulee Project.)

The Lakefield Jct. – Winnebago – Winco – Burt area and Sheldon – Burt area – Webster project would create a double-circuit 345/161-kV path through the south-central border of Minnesota and northcentral border of Iowa. The new 345-kV path through southern Minnesota and northern Iowa effectively mitigates an existing 161-kV constraint and reliably moves mandated renewable energy from western and northern Iowa to major 345-kV transmission hubs. The project is a combination of new 345-kV transmission and rebuilt 161-kV transmission lines. This project would add 218 miles of new 345-kV and 92 miles of rebuilt 161-kV transmission line to the region.

The Winco – Lime Creek – Emery – Black Hawk – Hazleton project would create a double-circuit 345/161-kV path through northern Iowa. The new 345-kV path through Iowa effectively mitigates an existing 161-kV constraint. Transformers would act as step-up transformers for wind energy and lower congestion on lower voltages, would significantly increase the transfer capability of a regional 345-kV line, and would move mandated renewable energy from western and northern Iowa to major 345-kV transmission hubs. The project is a combination of new 345-kV transmission and rebuilt 161-kV transmission lines. This project would add 206 miles of new 345-kV, 23 miles of new 161-kV, and 149 miles of rebuilt 161-kV transmission to the region.

The Adair – Ottumwa project would create a 345-kV path through central/eastern Missouri by connecting Iowa's Ottumwa substation to Ameren Missouri's West Adair substation. The new 345-kV lines would provide an outlet for wind generation in the western region to move toward more populated areas in the east. Additionally, the new lines would provide reliability benefits including resolving 161-kV line overloads, loss of generation, and mitigate constraints in the region. Approximately 88 miles of new and rebuilt 345 kV line would be installed, along with a 345-kV terminal, and a 345/161-kV, 560-mega volt ampere (MVA) step-down transformer.

The N. LaCrosse – N. Madison – Cardinal project would create a 345-kV line from the North LaCrosse (Briggs Road) Substation, to the North Madison Substation, to the Cardinal Substation, through southwestern Wisconsin. The new 345-kV line would create a tie between the 345-kV network in western Wisconsin to the 345-kV network in southeastern Wisconsin, which creates an additional wind outlet path across the state; pushing power into southern Wisconsin. Additionally, the new line would help alleviate constraints on the existing 345-kV system and on the 138- and 161-kV systems in southwest Wisconsin and Iowa. Approximately 20 miles of 138-kV line would be reconductored. The new 345-kV line would be approximately 157 miles long.

4.3.4 Other Transmission Line Projects Proposed by the Utilities

There are several other projects proposed by the Utilities that include new construction projects as well as maintenance projects in Wisconsin and Iowa over the next several years.

Dairyland Power Cooperative is currently proposing eight new 69-kV transmission line construction projects, twenty-one 69-kV rebuild projects, transformer addition, and a new 69-kV switching station.

ATC is currently working on three major transmission projects in Wisconsin. The first is a reinforcement project to address reliability concerns associated with the high-voltage transmission system in southeastern Wisconsin. To enable more efficient power flow, the project reconfigures two existing 345-kV lines in Wisconsin and Illinois, linking them with approximately 3 to 5 miles of new double-circuit, 345-kV transmission and a new substation. The second is a construction project to meet an increase in electric demand in Walworth and Kenosha Counties, Wisconsin. The project involves the construction of a new 23-mile, 138-kV transmission line, stretching from the North Lake Geneva Substation in southern Walworth County to the Spring Valley Substation in western Kenosha County; construction of a new 138-kV and 69-kV substation in the town of Wheatland; construction of a new 69-kV transmission line to connect the new substation to the existing Twin Lakes Substation in Twin Lakes; and other power line modifications. The third project is a rebuild of a 69-kV transmission line in northeastern Wisconsin. The project will involve the replacement of 834 wood pole structures, the replacement of line conductor and addition of a fiber-optic shield wire, and replacement of some associated substation equipment.

ITC Midwest is currently working on several projects across Iowa over the next several years. Twenty-four projects would convert existing 34.5-kV transmission lines to 69-kV transmission lines primarily in southwest Iowa, but a few would be in southeast and northeast Iowa. Twenty-three rebuild projects across approximately 299 miles of transmission line are planned across Iowa. Seven new construction projects totaling approximately 72 miles primarily in southeast Iowa are proposed. Eight substations and one transmission line upgrade are also planned.

4.3.5 Major Transportation Improvements

4.3.5.1 Dane County, Wisconsin

Major transportation projects are anticipated over the next few years that would occur on interstate and highways within Dane County, Wisconsin. Many of the projects include bridge work, safety improvements, maintenance facilities, and traffic flow improvements.

Bridge work is anticipated for several bridges along Interstate (I-) 94 and several highways within Dane County. A bridge replacement project is planned for over Koshkonong Creek, which would also include the replacement of three culverts in the same general area. Additionally, the reconstruction of the eastbound and westbound bridges spanning Wisconsin Highway (WIS) 73 is in the design phase and would also include changes to side roads and improving the I-94 and WIS 73 interchange. A bridge replacement project is planned for the westbound bridge over Byrne Road along with bridge deck replacement at the WIS 138 and McCoy Road bridges, and bridge deck overlays at the County MM bridge. Bridge replacements along WIS 19 are planned for over the Yahara River and two unnamed locations between the WIS 78 and U.S. Route 12 intersections.

Safety improvements planned throughout Dane County could include installation of barriers, replacement of signage and pavement markings, and improvements to drainage. Safety improvements to WIS 19 would include upgrading selected horizontal and vertical curves, replacing guardrails, protecting existing roadside hazards, rehabilitating select roadway culvert pipes, replacing signing and pavement markings, and widening shoulders. Safety improvements to WIS 69 would include rehabilitating sections with asphalt overlay; complete replacement of road along selected sections; widening shoulders; improving curves, super elevations, cross slopes, side slopes, and clear zone; improve intersection angles and geometrics; remove two intersections; and add or replace signing, pavement markings, culverts, storm sewer, and guards as required.

The construction of maintenance facilities is anticipated in several locations throughout Dane County. These include the construction of a salt shed, maintenance shed at the U.S. Route 14 and County MM Road interchange, and the replacement of an existing salt storage facility on WIS 19, west of the I-39/90/94/U.S. Route 51 interchange.

Improvements to traffic flow would occur throughout Dane County and could include construction of roundabouts, lane additions, and improvements to intersections. Roundabout construction is planned for two locations on U.S. Route 51 at the intersections of WIS 138 and Silverado. A roundabout is planned at the U.S. Route 14 and County MM intersection to accommodate the installation of a park-and-ride lot. The expansion of WIS 19 from a two-lane highway to a four-lane highway from west of River Road to the WIS 19/I-39 interchange is currently being planned. This project would also include the reconstruction of the River Road intersection as a roundabout.

4.3.5.2 Grant County, Wisconsin

Transportation improvement projects are planned for U.S. Route 18 and U.S. Route 61 in Grant County, Wisconsin. The U.S. Route 61 bridge over the Platte River would be replaced. Improvements to U.S. Route 61 are planned for sections between Cherry Street and City Limits Street in Lancaster, Wisconsin. This project would include replacing concrete and asphalt pavement, existing lighting with new or decorative lighting, storm sewer, sanitary sewer, water main, curb and gutters, and sidewalks. Improvements to U.S. Route 61 are planned for sections between Pitzen Lane and Hickory Lane in Dickeyville, Wisconsin. Repairs to deficient pavement, curb, gutter, and sidewalks are anticipated along with the removal of an abandoned cattle pass.

4.3.5.3 Iowa County, Wisconsin

Transportation projects are planned for U.S. Route 18, U.S. Route 151, WIS 191, and WIS 39 in Iowa County, Wisconsin. Roadway improvements to U.S. Route 18 between Dodgeville and Mount Horeb, Wisconsin, include patch and overlay to existing pavement surface, upgrading selected intersections to lengthen right- and left-turn lanes, replacement of existing beam guard and turn-down terminal ends, installation of median cable barriers in select locations, protection of existing roadside hazards within the roadway clear zone, replacement of existing signage and pavement markings, and bridge work on the westbound over Jones Street. Improvements to U.S. Route 151 in Dodgeville, Wisconsin, between the U.S. Route 18 interchange and WIS 23 interchange would include replacing concrete pavements on highway, interchanges, and ramps. The reconstruction of WIS 191 between Iowa Street and Diamond Oaks Drive in Dodgeville, Wisconsin, would include replacing pavement structure, storm sewer, sidewalks, and the city’s sanitary and water lines.

4.3.5.4 Lafayette County, Wisconsin

Transportation projects are planned for WIS 11, WIS 23, and WIS 78 in Lafayette County, Wisconsin. Roadway improvements could include removing and replacing asphalt pavement, increasing paved shoulder width, replacing culverts, installing gravel shoulders to match the final roadway elevation, upgrading beam guard, installing signs and pavement markings, and installing shoulder and centerline rumble strips. Additionally, two bridges over the Shullsburg Branch near Shullsburg, Wisconsin would be replaced.

4.3.5.5 Clayton County, Iowa

Only one transportation project is planned for Route 52 in Clayton County, Iowa. Bridge deck overlay is planned for the Route 52 bridge over Little Turkey River south of County Road C9Y.

4.3.5.6 Dubuque County, Iowa

Major transportation projects are anticipated over the next few years that would occur within Dubuque County, Iowa. Improvements, including grading and paving, would occur in multiple locations within the county, including on select sections on Route 20, Route 3, Route 52, Route 151, and Route 61. Riprap work is also anticipated for Route 3 northwest of Durango. Bridge work would also occur at several bridges throughout the county. Bridge cleaning is planned for the Mississippi River bridge in Dubuque. Bridge deck overlay is planned for five bridges along Route 20, including the North Fork Maquoketa River, Iowa Highway 136 interchange in Dyersville, County Road Y13/1st Street S Interchange in Farley, County Road Y17 in Epworth, and Middle Branch Catfish Creek and CC RR bridges in Dubuque.

4.3.6 Pipeline Projects

One pipeline project is expected to occur in the analysis area. Enbridge is in the process of increasing capacity on Line 61, a 42-inch-diameter crude oil pipeline which spans from Enbridge's terminal in Superior, Wisconsin, to the company's Flanagan Terminal near Pontiac, Illinois. The pump station located in Waterloo, Dane County, Wisconsin, is included in this project. After completion of Line 61 upgrades, the project would have the infrastructure in place to transport up to 1.2 million barrels per day (bpd) of crude. The pipeline is currently carrying approximately 930,000 bpd.

4.3.7 Forest Restoration within the Refuge

The Refuge's Comprehensive Conservation Plan (USFWS 2006a) identified forest restoration, especially of mast-producing trees, as an objective. Mast is the botanical name for the nuts, seeds, buds, or fruits of trees and shrubs that are eaten by wildlife. Until 2008, several fields on the Turkey River bottoms portion of the Refuge, approximately between river miles 606 and 608, were farmed through a cooperative farming agreement between the Refuge and a third party. In 2008, cooperative farming ceased on the Turkey River bottoms and the Refuge began restoring the bottomland hardwood forest community. In the intervening 10 years, the Refuge has planted thousands of trees species, including swamp white oak, representative of a bottomland hardwood community. Oak forests are an underrepresented habitat type in the Mississippi River floodplain and a declining, unique habitat type in the Midwest United States.
The Refuge's tree planning efforts have been supported by volunteers from several area schools in Cassville, Wisconsin and Guttenberg, Iowa. Hundreds of middle school and high school students have assisted the Refuge with planting and maintenance of established trees on the Turkey River bottoms.

4.3.8 Summary of Impacts from the Cumulative Action Scenario

This section summarizes the incremental impact from the actions identified in the cumulative scenario, by resource. Table 4.3-1 identifies the short- and long-term adverse and beneficial impacts anticipated to result from project type listed in the cumulative action scenario. As presented in Chapter 3, short-term impacts would occur during the C-HC Project construction period through two growing seasons after construction is completed, 1 to 3 years. Long-term impacts would occur over the operational life of the C-HC Project, 3 to 50 years. For this analysis, RUS assumes that all projects listed in the cumulative action scenario would follow applicable laws that protect cultural resources. Therefore, impacts to cultural resources from the projects listed in the cumulative impact scenario would be avoided, minimized, and mitigated.

Table 4.3-1. Incremental Impacts from the Cumulative Action Scenario

Affected Resource	Renewable Generation Projects	Nemadji Trail Center	MVP Projects in WI and IA	Other Transmission Projects	Major Transportation Improvements	Pipeline Projects	Restoration within the Refuge
Geology and Soils	S/L−	S−	S/L−	S−	S/L−	S/L−	L+
Vegetation, including Wetlands	S/L−	S/L−	S/L−	S/L−	S/L−	S/L−	L+
Wildlife, including Special Status Species	S/L−	S/L−	S/L−	S/L−	S/L−	S/L−	L+
Water Resources and Quality	S−	S/L−	S−	S−	S−	S−	L+
Air Quality	S−/L+	L+	S/L−	S−	S−/NE	S/L−	L+
Noise	S−	S−	S−	S−	S−	S−	NE
Transportation	S−	NE	S−	S−	S−/L+	S−	NE
Cultural and Historic Resources	NE	NE	NE	NE	NE	NE	NE
Land Use, including Agriculture and Recreation	S/L−	NE	S/L−	S/L−	S/L−	S/L−	L+
Visual Quality and Aesthetics	S/L−	S/L−	S/L−	S/L−	S/L−	S/L−	L+
Socioeconomics and Environmental Justice	S/L+	S/L+	S/L+	S/L+	S/L−	S/L+	NE
Public Health and Safety	NE	L−	L−	L−	NE	L−	NE
Upper Mississippi River National Wildlife and Fish Refuge	NE	NE	NE	NE	NE	NE	L+

Notes:

Adverse effect: −

Beneficial effect: +

Short-term effect: S

Long-term effect: L

No effect: NE

4.4 GEOLOGY AND SOILS

Cumulative impacts to geology and soils resulting from past, existing, or foreseeable projects are expected to be temporary and minor. Environmental impacts to geology and soils are generally localized where they occur. Cumulative impacts to geological and soil resources could occur due to multiple additional projects as described the Cumulative Action scenario described in Section 4.3. Any projects that disturb soil resources within the vicinity of the C-HC Project would add to the cumulative impacts that may occur as a result of added erosion, compaction, or disturbance to shallow soils.

Potential cumulative impacts to geology and soils include the following:

1. The construction of wind turbines for renewable energy projects are expected to have similar impacts to sensitive soils as the construction of the C-HC Project, with potential for severe erosion and soil compaction along access roads, construction areas, and laydown areas; and permanent impacts at tower foundations. Most wind energy projects would likely result in temporary minor cumulative impacts to geology and soils assuming soils would be restored, and minor permanent impacts at tower locations.

2. The construction of solar farms for renewable energy would have minor impacts to soils and geology. Soil impacts, primarily from compaction of soils, will result from project construction access roads, and operational areas. Typically, however, solar farms will stabilize soils against erosion, and therefore limit impacts. Cumulative impacts to soils due to these projects are expected to be permanent and minor.
3. The construction of the Nemadji Trail Energy Center would have similar impacts to sensitive soils as the construction of the C-HC Project, with potential for severe erosion and soil compaction at the construction site with permanent impacts at the facility location. Cumulative impacts to sensitive soils are expected to be temporary and minor, assuming that erosion and compaction are avoided or immediately repaired.
4. Electric transmission line projects would have environmental consequences similar to the C-HC Project. Cumulative impacts are expected to be minor and temporary, with the exception of permanent impacts due to structure foundations and substations.
5. Oil or natural gas pipelines and/or associated infrastructure (compressor or pump stations) within the study area may impact sensitive soils. The construction of other pipelines will have similar impacts as the C-HC Project by disturbing sensitive soils. Cumulative impacts to sensitive soils are expected to be temporary and minor, assuming that erosion and compaction are avoided or immediately repaired. Permanent impacts from pipelines include increased potential for erosion, compaction, and disturbance of shallow soils at compressor stations or other permanent facilities, much the same as expected for substations for the C-HC Project.
6. Major transportation projects within the study area, including along highways U.S. Route 18, U.S. Route 151, WIS 191, and WIS 39 in Wisconsin, and Route 20, Route 3, Route 52, Route 151, and Route 61 in Iowa, will have minor cumulative impacts to soil and geology. The road improvement projects primarily include construction or repairs of existing roads and bridges, with little additional impacts to geological or soil resources. Where roads will be expanded (lane improvements, shoulder widths), the potential for severe erosion exists; however, this impact would be minimized by required erosion control methods. Where road improvements are aligned with the C-HC Project, temporary, minor cumulative impacts are possible, resulting in added compaction and erosion of soils. Where bridges are repaired, or new bridges are constructed, strict erosion and sediment controls are required by the state, and cumulative impacts will be minor and temporary.

In all potential projects, severe erosion is the single greatest impact to soils and geology, and if left unrepaired, erosion could migrate to a broader area, impacting surrounding soils (including sensitive and prime farmland soils) and water resources (such as streams and lakes) with increased sediment loads. Appropriate measures to avoid erosion (implementation of erosion and sediment controls) and repair erosion damage immediately will likely result in no impacts, or temporary and minor short-term cumulative impacts.

4.5 VEGETATION, INCLUDING WETLANDS AND SPECIAL STATUS PLANTS

Cumulative effects on vegetation would occur where vegetation is removed or disturbed, special status species are impacted, and invasive species are introduced. Vegetation in the analysis areas includes grassland (e.g., dry prairies, dry-mesic prairies), forest (e.g., southern dry forests, southern mesic forests), and other natural vegetation communities. As discussed in Section 3.3, direct and indirect impacts from the C-HC Project on vegetation, including vegetation communities, special status species, and invasive species, would be both short and long term and moderate, depending on the location and extent of the impact.

The projects listed in the cumulative action scenario would have similar impacts to vegetation as the C-HC Project. These present and reasonably foreseeable projects all would contribute to the modification of vegetation in the region. Because the precise project boundaries are not available for the cumulative action scenario, the cumulative impacts to each land cover class are not quantifiable. However, similar land cover classes are expected to occur in the vicinity of the projects listed in the cumulative action scenario as with the C-HC Project. Cumulative impacts would occur as a result of the removal, disturbance, and conversion of vegetation and plant communities, and the potential introduction of invasive species.

In conclusion, cumulative impacts to vegetation communities would be short and long term and moderate. Project proponents often implement BMPs to avoid and minimize direct impacts to special status species. However, the cumulative impacts on vegetation communities as a result of removal, alteration, and fragmentation would further reduce the availability of suitable habitat for special status species in the region. Cumulative impacts to invasive species would be short and long term, and moderate.
The cumulative impacts of disturbance to vegetation, creation of edges, and use of foreign vehicles or equipment transporting invasive species would contribute to a potential increase in those species.

4.6 WILDLIFE, INCLUDING SPECIAL STATUS SPECIES

Cumulative effects on wildlife occur when an action results in modification, degradation, or fragmentation of their habitat, or effects the natural processes that sustain them and their ability to feed, breed, and shelter. Habitat within the C-HC Project analysis area includes forested areas, grassland, wetlands, open water habitat, and streams. Additionally, there are both High and Low Potential Occurrence zones for rusty patched bumble bees and algific talus slopes that may be occupied by Iowa Pleistocene snails. As discussed in Section 3.4, direct and indirect impacts from the C-HC Project to wildlife would be both short and long term and moderate.

The projects listed in the cumulative action scenario would have similar impacts to wildlife as the C-HC Project: habitat removal, degradation, and fragmentation. The transmission line projects would pose a similar risk for avian collision as the C-HC Project. The wind energy generation projects would present additional risk of collision for bird and bat populations. These present and reasonably foreseeable projects would all contribute to the modification, degradation, and/or fragmentation of habitat in the area by converting undeveloped areas to developed areas, changing forested and shrubland land cover types to grassland, and loss of area to structure and ancillary facilities. The availability of unfragmented forested blocks would decrease. Construction of each project poses a risk of degrading wetland, open water, and stream habitat through siltation and erosion. An increase in capacity to Line 61 could result in greater impacts to wetland, open water, and stream habitat should a release occur.

In conclusion, cumulative impacts to wildlife would be long term and adverse. The cumulative scenario and the C-HC Project would result in an increase in grassland habitat through conversion of forested habitat, which is a moderate and long-term impact. Temporary, minor impacts to wetlands, open water, and stream habitat would likely occur during construction. Avian species would receive moderate, long-term impacts from the increased risk of collision with transmission lines and wind energy generation projects.

4.7 WATER RESOURCES AND QUALITY

Direct and indirect impacts from the C-HC Project would primarily be associated with construction activities. These impacts include 1) potential adverse impacts on water quality due to the effect of construction activities on discharges, 2) potential changes to water quantity because of diversion or use of water, and 3) impacts to floodplains due to fill associated with project footprints. The first two impacts are short term. The third impact is long term.

Cumulative effects on water resources and quality from projects listed in the cumulative action scenario would occur as a result of construction activities. Cumulative impacts to groundwater and surface water from potential sediment discharges from disturbed areas or hazardous materials would be minor and temporary. Industry BMPs would be implemented and Federal and state regulations would be followed, which are typically effective at minimizing these impacts to groundwater and surface waters. Where construction activities take place near to or across riparian areas, such as other transmission projects or the Nemadji Trail Energy Center, the removal of trees and grubbing within project footprints could cause increase in water temperatures until permanent vegetative cover is reestablished. Cumulative impacts to groundwater from dewatering activities for construction purposes would also be minor and temporary.

4.8 AIR QUALITY

Impacts to air quality from the C-HC Project would occur as a result of air pollutant emissions from equipment exhaust, vehicle exhaust from travel to and from the project site, and fugitive dust from soil disturbance during construction activities. Construction of the C-HC Project would result in temporary, localized air emissions. Operational emissions of criteria pollutants by the C-HC Project are expected to be negligible, as they are restricted to vehicular emissions from periodic maintenance.

Cumulative effects to air quality from projects listed in the cumulative action scenario would occur as a result of emissions from equipment exhaust, vehicle exhaust, facility operation, and fugitive dust during construction, operation, and maintenance. Other construction activities for the projects described above in the cumulative action scenario would also generate emissions, which, when considered cumulatively, would result in adverse impacts to air quality.

Emissions from operation of the C-HC Project would be similar for wind, solar, and other transmission projects in the region resulting in minor long-term effects to air quality. Transportation improvement projects could result in increased air emissions from traffic; however proposed transportation projects must demonstrate conformity with the State Implementation Plan; therefore, no cumulative air quality impacts are expected from the transportation improvement projects. Operational emissions from the pipelines and the Nemadji Trail Energy Center would contribute cumulatively to air quality impacts resulting in moderate long-term effects. In conclusion, cumulative impacts to air quality would be long-term and moderate. Additionally, GHG emissions from the construction, operation, and maintenance of projects in the region would result in a minor (relative to local, national, and/or global GHG emissions) increase in GHGs.

4.9 NOISE

Direct and indirect noise impacts from the C-HC Project would typically be localized, with noise levels associated with the construction and operation activities returning to ambient conditions within a relatively short distance. Similar noise impacts would occur as a result of construction activities for the Badger Hollow Solar Farm and potential overlapping transportation projects in Lafayette and Dubuque Counties. Cumulative minor noise impacts would occur in these localized areas but would be temporary.

Based on the relatively minimal nature of operational noise, ongoing cumulative effects would only occur for a short time during construction and during routine maintenance activities; there would be no long-term cumulative noise impacts.

4.10 TRANSPORTATION

Cumulative impacts to transportation facilities are not anticipated to be permanent, but rather temporary, occurring only during construction. As discussed in Section 3.8, direct and indirect impacts from the C-HC Project would be minor for roadways in the analysis area as traffic congestion on any one road segment is unlikely and roadway conditions would remain unchanged. In some cases, there may be a slight positive contribution to the improvements of roadways, which would enhance the functionality of the transportation network by reducing congestion and improving traffic flow. Similar impacts from the construction and operation of the Badger Hollow Solar Farm and construction of the transportation improvement projects within the analysis area would be expected on roadways. Cumulative impacts would be expected to be minor and temporary as projects in the area would not significantly change the transportation trends in the study area.

If the project is constructed simultaneously with another project presented in the cumulative action scenario, increased construction vehicle traffic could result in short-term, minor traffic impacts. Projects listed in the cumulative action scenario would be required to comply with all applicable roadway, airport, rail, and waterway authorities' management standards and policies during construction; therefore, cumulative potential effects are not anticipated to be significant.

4.11 CULTURAL AND HISTORIC RESOURCES

The construction and operation of the C-HC project could affect previously recorded and unknown cultural resources within the analysis area. These resources would be identified through the NHPA Section 106 procedures in consultation with the Iowa and Wisconsin SHPOs, RUS, the Utilities, and affected Tribal groups, among other stakeholders. The consultation would be completed prior to the start of construction activities. Associated with that effort, RUS and the Utilities would seek to avoid, minimize, or mitigate adverse impacts to any historic properties within the C-HC Project's analysis area.

Under the cumulative impact scenario, a number of regional projects could conceivably be facilitated by the construction of the project. While these projects vary widely in scope and impacts, the principal types of impacts that may have an effect on cultural resources would be the direct impact to historic properties or other cultural resources themselves, such as through demolition, fill, grading, blasting, subsurface excavation, and vibration; such impacts may impact the integrity of one or more elements needed to convey the significance of the historic property. Other impacts include the diminution of the integrity of setting and feeling through imposition of undesirable elements in the viewshed or environment of the historic property. All of the regional projects included within the cumulative impact scenario would have the potential to cause both general types of impacts to historic properties. Although it is not yet known whether any cultural resources are present within the areas where impacts from the projects listed in the cumulative impact scenario may occur, it may be assumed that potentially significant cultural resources could be identified in association with any of the regional projects identified within the cumulative impact scenario.

In cases where applicable laws protect cultural resources, these impacts to cultural resources from the projects listed in the cumulative impact scenario would be avoided, minimized, and mitigated.
For instance, where projects are directed, overseen, funded, partially funded, or permitted by a Federal agency, those projects would be subject to review under Section 106 of the NHPA. Similarly, any project

which involves a Federal agency and constitutes a major Federal action would involve a review of impacts to cultural resources under NEPA. In addition, any projects which receive a Wisconsin Public Services Commission certificate are reviewed by the Wisconsin Historical Society, providing some protection to resources that have been previously recorded within the Wisconsin Historic Preservation Database. Any historic structures that have been previously listed on the NRHP are also protected under Wisconsin statute. The same protection is not afforded to NRHP-listed structures in Iowa. Outside Federal and Wisconsin state actions, only human burial sites are generally universally protected. As such, if projects are privately funded and avoid any Federal or state permitting, protections on cultural resources would not necessarily be in place and these projects may have an adverse impact on cultural resources. As such, without understanding the specific regulatory environment of each of the projects listed in the cumulative impact scenario, a clear understanding of the potential to impact cultural resources is unknown but may be assumed to constitute a cumulative impact on cultural resources.

4.12 LAND USE, INCLUDING AGRICULTURE AND RECREATION

Cumulative effects to land use would occur where lands are converted from one use to another (i.e., undeveloped land is converted to utility infrastructure). Land in the analysis area is predominantly rural in nature and undeveloped. As discussed in Section 3.10, direct and indirect impacts from the C-HC Project on land use would be both short and long term and major, depending on the geographical location of the impact.

The projects listed in the cumulative action scenario would have similar impacts to land cover, agricultural lands, recreational areas, and natural areas as the C-HC Project. These present and reasonably foreseeable projects would all contribute to the modification of land cover in the area by converting undeveloped areas to developed areas, changing forested and shrubland land cover types to grassland, and contributing to the loss of area to structure and ancillary facilities. Cumulative impacts would occur to agricultural lands, and the increase in transmission line ROWs across these lands would impact operation and productivity of farmland. Recreational settings and experiences would be altered and recreational opportunities in undeveloped landscapes would become more limited as more transmission line ROWs are built within the area. Cumulative impacts would also occur to natural areas because when more transmission line ROWs exist in the area, the areas available for conservation are smaller and more limited.

In conclusion, cumulative impacts to land use, including agriculture and recreation, would be long term and moderate. Previous land uses would be expected to change with parts of the region to be compatible with projects listed in the cumulative action scenario. A moderate portion of the agricultural lands within the region may be used for purposes other than agriculture, although agricultural uses would be compatible with several of the projects listed in the cumulative scenario. For recreation, the visitor experiences would be slightly changed near specific projects, but recreational experiences would still be available in the region.

4.13 VISUAL QUALITY AND AESTHETICS

For the C-HC Project, alternatives were sited wherever possible to follow existing linear infrastructure to mitigate visual impacts in sensitive areas. All alternatives cross the Mississippi River near Cassville, Wisconsin, and all alternatives would be visible from the Ice Age National Scenic Trail and the Great River Road. Cumulative visual effects would result from the incremental modification of the landscape's scenic quality because disruptions to sensitive viewsheds would result from the construction, operation, and maintenance of the C-HC Project, in combination with other past, present, and reasonably foreseeable future actions presented in Section 4.3.

Present and ongoing activities that alter the landscape include agricultural activities (mainly crop production and livestock grazing) and operation of existing power lines. Residential and industrial developments, dirt surface roads and paved roads have all contributed to changes to the existing scenic quality and landscape in the area. Landscapes within the project area vary based on location but primarily comprise a mosaic of agricultural fields, rural homesteads, and developed towns. Across the project area, rural homesteads and towns are the most common interruption to the landscape. The western portion of the project area intersects the Mississippi River.

Reasonably foreseeable future developments in the C-HC Project vicinity also have the potential to result in cumulative effects on visual resources. Reasonably foreseeable future actions that are likely to have direct cumulative effects to visual resources along the proposed C-HC Project alternative routes include development of new transmission lines and substations, development of renewable energy generation facilities, pipeline construction, and multiple transportation improvements. These developments, when added to the direct effects of the proposed C-HC Project, would incrementally convert the scenic quality of the natural landscapes into a more developed and industrialized landscape that would adversely affect scenery, and sensitive viewers over time.

Due to the energy projects listed in the cumulative action scenario and similar energy projects also likely to be developed in the region, it is likely that additional electrical infrastructure (transmission and distribution lines and substations) would be built in the future. Standard transmission siting practices state that when siting a new transmission line, efforts should be made to parallel existing linear features. If, at some time in the future, an additional transmission line is proposed within the project area, it is likely that the current project would be seen as an opportunity site for the construction of additional transmission features. Since characteristics of the landscape have previously changed and will continue to change over time, all action alternatives would contribute to long-term, moderate cumulative impacts to visual resources.

4.14 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

Cumulative effects to socioeconomics would occur where existing or reasonably foreseeable future transmission lines or construction activities could affect population, housing, employment and income, tourism, and property values. As discussed in Section 3.12.2, the direct and indirect impacts from the C-HC Project on socioeconomics would be both short and long term and moderate.

The projects listed in the cumulative action scenario would have similar impacts to socioeconomics as the C-HC Project. These present and reasonably foreseeable future projects would all have negligible impacts on population and housing for similar reasons to those discussed in Section 3.12.2. Employment and income impacts from present and reasonably foreseeable future projects would be minor, beneficial, and both short and long term for similar reasons to those discussed in Section 3.12.2. Impacts on tourism from present and reasonably foreseeable future projects would be site-specific to the projects, and would be minor, negative, and both short and long term for similar reasons to those discussed in Section 3.12.2. Impacts to property values from the present and reasonably foreseeable future projects would be similar to impacts typically experienced by property abutting industrial developments. These impacts would be similar to, and as variable as, the potential impacts to property values discussed in Section 3.12.2.

In conclusion, cumulative impacts to socioeconomics, including population, housing, employment and income, tourism, and property values would be both short and long term and moderate. Because all action alternatives would have a minor and short-term impact on population and housing, the cumulative impact on population and housing is expected to be minor and short term. Because of the relatively small increases in employment, income, and state and local tax revenue resulting from project spending, the cumulative impact to employment, income, and state and local tax revenue would be minor, beneficial, and short term. Because of the relatively small acreage of disturbance within the analysis area, the cumulative impacts on agriculture would be minor, negative, and long term. Because the action alternatives would only affect the specific tourist destinations intersected by the C-HC Project, the cumulative impacts on tourism would be minor, negative, and long term. Because potential impacts on property values would be site-specific and would not intersect the present and reasonably foreseeable projects, they are not expected to cumulatively affect each other. Because none of the action alternatives would have environmental justice impacts, there would be no cumulative impacts on environmental justice.

4.15 PUBLIC HEALTH AND SAFETY

Cumulative effects to public health and safety would occur where existing or reasonably foreseeable future transmission lines or construction activities could affect public or worker health and safety through EMF, risk of fire, workplace injury, or potential release of solid, hazardous, or toxic materials or waste. As discussed in Section 3.13.2, the direct and indirect impacts from the C-HC Project on public health and safety would be long term and minor.

The projects listed in the cumulative action scenario would have similar impacts to public health and safety as the C-HC Project. These present and reasonably foreseeable future projects would all contribute to the risk of public and worker health and safety impacts resulting from construction and operation activities as follows:

- The EMF levels from existing transmission lines are expected to be within the levels discussed in Section 3.13.1.
- The risk of fire from existing and reasonably foreseeable future projects, as well as severe weather, is expected to be the same as discussed in Sections 3.13.1 and 3.13.2.
- Workplace injuries in the construction industry for existing and reasonably foreseeable future projects are expected to be similar to industry averages, as discussed in Section 3.13.1.

Existing and reasonably foreseeable future projects must comply with applicable Federal and state laws and regulations regarding the storage, transport, generation, and disposal of solid, hazardous, and toxic materials and waste.

In conclusion, cumulative impacts to public health and safety, including risk of fire, worker safety, and solid, hazardous, and toxic materials and waste, would be long term and minor. Because all action alternatives would implement applicable BMPs, the cumulative impact on public and worker health and safety related to risk of fire and severe weather hazards would be long term and minor. Because construction safety requirements would meet the OSHA standards and site-specific occupational safety measures would be developed as needed under all action alternatives, the cumulative impact on worker safety would be long term and minor. Because all action alternatives would comply with applicable solid, hazardous, and toxic materials and waste handling, storage, and disposal requirements under Federal and state laws and regulations, the cumulative impact on public and worker health and safety related to solid, hazardous, and toxic materials and waste would be long term and minor.

In regard to EMF, additional sources of EMF in the analysis area would not combine to create greater levels of EMF, but would create additional, discrete locations of EMF. In other words, each additional source would create a certain level of EMF, but that level would not be increased when added to other sources of EMF nearby. Because the levels of EMF created by the proposed project would be relatively low when compared to the recommended public and occupational exposure guidelines, the cumulative impact from EMF under all alternatives would be minor and long term.

4.16 UPPER MISSISSIPPI RIVER NATIONAL WILDLIFE AND FISH REFUGE

As discussed in Section 3.14, the C-HC Project would have major impacts to resources within the Refuge as a result of short-term construction and long-term maintenance of the transmission line.

One of the projects listed in the cumulative action scenario would involve Refuge lands: the forest restoration project along Turkey River bottoms. This restoration project would have long-term beneficial effects to resources within the Refuge. Three of the alternatives (Alternatives 1, 5, and 6) as part of the C-HC Project would cross the Refuge at the same place and would intersect the forest restoration project area. These alternatives that would intersect the restoration area would offset or negate some of the beneficial cumulative impacts of the forest restoration project. As discussed in Section 3.3 and 4.5, direct and indirect impacts from the C-HC Project on vegetation, including vegetation communities, special status species, and invasive species, would be both short and long term and moderate, depending on the location and extent of the impact. Cumulative impacts would occur because of the removal, disturbance, and conversion of vegetation and plant communities, and the potential introduction of invasive species from the C-HC Project that would intersect the forest restoration project area. These cumulative impacts would be short and long term and moderate.

However, the other three alternatives (Alternative 2, 3, and 4) would avoid the forest restoration project area; therefore, trees planted as part of the Refuge's forest restoration effort would not be affected.

No other permits or projects have been identified for the portion of the Refuge where the C-HC Project would occur. Any future projects or permitted activities that would involve crossing Refuge lands could have cumulative adverse impacts to the Refuge if they adversely impact soils, vegetation, wildlife, land use, or visual quality and aesthetics.

4.17 UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are effects that cannot be avoided due to constraints in the proposed alternatives. These effects do not have to be avoided by a project, but they are required by NEPA to be disclosed, discussed, and mitigated, if possible (40 CFR 1500.2(e)).

Most potentially adverse impacts that have been described in previous sections of this document can be avoided or minimized by selecting an alternative or alignment option that avoids or minimizes impacts on environmental resources through refinement of the alignment, or through incorporation of mitigation measures. The unavoidable adverse impacts identified for this project, which have been addressed in previous sections, are reiterated here.

4.17.1 Wetlands

The construction phase of the project would create unavoidable impacts to wetlands by the disturbance and/or destruction of these resources from construction-related activities (e.g., dewatering, filling). The operations and maintenance phase of the project would not create additional unavoidable impacts to wetlands, but in some cases the impacts from the construction phase would be sustained through the life of the project, and in other cases the impacts from the construction phase would be mitigated. The degree of adverse impacts to wetlands would vary based on the alternative selected and mitigation measures implemented. Mitigation measures could include returning the disturbed land to preconstruction condition, and/or compensatory mitigation banking.

4.17.2 Floodplains

The construction phase of the project would create unavoidable impacts to water resources, and specifically to floodplains, by the disturbance and/or destruction of these resources from construction-related activities (e.g., dewatering, filling). The operations and maintenance phase of the project would not create additional unavoidable impacts to floodplains, but in some cases the impacts from the construction phase would be sustained through the life of the project, and in other cases the impacts from the construction phase would be mitigated. The degree of adverse impacts to floodplains would vary based on the alternative selected and mitigation measures implemented. Mitigation measures could include returning the disturbed land to preconstruction condition.

4.17.3 Air Quality and Noise

The construction phase of the project would create unavoidable impacts from air emissions, noise, and vibration due to the use and deployment of equipment, machinery, vehicles, and manpower.
The operations and maintenance phase of the project would also create unavoidable impacts from air emissions from vehicles and noise due to corona activity along the transmission line (a crackling or humming sound) and periodic maintenance activities along the transmission line route. The degree of adverse impacts from noise would vary based on the distance from the noise source to the receptor, and whether mitigation to abate that noise source was implemented.

4.17.4 Cultural and Historic Resources

In the event that cultural and/or historical resources were encountered during the construction of the proposed project, then the construction phase of the project could create unavoidable impacts to the resource encountered due to the unintended disturbance and potential destruction of that resource.
The operations and maintenance phase of the project would not create additional unavoidable impacts to cultural and historical resources but would sustain the impacts from the construction phase through the life of the project, with unknown potential for returning the impacted resource to its preconstruction condition at the end of the life of the project. The degree of adverse impacts to cultural and historical resources would vary based on potential discoveries in the field (i.e., they are unanticipated and unknown at this time), and whether mitigation to stop the disturbance at the time of discovery was implemented.

4.17.5 Land Use, including Agriculture and Recreation

The construction phase of the project would create unavoidable impacts to land use due to the removal and reallocation of land from its current use (e.g., agricultural, recreational, undeveloped, wildlife habitat) to use as a transmission line ROW or support structure or facility. The operations and maintenance phase of the project would not create additional unavoidable impacts to land use but would sustain the impacts from the construction phase through the life of the project, with potential for returning portions of the recently disturbed land to its preconstruction use for agriculture, recreation, and wildlife habitat.
The degree of adverse impacts to land use would vary based on the alternative selected, and whether mitigation to return the disturbed land to preconstruction condition was implemented (both at the end of construction, and again at the end of the project life).

4.17.6 Visual Quality and Aesthetics

The construction phase of the project would create unavoidable impacts to visual quality and aesthetics (visual resources) due to the permanent alteration of the viewshed to a transmission line ROW or substation. It should be noted, however, that a large portion of each project alternative includes a transmission line route that is already operating as a transmission line ROW or support structure or facility. The operations and maintenance phase of the project would not create additional unavoidable impacts to visual resources but would sustain the impacts from the construction phase through the life of the project. The degree of adverse impacts to visual resources would vary based on the alternative selected, and the viewshed from sensitive receptors.

4.17.7 Short-Term Uses and Long-Term Productivity

NEPA requires that an EIS include a discussion of the relationship between short-term uses of the human environment and the maintenance and enhancement of long-term productivity (42 U.S.C. 4332(C)(iv)) (see also 40 CFR 1502.16). This section discusses whether construction and operation of the proposed project could cause short-term uses of the environment that would affect, either positively or negatively, the long-term productivity of the environment.

For the purposes of this discussion, “short term” generally refers to the more immediate period of time during which the proposed project would be constructed, whereas “long term” refers to an indefinite period beyond this timeframe.

Short-term uses of the environment associated with the proposed alternatives are described for each environmental resource analyzed in Chapter 3, to include the intended use and resultant potential impacts. These impacts include both temporary and permanent “use” of the physical environment as a result of constructing and operating the proposed project.

In considering the effect of these uses on long-term productivity, four types of long-term productivity were identified as being affected: land use and soils; vegetation and wildlife, including wetlands and special status species; water resources, including floodplains; and economics.

4.17.8 Land Use and Soils

Construction of the project would not affect geology but would affect productivity of both land and soils through clearing, grading, and occupation by project facilities. At tower and substation sites and along access roads, project construction would have a long-term effect on land and soil productivity since these lands and their associated soils would be taken out of use for the life of the project or longer if facilities are abandoned and not restored. In areas between tower and substation sites and outside of access roads, the proposed project would not be expected to affect long-term land and soil productivity since these areas would be restored, either actively or naturally, to general pre-project conditions, and the lands and soils in these areas could be put to other uses in the long term.

4.17.9 Vegetation and Wildlife, including Wetlands and Special Status Species

Plant communities, fish, and wildlife contribute to biological productivity; their long-term productivity provides an ecological and recreational benefit in sensitive or remote areas. Project construction would affect both biological resources and wetland resources through land clearing, grading, erosion and sedimentation, and occupation by project components.

After construction, natural recovery and restoration would take place in some areas but in others, terrestrial and aquatic habitat would be permanently lost, altered, and/or fragmented. Also, trees and shrubs within the right-of-way would not be permitted to grow beyond allowable limits during the life of the project.

4.17.10 Water Resources, including Floodplains

Construction of the project would affect water resources (e.g., rivers, floodplains) through land clearing, grading, filling, and occupation by project facilities. Water bodies and floodplains would lose some productivity in the short term from construction-related pollutants, sedimentation, and erosion. In areas between tower and substation sites and outside of access roads, the project would not affect long-term floodplain or groundwater productivity since those areas would be either restored as a mitigation measure or through natural recovery, to similar pre-project conditions.

4.17.11 Economics

Transmission line construction and operation could affect the economic productivity of some resources by limiting their long-term revenue potential (e.g., agricultural land such as tree farms and orchards), but could also contribute to long-term revenue potential in other sectors that benefit from a reliable transmission system (e.g., expanding businesses and attracting new businesses to the region).

4.18 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An irreversible or irretrievable commitment of resources refers to impacts to or losses of resources that cannot be recovered or reversed as a result of the proposed project. Examples include permanent conversion of wetlands and loss of cultural resources, soils, wildlife, agricultural production, or socioeconomic conditions.

Irreversible is a term that describes the loss of future options. It applies primarily to the impacts of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over long periods of time.

Irretrievable is a term that applies to the loss of production, harvest, or use of natural resources for a period of time (whether long or short). For example, if farmland is used for a non-agricultural event, some or all of the agricultural production from an area of farmland is lost irretrievably while the area is temporarily used for another purpose. The production lost is irretrievable, but the action is not irreversible.

The following is a list of the anticipated potential irreversible and irretrievable commitment of resources to be experienced over the life of the C-HC Project:

- Water—consumption of water for dust control, equipment washdown, cleanup during construction
- Wetlands and floodplains—destruction of wetlands and floodplains during construction of transmission line support structures
- Biological resources—destruction of vegetation and wildlife habitat (both terrestrial and aquatic) during construction
- Land use and ownership—consumption of land for transmission line ROW, support facilities, and access roads
- Construction materials and labor—consumption of non-recyclable building materials such as concrete, steel, wiring, etc., and the human effort to plan, construct, and operate the phases of the proposed project

- Energy resources—consumption of fossil fuels such as gas, oil, and diesel fuel by construction equipment and employee vehicles
- Visual resources—alteration to the viewshed by clearing land, cutting and filling, and constructing transmission line structures
- Financial resources—permanent loss of the cost to implement the proposed project

CHAPTER 5. COORDINATION AND CONSULTATION

5.1 COORDINATION WITH COOPERATING AGENCIES

As defined by CEQ regulations, a cooperating agency, or cooperator, is an agency (other than the lead agency) that has special expertise with respect to an environmental issue and/or has jurisdiction by law. Federal, state, and local agencies that have clear jurisdiction over portions of the C-HC Project were invited to become a cooperator in preparation of the EIS. The role of a cooperator is to participate in the process and provide leadership, expertise, guidance, and review, as well as to offer information related to the agency's authority. The USACE, USFWS, and USEPA accepted invitations to serve as cooperating agencies during preparation of the EIS. The USFWS will evaluate the Utilities' request for a ROW easement and a Special Use Permit to cross the Refuge. The USACE will review a ROW request as well as permit applications and requests for permission by the Utilities, as required by Section 10 and Section 408 of the Rivers and Harbors Act and Section 404 under the CWA. The USFWS will complete Section 7 consultation under the Endangered Species Act, which is discussed in further detail in Section 5.4. More information about the decisions to be made by the USFWS and USACE is provided in Chapter 1. The USEPA will provide project-related input on impact assessment methodologies; participate in coordination meetings, webinars/conference calls, and field visits; and provide comments on preliminary information developed for the EIS, including the administrative draft of the Draft EIS. The NPS was invited but did not accept the invitation to serve as a cooperating agency.

An initial cooperating agency meeting was held on September 21, 2016, in Marquette, Iowa. RUS and the cooperating agencies met frequently during the development of the DEIS. Monthly project status update calls were held throughout the NEPA process as well as additional meetings and calls as necessary. Cooperating agencies were provided opportunities to review and comment on the administrative draft scoping report, biological assessment, cultural resource reports, and chapters of the DEIS. Cooperating agencies also informed the proposed analysis approach for the EIS and helped identify key observation points for the visual simulations presented in Chapter 3.

5.2 COORDINATION WITH OTHER AGENCIES

On October 14, 2016, a letter was sent to 38 Federal and state agencies inviting them to participate in public and agency scoping meetings. Agency scoping meetings were held to provide updates and answer questions about the C-HC Project. Iowa agencies were invited to attend a meeting in Peosta, Iowa, on October 31, 2016. Wisconsin agencies were invited to attend a meeting in Middleton, Wisconsin, on November 3, 2016. Table 5.2-1 lists those agencies that attended the meetings in October and November 2016.

Table 5.2-1. Agencies that Attended the Agency Scoping Meetings

Agencies Represented at Peosta, Iowa Meeting October 31, 2016	Agencies Represented at Middleton, Wisconsin Meeting November 3, 2016
Iowa State Historic Preservation Office	Federal Aviation Administration
U.S. Fish and Wildlife Service	Wisconsin Department of Transportation
U.S. Army Corps of Engineers	Wisconsin Public Service Commission
Iowa Utilities Board	Wisconsin Department of Natural Resources
	Wisconsin Department of Agriculture, Trade, and Consumer Protection
	National Park Service
	U.S. Army Corps of Engineers

RUS also coordinated with the Public Service Commission of Wisconsin throughout the development of the DEIS. Meetings and conference calls between RUS and PSCW were held periodically to discuss the status of each agencies' environmental review process and to share pertinent information about the C-HC Project.

RUS met with NPS staff responsible for managing the Ice Age Scenic Trail on June 12, 2017, and February 5, 2018. These meetings were held to discuss concerns about the proximity of the C-HC Project to the Trail and Cross Plains Complex as well as to review the visual simulations prepared for the C-HC Project segments that were proposed near the trail.

On June 14, 2017, RUS met with the Dubuque City Manager and other staff to review the alternatives considered for crossing the Mississippi River.

5.3 COORDINATION WITH TRIBES

RUS contacted federally recognized tribes on three different occasions during the development of the DEIS for the C-HC Project. Appendix B provides lists of the tribes contacted on each occasion.

On October 17, 2016, RUS mailed the first round of letters to 26 tribes announcing the public scoping period and public meetings held in October and November for the NEPA process.

On November 17, 2016, RUS mailed the second round of letters to 26 tribes announcing the addition of two more public scoping meetings held in December in the proposed project area.

On September 28, 2017, RUS mailed the third round of letters to 57 tribes initiating the Section 106 process and soliciting information about any specific historic properties or important tribal resources in the area of potential effects.

5.4 FORMAL CONSULTATION

RUS is required to prepare the EIS in coordination with any studies or analyses that are required under the ESA (16 USC 1531 et seq.) and the NHPA, as amended (54 U.S.C. 300101 et seq.)

5.4.1 Section 7 of the Endangered Species Act

Section 7 of the ESA requires Federal agencies to ensure that their actions do not jeopardize the continued existence of threatened or endangered species or result in the destruction of their designated critical habitat. It may also require consultation with the USFWS in making this determination.

A letter from SWCA, sent on behalf of RUS, to USFWS was sent on October 23, 2017, requesting technical assistance for the DEIS. USFWS provided comments on the Administrative Draft Biological Assessment, submitted by the Utilities, on January 5, 2018. These comments provided recommendations on specific species that may be potentially affected by the C-HC Project as well as suggested mitigation measures. RUS formally submitted the Draft BA to USFWS on November 3, 2018. Consultation with USFWS is ongoing.

5.4.2 Section 106 of the National Historic Preservation Act

Section 106 of the NHPA requires Federal agencies to consider the effects of their actions on historic properties (including archaeological sites) that are listed, or are considered eligible for listing, on the NRHP (a historic property is an eligible site). In so doing, the lead agency must consult with Native

American tribes, the Advisory Council on Historic Preservation, interested members of the public, and appropriate State Historic Preservation Offices (SHPOs). The ultimate goal of consultation is to identify and resolve any adverse effects of an undertaking on historic properties.

RUS plans to initiate consultation with the Iowa and Wisconsin SHPOs during the public review period for the DEIS.

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CHAPTER 6. LIST OF PREPARERS

6.1 INDIVIDUALS AND ORGANIZATIONS

This DEIS was prepared and reviewed by a team from RUS, USFWS, USACE, and USEPA. A team associated with SWCA assisted the RUS in conducting research, gathering data, and preparing the DEIS and supporting documents. Table 6.1-1 identifies the team members and their roles.

Table 6.1-1. List of Preparers and Reviewers

Agency/Firm	Name	Title/Document Role
USDA Rural Utilities Service		
RUS	Dennis Rankin	Agency Co-Project Manager
RUS	Lauren Cusick	Agency Co-Project Manager
RUS	Joe Dorava	Wisconsin State Office
RUS	Ken Solano	Project Engineer
RUS	Emily Flanigan	Project Engineer
RUS	Colin Waddell	Project Engineer
RUS	Erika Martin Siebert	Federal Preservation Officer
U.S. Environmental Protection Agency		
USEPA, Region 5	Ken Westlake	Chief, NEPA Implementation Section
USEPA, Region 5	Kathleen Kowal	NEPA Reviewer
USEPA, Region 7	Amber Tilley	NEPA Reviewer
U.S. Army Corps of Engineers		
USACE, Rock Island Planning Div.	Wendy Frohlich	Biologist
USACE, Rock Island Real Estate	Jeff Nelson	Realty Specialist
USACE, Mississippi River Project	Joseph Lundh	Supervisory Natural Resource Specialist
USACE, Rock Island EMS	Paul St. Louis	Section 408 Program Manager
USACE, St. Paul District	Kerrie Hauser	Regulatory Project Manager
U.S. Fish and Wildlife Service		
USFWS, Upper Mississippi River National Wildlife and Fish Refuge (Refuge)	Tim Yager	Deputy Refuge Manager
USFWS, Refuge	Brandon Jones	McGregor District Manager
USFWS, Refuge	Wendy Woyczik	McGregor District Deputy Manager
USFWS, Minnesota-Wisconsin Field Office	Andrew Horton	Biologist
Contractor Team		
SWCA	Joseph J. Fluder III	CEO, project principal, senior reviewer
SWCA	Coleman Burnett	Senior project manager, environmental planner/senior project manager, lead author
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CHAPTER 8. DISTRIBUTION LIST

In addition to the RUS website, electronic copies (via CD) of the draft EIS will be available for public viewing in the 14 locations listed in Table 8.1-1.

Table 8.1-1. Public Locations Where the Environmental Impact Statement Will Be Distributed

Library	Address
Allen-Dietzman Public Library	220 W. Barber Avenue, Livingston, WI 53554
Barneveld Public Library	107 W. Orbison Street, Barneveld, WI 53507
Dodgeville Public Library	139 S. Iowa Street, Dodgeville, WI 53533
Dubuque County Library, Asbury Branch	5290 Grand Meadow Drive, Asbury, IA 52002
Eckstein Memorial Library	1034 E. Dewey Street, Cassville, WI 53806
Guttenberg Public Library	603 S. 2nd Street, Guttenberg, IA 52052
Middleton Public Library	7425 Hubbard Avenue, Middleton, WI 53562
Montfort Public Library	102 E. Park Street, Montfort, WI 53569
Mount Horeb Public Library	105 Perimeter Road, Mount Horeb, WI 53572
Platteville Public Library	65 S. Elm Street, Platteville, WI 53818
Potosi Branch Library	103 N. Main Street, Potosi, WI 53820
Rosemary Garfoot Public Library	2107 Julius Street, Cross Plains, WI 53528
Schreiner Memorial Library	113 W. Elm Street, Lancaster, WI 53813
USFWS McGregor District Office	470 Cliff Haven Road, Prairie du Chien, WI 53821

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CHAPTER 9. GLOSSARY

Algific talus slopes—Algific talus slopes are rare, fragile soil formations and habitat that exist on north-facing slopes of ridges and canyons in the "Driftless Area" of Wisconsin and Iowa.

Aquifer—An underground body of porous materials, such as sand, gravel, or fractured rock, filled with water and capable of yielding useful quantities of water to a well or spring.

Auger—Any sort of various tools or devices with a helical shaft or part that is used for boring holes (as in wood, soil, or ice) or moving loose material (such as snow).

A-weighted decibel (dBA)—A logarithmic unit of sound measurement based on an A-weighted scale, commonly used for measuring environmental and industrial noise levels.

Borings—The drilling of a hole, tunnel, or well in the earth.

Bus—Also referred to as a "node" or a "station" or a "substation." A common connection point for two or more electrical components, such as a transformer, a generator.

Capacity—A measure of the ability of a transmission line, groups of transmission lines (path), or a transmission system to carry electricity; the maximum load that a generator, piece of equipment, substation, transmission line or system can carry for a given period of time without exceeding approved limits of temperature or stress.

Centerline—A line on a map or flagged on the ground that indicates the location of a linear feature such as a road or a transmission line. The linear feature is further defined by its total width, either for construction or operation, which is bisected into two equal parts by the centerline.

Certificate—A type of permit for public convenience and necessity issued by a utility commission, which authorizes a utility or regulated company to engage in business, construct facilities, provide some services, or abandon service.

Certificate of Public Convenience and Necessity (CPCN)—A CPCN or certificate of public convenience is a type of regulatory compliance certification for public service industries.

Circuit—An electrical device that provides a path for electrical current to flow, or along which an electrical current can be carried. In the case of high-voltage transmission, a set of wires energized at transmission voltages extending beyond a substation which has its own protection zone and set of breakers for isolation.

Circuit breaker—A device designed to open and close an electrical circuit.

Conductor—The wire cable strung along a transmission line through which electricity flows.

Corona noise—The discharge of energy from an energized transmission line that occurs when the voltage gradient exceeds the breakdown strength of air. Corona occurs in regions of high electric field strength on conductors, insulators, and hardware when sufficient energy is imparted to charged particles to cause ionization (molecular breakdown) of the air.

Corridor—A continuous strip of land, of defined width, through which a linear utility route (or routes) passes.

Current—The amount of electrical charge flowing through a conductor (as compared to voltage, which is the force that drives the electrical charge), which is measured in amperes or amps.

Dead-end structures—Transmission line tower structures that are more robust than tangent structures used 1) to add longitudinal strength to the line; 2) at turning points (angles); 3) for added safety at crossings of other utilities (e.g., other transmission lines and roads); and 4) to interrupt long distances of suspension structures that would otherwise provide more exposure to catastrophic line failure over long distances.

Demand—1) The rate at which electric energy is delivered to or by a system or part of a system, generally expressed in kilowatts or megawatts, at a given instant or averaged over any designated interval of time; 2) the rate at which energy is being used by the customer.

Demand response—"Changes in electric use by demand-side resources [consumers] from their normal consumption patterns in response to changes in the price of electricity, or to incentive payments designed to induce lower electricity use at times of high wholesale market process or when system reliability is jeopardized" as defined by FERC.

Distribution line—The structures, insulators, conductors, and other equipment used to deliver electricity directly to the customer, including commercial facilities, small factories, or residences.

Double-circuit transmission line—A transmission line composed of six electrical phases (two independent circuits of three phases each) and two lightning protection shield wires. One of the lightning protection shield wires is a steel overhead ground wire (OHGW), and the other is an optical ground wire (OPGW).

Easement—A grant of certain rights to the use of a piece of land. A grant of easement across a private parcel for a transmission line typically includes the right to enter the easement area to build, maintain, and repair transmission facilities, including access roads. Permission for these activities is included in the negotiation process for acquiring easements over private land. The land itself remains in private ownership.

Electric and magnetic fields (EMF)—Fields describing properties of a location or point in space and its electrical environment, including the forces that would be experienced by a charged body in that space by virtue of its charge or the movement of charges. The voltage, which is the "pressure," produces an electric field that moves the electricity through wires. The current produces a magnetic field, which is a measure of how much electricity is flowing. Thus, wherever there is electric current flowing (including through any type of wiring), there is both an electric and a magnetic field.

Erosion—The wearing away of land surface by wind or water that occurs naturally from weather or runoff but can be intensified by land-clearing practices related to such activities as farming, residential or industrial development, road building, or timber-cutting.

Federal Energy Regulatory Commission (FERC)—The independent agency that regulates the interstate transmission of natural gas, oil, and electricity.

Franchise—The authorization of the Iowa Utilities Board (IUB) for the construction, erection, maintenance, and operation of an electric transmission line.

Generation—The act of converting various forms of energy input (thermal, mechanical, chemical, and/or nuclear energy) into electric power. Also, the amount of electric energy produced, usually expressed in kilowatt hours (kWh) or megawatt hours (MWh).

Grid—A transmission grid is a network of high-voltage, long-distance transmission lines and substations that connect generating facilities to distribution systems.

Hazard tree—Hazard trees include dead or dying trees, dead parts of live trees, or unstable live trees (due to structural defects or other factors) that are within striking distance of people or property (a target). Hazard trees have the potential to cause property damage, personal injury, or fatality in the event of a failure.

High voltage—Lines with 230 kV or above electrical capacity.

Insulator—A component of the hardware assembly at either a suspension or dead-end transmission line structure made of a non-conducting material, such as ceramic or fiberglass, generally bell-shaped; connects the conductor to the suspension structure and is used to keep electrical circuits from jumping over to ground.

Interconnection—Two or more electric systems having a common transmission line that permits a flow of energy between them. The physical connection of the electric power transmission facilities allows for the sale or exchange of energy.

Invasive species—A species that is not native to the habitat under consideration and whose introduction causes, or is likely to cause, economic or environmental harm (Executive Order 13112). Invasive plants are typically adaptable, aggressive, and have a high reproductive capacity.

Karst—Landscape created where water dissolves the limestone and dolomite rocks. The rocks are dissolved primarily along fractures which create caves and conduits for groundwater flow. Karst landscapes typically have deep bedrock fractures, sinkholes, and springs.

Key observation points (KOPs)—Viewing locations chosen to be generally representative of visually sensitive areas where it can be assumed that viewers may be affected by a change in the landscape setting from a proposed project. Views from KOPs are described by distance zones and are based on perception thresholds (changes in form, line, color, and texture).

Laydown yard—See staging area.

Line losses—Energy consumed by the conductor generating heat during transport of power through each line; a function of load, circuit length, conductor size, and electrical "resistance."

Load—The amount of electric power or energy delivered or required at any specified point or points on a system. Load originates primarily at the energy-consuming equipment of customers.

Load-serving—Secures energy and transmission service to serve the electrical demand and energy requirements of its end-use customers

Loess—An unstratified silt, usually buff to yellowish brown loamy deposit; found in North America, Europe, and Asia; believed to be chiefly deposited by the wind.

Megawatts (MW)—A megawatt is 1 million watts, or 1,000 kilowatts; an electrical unit of power.

Midcontinent Independent System Operator, Inc. (MISO)—MISO operates the transmission system and a centrally dispatched market in portions of 15 states in the Midwest and the South, extending from Michigan and Indiana to Montana and from the Canadian border to the southern extremes of Louisiana and Mississippi.

Midwest Reliability Organization (MRO)—In 2007, FERC approved agreements by which NERC delegates its authority to monitor and enforce compliance to Regional Entities established across North America, of which MRO is one. MRO’s primary responsibilities are to: ensure compliance with mandatory Reliability Standards by entities who own, operate, or use the interconnected, international bulk power system (BPS); conduct assessments of the grid's ability to meet electricity demand in the region; and analyze regional system events.

MISO Transmission Expansion Plan (MTEP)—A electric infrastructure plan developed annually by MISO to evaluate various types of transmission projects that ensure reliable operation of the transmission system; support achievement of state and Federal energy policy requirements; and enable a competitive electricity market to benefit all customers. More information about the MTEP process can be found here: https://www.misoenergy.org/planning/transmission-studies-and-reports/#nt=/report-study-analysistype:MTEP.

Monopole—A single self-supporting vertical pole with no guywire anchors, usually consisting of a metal or a wooden pole with below-grade foundations.

Multi-value projects (MVP)—Multi-value projects are a group of projects approved by MISO based on planning analysis showing that they provide multiple benefits (economic, reliability, and public policy) to the region.

National Landcover Database (NLCD)—NLCD is a land cover database for the nation that provides spatial reference and descriptive data for characteristics of the land surface, such as thematic class (for example, urban, agriculture, and forest), percent impervious surface, and percent tree canopy cover. NLCD is used for a variety of Federal, state, local, and nongovernmental applications to assess ecosystem status and health, understand the spatial patterns of biodiversity, predict effects of climate change, and develop land management policy.

Natural Resources Conservation Service (NRCS)—Formerly known as the Soil Conservation Service (SCS), the NRCS is an agency of the United States Department of Agriculture (USDA) that provides technical assistance to farmers and other private landowners and managers.

Network—A system of interconnected lines and electrical equipment.

Noise sensitive receptors—Defined as locations where people reside or where the presence of unwanted sound may adversely affect the existing land use. Typically, noise-sensitive land uses include residences, hospitals, places of worship, libraries, performance spaces, offices, and schools, as well as nature and wildlife preserves, recreational areas, and parks.

North American Electric Reliability Corporation (NERC)—A not-for-profit company formed by the electric utility industry in 1968 to promote the reliability of the electricity supply in North America. NERC consists of nine Regional Reliability Councils and one Affiliate whose members account for virtually all the electricity supplied in the United States, Canada, and a portion of Mexico.

Noxious weed—A legal term, meaning any plant officially designated by a federal, state, or local agency as generally possessing one of more of the following characteristics: aggressive and difficult to manage; parasitic; a carrier or host of serious insects or disease; or non-native, new, or not common to the United States.

Operating guides—Procedures carried out by transmission operators when certain events occur on the system that may compromise system reliability if no action is taken.

Ordinary high-water mark (OHWM)—The ordinary high-water mark defines the boundaries of aquatic features for a variety of federal, state, and local regulatory purposes.

Outage—The unavailability of electrical equipment; could be planned for maintenance of unplanned (forced) by weather or equipment failures.

Overload—Occurs when power flowing through wires or equipment is more than they can carry without incurring damage.

Palustrine—Wetlands dominated by trees, shrubs, and persistent emergent plants associated with water bodies that cover less than 20 acres or with water less than 6.6 feet deep.

Prime farmland—A land use classification used by the U.S. Department of Agriculture (7 CFR §657.5) where a favorable growing season, adequate precipitation or irrigation source, and soil characteristics result in good to excellent crop production.

Pulling site—A staging area located at the beginning of a segment along the transmission line where equipment (i.e., a puller) is set up and used to pull the conductor through the transmission line.

Rebuild—Removing an existing line and replacing it with a new, higher-capacity line.

Regional Transmission Organizations (RTOs)—An RTO in the United States is an electric power transmission system operator (TSO) that coordinates, controls, and monitors a multi-state electric grid. The transfer of electricity between states is considered interstate commerce, and electric grids spanning multiple states are therefore regulated by FERC. The voluntary creation of RTOs was initiated by FERC Order No. 2000. The purpose of the RTO is to promote economic efficiency, reliability, and non-discriminatory practices while reducing government oversight.

Reliability—The degree of performance of the elements of the bulk electric system that results in electricity being delivered to customers within accepted standards and in the amount desired. The ability to deliver uninterrupted electricity to customers on demand, and to withstand sudden disturbances such as short circuits or loss of system components.

Right-of-way (ROW)—The right to pass over another’s land and includes land or an interest in land acquired for the purposes of laying, placing, maintaining, replacing, and removing transmission lines or wires along with support structures for the conveyance of electric power.

Shunt reactor—A shunt reactor is an absorber of reactive power, thus increasing the energy efficiency of the system. It is the most compact device commonly used for reactive power compensation in long high-voltage transmission lines and in cable systems.

Silt—Silt is granular material of a size between sand and clay, whose mineral origin is quartz and feldspar. Silt may occur as a soil or as sediment mixed in suspension with water and soil in a body of water such as a river.

Single-circuit transmission line—A transmission line composed of three electrical phases and two lightning protection shield wires. One of the lightning protection shield wires is a steel overhead ground wire (OHGW), and the other is typically an optical ground wire (OPGW).

Soil compaction—Compaction of soil is the compression of soil particles into a smaller volume, which reduces the size of pore space available for air and water.

Staging area—The area cleared and used by the construction contractor to store and assemble materials or structures immediately before and during construction.

Substation—An assemblage of equipment, enclosed by a fence, occurring at points along a transmission line. A facility in an electrical transmission system with the capability to route and control electrical power and to transform power to a higher or lower voltage. Equipment includes transformers, circuit breakers, and other equipment for switching, changing, or regulating the voltage of electricity.

System Control and Data Acquisition (SCADA)—This equipment is used to send data from a remote location to a central location, and to communicate control commands from a central location to remote devices.

Terminal—The point at which a conductor comes to an end and provides a point of connection to external circuits.

Traditional cultural property (TCP)—Any built or natural location, area, or feature eligible for the NHRP because of its associations with cultural practices or beliefs of a living community that (a) are routed in that community's history, and (b) are important in maintaining the continuing cultural identity of the community.

Transfer capacity—The measure of the ability of interconnected electric systems to reliably move or

transfer power from one area to another over all transmission lines (or paths) between those areas under specified system conditions.

Transformers—Electrical equipment usually contained in a substation that is needed to change voltage on a transmission system.

Transmission—An interconnected group of lines and associated equipment for the movement or transfer of electric energy between points of supply, and points at which it is transformed for delivery to customers or is delivered to other electric systems.

Transmission line—A system of structures, wires, insulators, and associated hardware that carry electric energy from one point to another in an electric power system. Lines are operated at relatively high voltages varying from 69 kV up to 765 kV and are capable of transmitting large quantities of electricity over long distances.

Transmission structures—Poles or towers that support the conductors and separate the overhead wires.

Viewshed—Visible portion of the specific landscape seen from a specific viewpoint, normally limited by landform, vegetation, distance, and existing cultural modifications.

APPENDIX A

Detailed Electricity Characteristics

ELECTRIC GENERATION AND TRANSMISSION LOAD FORECASTS

The electric generation and transmission load forecasts for Dairyland Power Cooperative (Dairyland) are part of Rural Utilities Service's (RUS's) evaluation of Dairyland's loan application. Improving transmission system reliability is one of the purposes of the Cardinal-Hickory Creek Project (C-HC Project). An important factor in system reliability planning is the projection of future load forecasts, both regional and local. One of the significant factors affecting those forecasts is the projected changes in population levels, and the associated effects on the regional and local economies. This section provides a summary of the Midcontinent Independent System Operator, Inc.'s (MISO's) historical electricity sales, regional load forecasts through 2026, Wisconsin and Iowa state population projections from 2010 through 2040, and Dairyland load forecasts through 2035.

Midcontinent Independent System Operator, Electric Generation, and Transmission Load Forecasts

Within MISO, as shown in Table A-1, electricity use has generally increased in Wisconsin and Iowa since 1990. Historical electricity usage in Wisconsin was 49,198 gigawatt hours (GWh) in 1990, 65,146 GWh in 2000, and 69,495 GWh in 2014. In Iowa, it was 29,437, 39,088, and 47,202 GWh in those same years, respectively. Compound annual average growth rates were 1.45% and 1.99%, respectively, over that period (Gotham et al. 2016)

Table A-1. MISO Historical Wisconsin and Iowa Gross Electricity Use (1990–2014)

Year	Annual Electricity Retail Sales (GWh)		
	Wisconsin	Iowa	Total
Historical			
1990	49,198	29,437	**78,635**
2000	65,146	39,088	**104,234**
2010	68,752	45,445	**114,197**
2011	68,612	45,655	**114,267**
2012	68,820	45,709	**114,529**
2013	69,124	46,705	**115,829**
2014	69,495	47,202	**116,697**
Compound Annual Average Growth Rates (%)	1.45	1.99	–

Source: Gotham et al. (2016)

The following sections describe the MISO load forecast methodologies and results for projected future electricity uses.

10-Year Load Forecast Methodology

The State Utility Forecasting Group (SUFG) prepared an independent 10-year load forecast for the MISO. Figure A.1 shows the 10 local resource zones (LRZs) for which MISO provided load forecasts. As can be seen for the C-HC Project area, central and eastern Wisconsin are in LRZ 2, the southwestern portion of Wisconsin is in LRZ 1, and Iowa is in LRZ 3 (Gotham et al. 2016).

Econometric models were developed for each state to project annual retail sales of electricity. Forecasts of metered load at the LRZ level were developed by allocating the portion of each state's sales to the appropriate LRZ and adjusting for estimated distribution system losses. LRZ seasonal peak demand projections were developed using peak conversion factors, which translated annual electricity into peak demand based on historical observations assuming normal weather conditions. MISO system level seasonal peak projections were developed from the LRZ forecasts by using coincidence factors. Energy efficiency (EE), demand response (DR), and distributed generation (DG) adjustments were made at the LRZ level and the MISO system-wide level based on a study of those factors performed by Applied Energy Group for MISO (Gotham et al. 2016).

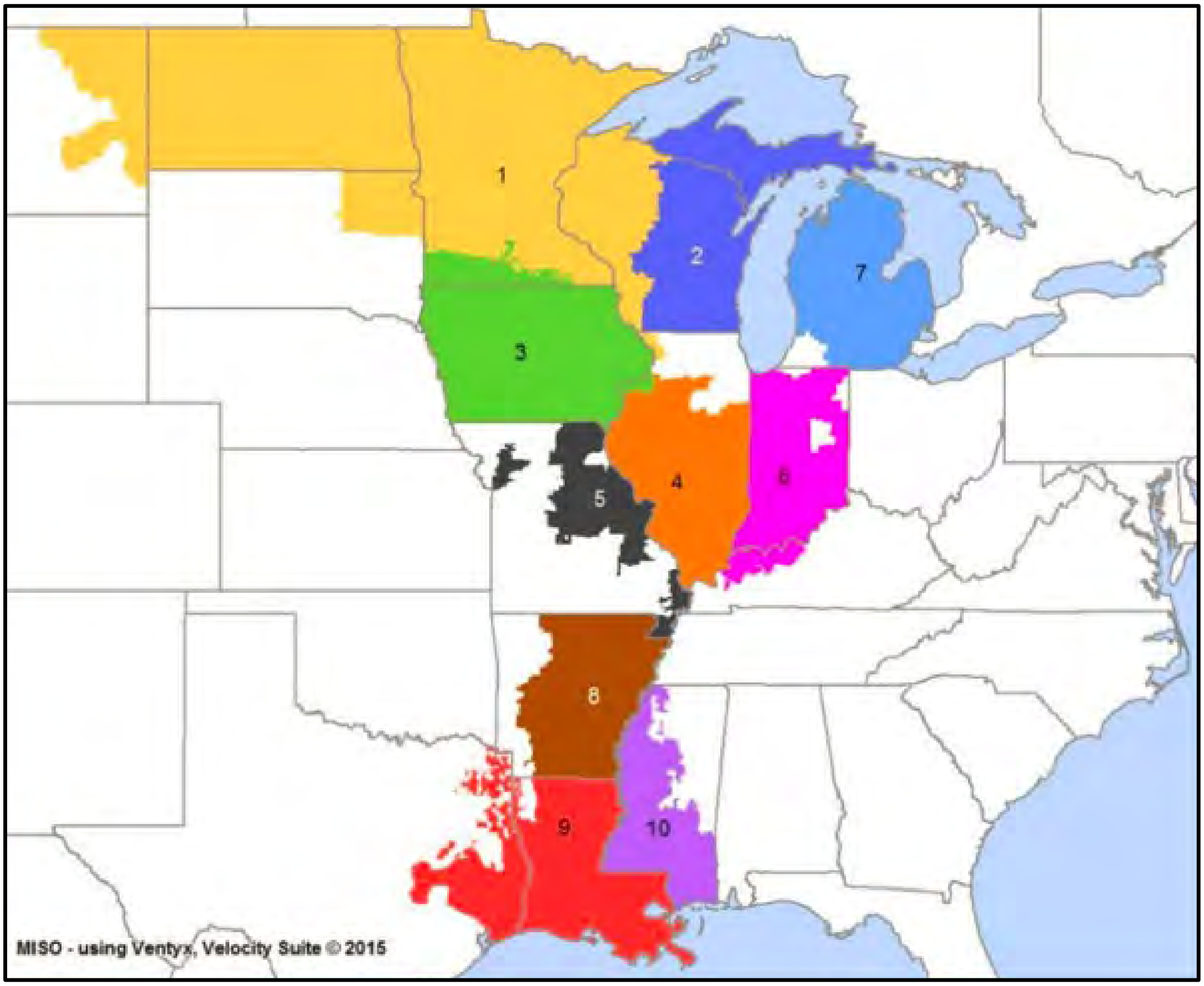

Figure A.1. MISO 2015 planning year local resource zones map (Gotham et al. 2016).

The state econometric models were developed using publicly available information for electricity sales, prices for electricity and natural gas, personal income, population, employment, gross state product, and annual cooling and heating degree days. Economic and population projections acquired from IHS Global Insight and price projections developed by SUFG were used to produce projections of future retail sales. Weather variables were held constant at their 30-year normal values (Gotham et al. 2016).

LRZ-level electricity forecasts were developed by allocating the state electricity forecasts to the individual LRZs on a proportional basis. The EE/DR/DG adjustments were made at the LRZ level. Additionally, losses associated with the distribution system were added to produce a forecast at the metered load level (Gotham et al. 2016).

LRZ summer and winter non-coincident peak demand projections were developed using peak conversion factors that are based on normal weather conditions and are determined from historical relationships between average hourly load for the year, summer and winter peak levels for the year, and weather conditions at the time of the peak demand. Because these conversion factors are held constant for the forecast period, the LRZ peak demand projections without the EE/DR/DG adjustments have the same growth rates as the electricity projections (Gotham et al. 2016).

10-Year Load Forecasts

As shown in Table A-2, in the MISO region electricity load is forecasted to increase from 667,822 GWh in 2015 to 783,121 GWh in 2026, without adjusting for EE/DR/DG, an increase of 115,299 GWh or a 1.46% compound annual average growth rate. When adjusting for EE/DR/DG, it is forecasted to increase to 774,270 GWh, an increase of 106,448 GWh and a 1.35% compound annual average growth rate. Thus, implementing EE/DR/DG measures in the MISO area is projected to result in an annual average 0.11% reduction in electricity use from 2015 through 2026 (Gotham et al. 2016).

Table A-2. MISO Gross and Net Electricity Forecasts (2015–2026)

Year	Total (in GWh)		
	Forecast without EE/DR/DG Adjustments	**Forecast with EE/DR/DG Adjustments**	**Difference**
2015	667,822	667,822	0
2016	687,202	685,935	−1,267
2017	700,281	698,377	−1,904
2018	712,549	709,986	−2,563
2019	722,754	719,505	−3,249
2020	731,733	727,768	−3,965
2025	774,010	766,048	−7,962
2026	783,121	774,270	−8,851
Total (GWh)/Compound Annual Average Growth Rates (%)			
2015–2020	63,911 / 1.84	59,946 / 1.73	−0.11
2015–2026	115,299 / 1.46	106,448 / 1.35	−0.11
2017–2026	82,840 / 1.25	75,893 / 1.15	−0.10

EE/DR/DG = energy efficiency, demand response, and distributed generation

Source: Gotham et al. 2016

Electricity demand is forecasted to increase by 14,158 GWh total and 1.69% annually in Wisconsin from 2015 through 2026 (prior to any EE/DR/DG adjustments), and Iowa is projected to increase by 10,181 GWh total and 1.84% annually (Table A-3) (Gotham et al. 2016).

Table A-3. MISO Wisconsin and Iowa Gross State Electricity Forecasts (2015–2026)*

Year	Annual Electricity Retail Sales (in GWh)		
	Wisconsin	Iowa	Total
Historical			
2010	68,752	45,445	114,197
2014	69,495	47,202	116,697
Projections			
2015	69,762	45,912	115,674
2016	71,401	47,563	118,964
2017	73,183	48,179	121,362
2018	74,892	48,954	123,846
2019	76,213	49,902	126,115
2020	77,267	50,834	128,101
2025	82,774	55,132	137,906
2026	83,920	56,093	140,013
Total (GWh)/Compound Annual Average Growth Rates (%)			
2015–2026	14,158 / 1.69	10,181 / 1.84	–
2017–2026	10,737 / 1.53	7,914 / 1.70	–

* Without EE/DR/DG Adjustments

Source: Gotham et al. (2016)

The compound annual average growth rates of the LRZ non-coincident peak demand projections with and without the EE/DR/DG adjustments are shown in Table A-4. Within the three LRZs overlaying the C-HC Project area, demand is projected to increase by 1.49% to 1.68% annually without adjusting for EE/DR/DG levels, and 1.32% to 1.59% annually with adjustments for EE/DR/DG levels (Gotham et al. 2016).

Table A-4. Forecasted State and LRZ Electricity Load Changes (2017–2026)

State/LRZ Zone	Forecast without EE/DR/DG Adjustments		Forecast with EE/DR/DG Adjustments	
	Total Change (GWh)	CAGR (%)	Total Change (GWh)	CAGR (%)
State Retail Sales				
Iowa	7,914	1.70	–	–
Wisconsin	10,737	1.53	–	–
LRZ Annual Metered Load				
1	16,812	1.68	15,762	1.59
2	9,811	1.49	9,785	1.49
3	7,772	1.66	6,045	1.32

LRZ = local resource zone

EE/DR/DG = energy efficiency, demand response, and distributed generation

CAGR = compound annual average growth rate

Source: Gotham et al. (2016)

There are a number of factors affecting hourly load demand, such as humidity, wind speed, temperature, and so forth. Of all the weather-related factors, temperature is the most important one to determine the timing and magnitude of the peak. A closer look at the historical relationships between hourly loads and hourly temperatures shows that temperature has a significant impact on annual electricity demand, zonal peak winter and summer hourly loads, and when seasonal peaks occur. The summer peak demand in each LRZ is forecasted to increase by 1.17% to 1.41% annually from 2017 through 2026 when adjusting for EE/DR/DG, and winter peak demand is forecasted to increase by 1.04% to 1.35% annually (Gotham et al. 2016).

MISO Modeling Methodologies and Processes

As a precursor to the Multi-Value Project (MVP) discussion, MISO first conducted the Regional Generation Outlet Study (RGOS). First, MISO identified where generation would be located in the study area for a specific year (for the MVPs, it was 2021). Because one of the main purposes of the MVPs was compliance with Renewable Portfolio Standards (RPSs), likely locations were identified for new renewable electricity generation facilities within each state. Those new renewable generation locations were added to other existing and new electric generation sources in the study area (Dairyland et al. 2016).

MISO then determined how best to reliably convey the electricity from those generators to customers. To obtain the most cost-effective solution to the RPSs, MISO evaluated a number of different scenarios. In one scenario it was assumed that each state would build enough in-state renewable electricity generation facilities to comply with its respective RPSs, and then also build the required transmission systems (i.e., MISO placed numerous renewable facilities in each state). In another scenario, MISO assumed that states would purchase the most economical renewable electricity from facilities regardless of their locations, and would build the required transmission systems to distribute the electricity. Through this iterative process, MISO tested whether local renewable generation facilities alone were more or less expensive than a mix of local and upper Great Plains renewable electricity generation facilities. Based on the results of RGOS, stakeholders selected the alternatives to be evaluated during the MVP process (Dairyland et al. 2016).

While the RGOS study focused on the ability to transmit renewable electricity, MISO expanded its analysis during the MVP process to evaluate which transmission lines, when considered with the whole portfolio, would provide reliability benefits to and reduce congestion on the regional electrical grid. MISO conducted the MVP analyses using the following four future scenarios:

- Business as Usual with Mid-Low Demand and Energy Growth Rates;
- Business as Usual with Historic Demand and Energy Growth Rates;
- Carbon Constraint; and
- Combined Energy Policy.

Each future scenario had differing assumptions for each variable, such as how quickly demand for electricity would grow and the price of natural gas (Dairyland et al. 2016).

In 2011, MISO and stakeholders selected (by near consensus) the 345-kilovolt (kV) transmission line option between Dubuque County, Iowa, and Dane County, Wisconsin. Stakeholders agreed that the 17 MVPs were “no regrets” projects, namely that they provided a robust solution to a number of challenges. MISO recently reconfirmed this robustness in its second Triennial Review of the MVP Portfolio (MISO 2017). The C-HC Project is one of the 17 MVPs (Dairyland et al. 2016).

Wisconsin and Iowa Population Projections

A significant factor in forecasting changes in future electricity usage in an area is the projected changes in population levels, and the associated changes in economic activity that are generated by that increase in population. Thus, the following sections provide population projections for Wisconsin and Iowa for the 2010 to 2040 period.

WISCONSIN POPULATION PROJECTIONS

Table A-5 provides a summary of the Wisconsin population levels for every 5 years from 1980 through 2010, and population projections from 2010 through 2040. Wisconsin's population in 2040 is projected to be nearly 6,500,000, a gain of more than 800,000 people (14%) from 2010 (Egan-Robertson 2013).

Table A-5. Wisconsin Population Levels (1980–2010) and Projections (2010–2040)

Year	Population	Change from Previous 5-Year Period	
		Quantity	Percent
Population Levels			
1980	4,705,642	–	--
1985	4,771,758	66,116	1.4
1990	4,891,769	120,011	2.5
1995	5,134,123	242,374	5.0
2000	5,363,715	229,572	4.5
2005	5,584,522	220,807	4.1
2010	5,686,986	102,464	1.8
Change 1980–2010			
Total Change	–	981,344	20.9
Average Annual Change	–	32,711	0.70
Population Projections			
2010	5,686,986	–	–
2015	5,783,015	96,029	1.7
2020	6,005,080	222,065	3.8
2025	6,203,850	198,770	3.3
2030	6,375,910	172,060	2.8
2035	6,476,270	100,360	1.6
2040	6,491,635	15,365	0.2
Change 2010–2040			
Total Change	–	804,649	14.1
Average Annual Change	–	26,822	0.47

Source: Egan-Robertson (2013)

From 2010 to 2040, 57 of Wisconsin's 72 counties are projected to increase in population. Of these, 25 are expected to exceed the state's total growth rate of 14.1% (0.47% average annual growth). Within the C-HC Project area, Dane County is projected to have one of the fastest-growing population levels in Wisconsin. The Grant County population is projected to peak in 2030, Iowa County will peak in 2035, and Dane and Lafayette Counties will peak in 2040 (Egan-Robertson 2013).

IOWA POPULATION PROJECTIONS

As shown in Table A-6, populations in the state of Iowa are projected to increase by over 459,000 people (15.2%) from 2010 through 2040. In Clayton County, where the C-HC Project would be located, the population level is projected to remain unchanged for the 30-year period. For neighboring Dubuque County, the population is projected to increase by almost 10,700 people (11.5%) from 2010 through 2040 (State Data Center 2009).

Table A-6. Iowa Population Levels and Projections (2010–2040)

State/County	Census 2010	Projected 2040	Quantity Change	Total/Average Annual Change (%)
State of Iowa	3,028,666	3,487,942	459,276	15.2 / 0.51
Clayton County*	17,530	17,366	−164	−0.94 / −0.03
Dubuque County	93,303	103,994	10,691	11.46 / 0.38

* Located in the C-HC Project area

Source: State Data Center (2009)

POTENTIAL CHANGE IN FUTURE STATEWIDE ELECTRICITY USE BASED ONLY ON POPULATION CHANGES

In 2015, the average annual electricity consumption for a U.S. residential utility customer was 10,812 kWh a year (i.e., 10.812 megawatt hours [MWh]) (U.S. Energy Information Administration 2017). The Wisconsin average household size was 2.43 people per household in 2011–2015 (U.S. Census Bureau 2017). Using this information as an assumption for calculating potential electricity needs using a broad estimation method, it means that the increase of 804,649 people in Wisconsin from 2010 to 2040 could result in a total increased use of 3,580,191 MWh (an average annual increase of 119,340 MWh). Similarly, the increase of 459,276 people in Iowa from 2010 to 2040 could result in a total increased use of 2,043,495 MWh (an average annual increase of 68,116 MWh).

Dairyland’s Electric Load Forecasts

Dairyland’s system consists of 24 distribution and 17 municipal systems. Two of the municipal systems are served directly by distribution systems. The distribution systems comprising the Dairyland system include the following Class A members:

- Allamakee-Clayton IA-74 MiEnergy MN-32
- Barron WI-40 Oakdale WI-25
- Bayfield WI-63
- People’s MN-59
- Chippewa Valley WI-19
- Pierce-Pepin WI-32
- Clark WI-29 Polk-Burnett WI
- Dunn WI-49 Price WI-58
- Eau Claire WI-53 Richland WI-35
- Freeborn-Mower MN-61
- Riverland WI-37
- Hawkeye IA-52
- Scenic Rivers WI-43
- Heartland IA-98
- St. Croix WI-51
- Jackson WI-47
- Taylor WI-21
- Jo-Carroll IL-44
- Tri-County MN-32
- Jump River WI-57
- Vernon WI-41

The total system serves more than 258,000 accounts in four states: Wisconsin, Minnesota, Iowa, and Illinois. Load forecasts are developed for each of the member systems and summed to determine Dairyland's forecast.

LOAD FORECASTING METHODOLOGY OVERVIEW

The major demographic and economic factors impacting future growth in the Dairyland system are population, real per-capita income, and total employment. Continued growth potential exists on the Dairyland system as the rural economy is expected to suffer less from the current economic troubles, and transportation expansion improves access to rural areas (Dairyland 2016a).

Dairyland's load forecast was developed using a bottom-up forecasting approach. This approach consists of developing individual load forecasts for each of the member distribution systems and municipal systems that are served by Dairyland. These individual results are then summed to determine Dairyland's forecast.

On November 16, 2016, Dairyland's Board of Directors approved the 2016 Load Forecast (Dairyland 2016a) for the 2016–2035 period. The analyses for this report reflect historic electricity and peak demand data through December 2015, and provide new projections through 2035. It focuses not only on the results for the entire Dairyland system, but also includes projections for each of the 25 Class A Cooperatives and for the Class D (municipal utility) systems. The following information was obtained from that load forecast.

OVERALL LOAD FORECASTS

As shown in Table A-7, total electricity requirements in the Dairyland service area are forecasted to increase by an average annual rate of 2.5% from 2015 to 2025, and by 1.5% from 2015 to 2035 (Dairyland 2016a).

Table A-7. Dairyland Forecasted Total Electricity Requirements (2016–2035)

Year	Total Electricity Requirements (MWh)	Peak Month	Load Factor (%)
Historical			
2010	4,944,408	August	62.60
2015	5,155,659	August	59.18
Projections			
2016	5,280,222	July	59.59
2017	5,348,680	July	59.76
2018	5,410,395	July	59.69
2019	5,460,911	July	59.69
2020	5,489,286	July	59.65
2025	6,593,397	July	59.78
2030	6,775,233	July	59.95
2035	6,956,174	July	60.04
Average Annual Growth Rates (MWh / %)			
2010–2015	42,250 / 0.84	–	-1.12
2015–2025	143,774 / 2.49	–	0.10
2015–2035	90,026 / 1.51	–	0.07

Source: Dairyland (2016a)

As shown in Table A-8, the greatest growth is expected to occur in the general and large commercial and industrial classes, with electricity sales expected to grow at an average annual rate of 2.5% and 3.0%, respectively, over 20 years (Dairyland 2016a).

Dairyland estimated that transmission line losses are 4.5%.

Table A-8. Dairyland Power Cooperative Total System Average Annual Growth Projections (2016–2035)

Consumers/Sales	Average Annual Growth (%)
Consumers	
Residential Consumers	1.1
General Commercial and Industrial Consumers	2.8
Large Commercial and Industrial Consumers	3.3
Subtotal	*1.1*
Sales	
Residential sales	0.9
General Commercial and Industrial Consumers	2.5
Large Commercial and Industrial Consumers	3.0
Subtotal	*1.6*
Summer Coincident Peak	**1.5**

Source: Dairyland (2016a)

MEMBER COOPERATIVE LOAD FORECASTS

Dairyland also prepared annual growth projections for each of its Class A members, by type of consumer. Most of the members are projected to have increases in loads from 2015 through 2035, ranging from 0.1% to 8.5% average annual growth, depending on the type of consumer for any given member (Dairyland 2016a).

Load Forecast and Population Changes Summary

As shown in Table A-9, annual rates of change in electricity use are forecasted to be 1.35% in the MISO region, 1.69% in Wisconsin, and 1.84% in Iowa from 2015 to 2026; populations will increase by 0.47% annually in Wisconsin and 0.51% in Iowa from 2010 to 2040; and electricity use will increase by 1.75% annually in the Dairyland service area from 2015 to 2035.

Table A-9. Summary of Forecasted Electrical Use and Population Growth Rates

Forecast	Change	Rate of Change (%)
MISO 2015–2026		
Total without EE/DR/DG Adjustments	115,299 GWh	1.46*
Total with EE/DR/DG Adjustments	106,448 GWh	1.35*
Wisconsin Total	14,158 GWh	1.69*

Forecast	Change	Rate of Change (%)
Iowa Total	10,181 GWh	1.84*
Population Projections 2010–2040		
Wisconsin		
Total Change	804,649 people	14.15
Average Annual Change	26,822 people	0.47†
Iowa		
Total Change	459,276 people	15.16
Average Annual Change	15,309 people	0.51†
Dairyland Power Cooperative Load Forecast 2016–2035		
Total Change	1,800,515 MWh	34.92
Average Annual Change	90,026 MWh	†

* Compound annual average growth rate

† Average annual rate of change

EE/DR/DG = energy efficiency, demand response, and distributed generation

Dairyland's Current Electrical System Management Characteristics and Issues

Dairyland's total energy requirements, which consist of energy sales to Class A (distribution) and Class D (municipal) members, increased from over 4.9 million MWh in 2010 to over 5.1 million MWh in 2015, for a total of over 211,000 MWh and at an annual average growth rate of 0.8% (Table A-10). There was a temporary decrease in electricity requirements from 2011 to 2012, and from 2014 to 2015. In both of those years the Dairyland service area experienced noticeably fewer heating degree days (HDD) than average (Dairyland 2016a).

Table A-10. Dairyland Historical Total Electricity Requirements (2010–2015)

Year	Total Electricity Requirements (MWh)	Peak Month	Load Factor (%)
Historical			
2010	4,944,408	August	62.60
2011	4,980,626	July	58.12
2012	4,947,117	July	53.28
2013	5,187,011	July	56.41
2014	5,337,896	July	63.17
2015	5,155,659	August	59.18
Change 2010–2015			
Total Electricity Use (MWh)	211,251	–	–
Annual Average Growth Rate (%)	0.8	–	−1.12

Source: Dairyland (2016a)

The electrical system and flows in southwestern Wisconsin have been affecting how the system is operated. First, two electrical generation facilities have been retired in the Cassville, Grant County, Wisconsin area:

- E.J. Stoneman Generating Station
    - Nameplate: 40 MW
    - Construction begun in 1950 by Dairyland, commissioned in 1952
    - Originally a coal-fired power plant with two units, closed in 1993 for economic reasons
    - Later sold and converted to a woody-biomass burning facility, and began operation again in October 8, 2010
    - Plant closed in December 2015
- Nelson Dewey Generating Station
    - Nameplate: 220 MW
    - Coal-fired power plant with two units
    - Owned by Wisconsin Power and Light Company, an Alliant Energy company
    - Plant closed in December 2015

These generation retirements, among other changes, have increased the reliance on the local transmission system due to the need to bring electricity from more remote generation sources (Dairyland et al. 2016).

Second, these power plant retirements have increased the power flow on the Dairyland-owned Stoneman–Nelson Dewey 161-kV transmission line. Power flow also has increased on the Turkey River–Stoneman 161-kV transmission line, of which Dairyland and ITC Midwest LLC each own a segment. Power usually flows from the 345-kV transmission source at the Hickory Creek Substation near Dubuque, Iowa, toward Wisconsin on the 161-kV transmission lines, causing high flows on them. As a result, these transmission lines could overload under some contingencies (Dairyland et al. 2016).

Third, when congestion is present on the system, higher cost generation is dispatched from the east to reduce power flows from Iowa towards Wisconsin (Dairyland et al. 2016).

Finally, there are MISO Operating Guides that affect Dairyland's system in the southwestern Wisconsin area, to respond to multiple outages and protect transmission lines from potential overloads during high load periods. An Operating Guides consists of pre-planned procedures that are initiated under pre-determined operating conditions of the transmission system to alleviate conditions such as line overloads. A last resort in one of these Operating Guides is the potential for shedding load (i.e., not providing electricity) to maintain equipment loading under their maximum loading capabilities. This includes some Dairyland member loads in southwestern Wisconsin. Operating Guides are normally used as interim measures and are not normally long-term solutions (Dairyland et al. 2016).

Renewable Electricity Projects and Programs

As shown in Table A-11, Dairyland and its member cooperative system have four thermal and 32 renewable generation facilities operating or soon to be operating.

Table A-11. Dairyland and Member Cooperative Electric Generation Facilities/Power Purchases

Electric Generation Type and Facility	Location	Operational/Power Purchase Year	Electricity Generation (MW)
Thermal Facilities			
Weston No. 4 Coal-Fired Power Plant	Wausau, WI	June 2008	158 (30% of 525, is Dairyland)
John P. Madgett Station – coal	Alma, WI	Nov 1979	400
Genoa Station No. 3 (G-3) – coal	La Crosse, WI	1969	379
Elk Mound Combustion Turbines – natural gas or fuel oil	Elk Mound, WI	June 2001	70
Subtotal Thermal			*1,007*
Renewable Facilities*			
Flambeau Hydroelectric Station	Ladysmith, WI	1951	22.0
Sartell Hydroelectric Project	Sartell, MN		
Barton Wind Farm	Kensett, IA	Feb 2017	80.0 (50% of 160, is Dairyland)
Quilt Block Wind Farm	Platteville, WI	Late 2017	98.0
Winnebago Wind Power Project	Thompson, IA	Sept 2008	20.0
McNeilus Wind Farm	Adams, MN	Oct 2003	18.0
Solar	Centuria, WI	2017	1.0
Solar	New Auburn, WI	2017	2.5
Solar	Strawberry Point, IA	2017	1.3
Fambeau GroSolar Partners – solar	Phillips, WI	2017	2.5
SoCore Energy – solar	Viola, WI	2017	0.5
SoCore Energy – solar	Roberts, WI	2017	2.2
SoCore Energy – solar	Conrath, WI	2017	1.0
SoCore Energy – solar	Necedah, WI	2017	1.5
SoCore Energy – solar	Menomonie, WI	2017	1.0
SoCore Energy – solar	Medford, WI	2017	2.0
SoCore Energy – solar	Liberty Pole, WI	2017	1.0
SoCore Energy – solar	Hillsboro, WI	2017	1.0
SoCore Energy – solar	Town of Hallie, WI	2017	1.0
SoCore Energy – solar	Mt. Hope, WI	2017	1.0
SoCore Energy – solar	Arcadia, WI	2017	1.0
Minnesota Three, LLC – solar	Oronoco, MN	2014	0.4
CEC Solar #1034, LLC – solar	Westby, MN	2014	0.4
City of Galena, IL – solar	Galena, IL	2012	0.3*
Timberline Trail Landfill Gas-to-Energy Generating Station	Bruce, WI	2006	5.6
Central Disposal Landfill Gas-to-Energy Generating Station	Lake Mills, IA	2006	4.8

Electric Generation Type and Facility	Location	Operational/Power Purchase Year	Electricity Generation (MW)
Seven Mile Creek Landfill Gas-to-Energy Generating Station	Eau Claire, WI	2004	4.0
Norm-E-Lane Biogas	Chili, WI	2008	0.6
Bush Brothers Biogas	Augusta, WI	2012	0.6
Big Ox Energy Riceville, LLC Biogas	Riceville, IA	2012	0.6
Bach Farms Biogas	Dorchester, WI	2009	0.6
USEMO Biogas	Chaseburg, WI	2012	0.05
Subtotal Renewables			*276.45*
Total			**1,283.45**

Note: The cooperatives either own and operate, or purchase power from the facilities listed.

* Excess energy is sold to Dairyland, and is not included in the total.

Sources: Dairyland (2016b, 2016c, 2017a, 2017b)

Dairyland is a founding member of the National Renewable Cooperative Organization, an organization of cooperatives promoting the development of renewable energy resources (Dairyland 2017b). Dairyland and its member cooperatives have historically and are continuing to implement several renewable energy programs, including development of wind and solar facilities. The advantages of multiple projects in separate locations include diversified weather, distributed grid infrastructure impacts, and locally based renewable energy (Dairyland 2016b).

As the costs of solar panels have declined, Dairyland and the member cooperatives have a new focus on developing solar electric generating facilities. They recently signed power purchase agreements for 15 utility-scale solar generation projects in southwestern Wisconsin and northeastern Iowa, ranging from 0.5 to 2.5 MW each and totaling 20.5 MW of generation (see Table A-11). In addition to these commercial facilities, there are over 850 consumer-owned distributed generation solar installations in the Dairyland service area (Dairyland 2016b).

Dairyland also supports farm animal waste-to-electric facility developments in its region. It does so by purchasing the electricity generated from several animal waste anaerobic digesters. These digesters biodegrade the liquid and manure wastes from cows and other livestock, converting it into methane gas, which is then used to power an electric generator (Dairyland 2017a).

Dairyland also has developed a *Solar for Schools* renewable energy and education initiative. This initiative not only includes installation of solar facilities on campuses, but also provides education and workforce training for the students. Under this program, solar installations were constructed at a technical college and three schools, shown in Table A-12 (Dairyland 2016d).

Table A-12. Dairyland and Member Cooperative Solar for Schools Electric Generation Facilities

School	Location	Operational Year	Electricity Generation (kW)
Western Technical College – Independence Campus	Independence, WI	Fall 2016	1.6
Alma Area School (K-12)	Alma, WI	Fall 2016	12
Cochrane-Fountain City School (K-12)	Fountain City, WI	Fall 2016	12
De Soto Area Middle and High School	De Soto, WI	Fall 2016	12

Source: Dairyland (2016d)

Dairyland has also developed an *Evergreen Renewable Energy Program*. Dairyland's members distribute renewable electricity to their consumers, who voluntarily support renewable electricity development by paying $1.50 more each month for each block of 100 kWh (1.5 cents/kWh). These additional funds are then used to support development of new renewable electricity facilities and programs (Dairyland 2017a).

Load and Demand-Side Management

Dairyland and its member systems currently offer a variety of load management and Demand-Side Management (DSM) programs designed to shift load from on-peak periods and to reduce system peak demands. The ultimate objectives of DSM programs are to lower rates, delay the need to construct new power plants, improve system efficiency and reliability, stimulate consumer interest in more efficient appliances, and reduce harmful environmental emissions associated with electrical generation (Dairyland 2016a).

Historic DSM efforts have primarily focused on management of electric water heating and electric space heating loads. Over the past few years, the summer peak demand has been more directly targeted for load management, including the control of air conditioning systems and voluntary interruptions of large commercial and industrial loads (Dairyland 2016a).

It is estimated that Dairyland currently has 90 to140 MW of direct load control during the winter months (at the substation) and an additional 35 MW of daily load control of electric thermal storage (ETS) systems. It is also estimated that the Dairyland system currently has 60 to 90 MW of summer load control, including voluntary interruptions of large commercial and industrial facilities. These impacts are estimated for peak days under extreme weather conditions (Dairyland 2016a).

Changing Load Characteristics

Although the consumer base of Dairyland's member systems has traditionally been composed primarily of rural agricultural consumers, the composition of members is becoming increasingly suburban due to housing development within commuting distance of the region's larger cities. The most recent Dairyland survey (2013) indicated that about 21% of residential accounts included a farm. In recent years, the strongest growth has occurred in the large commercial and industrial class as small manufacturing plants, large-scale agricultural loads, large retail stores, and industrial facilities have located in rural and suburban areas. Over the past 10 years, the number of loads reported with connected capacity greater than 1,000 kilovolt-amperes (kVA) has increased from 61 to 110 (Dairyland 2016a).

In June 2010, Dairyland joined the MISO system. This change, combined with the possibility of additional environmental legislation, created a great deal of uncertainty as to what the future of the industry might look like (Dairyland 2016a).

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APPENDIX B

List of Tribes Contacted

TRIBES CONTACTED BY RURAL UTILITIES SERVICE IN THE NEPA PROCESS

Rural Utilities Service (RUS) contacted federally recognized tribes on three different occasions during the development of the draft environmental impact statement for the Cardinal-Hickory Creek Project (C-HC Project).

On October 17, 2016, RUS mailed the first round of letters to 26 tribes announcing the public scoping period and public meetings held on October and November for the National Environmental Policy Act (NEPA) process (Table B- 1). The list of tribes contacted was generated from lists compiled by RUS and Dairyland Power Cooperative, American Transmission Company LLC, and ITC Midwest LLC (herein called the Utilities).

Table B- 1. Tribes Contacted on October 17, 2016

Apache Tribe of Oklahoma	Iowa Tribe of Kansas and Nebraska	Meskwaki Nation – Sac and Fox Tribe of the Mississippi in Iowa	Sa ki wa ki – Sac and Fox Nation of Oklahoma
Bad River Band of Lake Superior Chippewa Tribe	Kickapoo Tribe of Oklahoma	Miami Tribe of Oklahoma	Sokaogon Chippewa Community Mole Lake Board
Bah Kho-je - Iowas of Oklahoma	Lac Courte Oreilles Band of Lake Superior Chippewa	Ne ma ha ha ki – Sac and Fox Nation in Missouri	St. Croix Band Chippewa Indians of Wisconsin
Fond du Lac Band of Lake Superior Chippewa	Lac du Flambeau Band of Lake Superior Chippewa Indians	Oneida Nation of Wisconsin	Stockbridge Munsee Community of Wisconsin
Forest County Potawatomi	Lac Vieux Desert Band of Lake Superior Chippewa	Prairie Band Potawatomi Nation	Winnebago Tribe of Nebraska
Fort Belknap Indian Community	Little Traverse Bay Bands of Odawa Indians	Prairie Island Indian Community Minnesota	
Ho-Chunk / Winnebago Nation of Wisconsin	Menominee Indian Tribe of Wisconsin	Red Cliff Band of Lake Superior Chippewa	

On November 17, 2016, RUS mailed the second round of letters to 26 tribes announcing the addition of two more public scoping meetings held in December in the proposed project area (Table B.2). The list of tribes contacted was generated from lists compiled by RUS and the Utilities.

Table B- 2. Tribes Contacted on November 17, 2016

Apache Tribe of Oklahoma	Iowa Tribe of Kansas and Nebraska	Meskwaki Nation – Sac and Fox Tribe of the Mississippi in Iowa	Sa ki wa ki – Sac and Fox Nation of Oklahoma
Bad River Band of Lake Superior Chippewa Tribe	Kickapoo Tribe of Oklahoma	Miami Tribe of Oklahoma	Sokaogon Chippewa Community Mole Lake Board
Bah Kho-je – Iowas of Oklahoma	Lac Courte Oreilles Band of Lake Superior Chippewa	Ne ma ha ha ki – Sac and Fox Nation in Missouri	St. Croix Chippewa Indians of Wisconsin
Fond du Lac Band of Lake Superior Chippewa	Lac du Flambeau Band of Lake Superior Chippewa Indians	Oneida Nation of Wisconsin	Stockbridge-Munsee Community of Wisconsin
Forest County Potawatomi	Lac Vieux Desert Band of Lake Superior Chippewa	Prairie Band Potawatomi Nation	Winnebago Tribe of Nebraska
Fort Belknap Indian Community	Little Traverse Bay Bands of Odawa Indians	Prairie Island Indian Community of Minnesota	
Ho-Chunk / Winnebago Nation of Wisconsin	Menominee Indian Tribe of Wisconsin	Red Cliff Band of Lake Superior Chippewa	

On September 28, 2017, RUS mailed the third round of letters to 57 tribes initiating the Section 106 process and soliciting information about any specific historic properties or important tribal resources in the area of potential effects (Table B- 3). The list of tribes contacted in this round was generated from lists compiled by RUS, the Utilities, the U.S. Army Corps of Engineers, and the U.S. Fish and Wildlife Service.

Table B- 3. Tribes Contacted on September 28, 2017

Absentee-Shawnee Tribe of Indians of Oklahoma	Flandreau Santee Sioux Tribe	Lac du Flambeau Band of Lake Superior Chippewa Indians of Wisconsin	Sisseton-Wahpeton Oyate
Alabama-Quassarte Tribal Town	Fond du Lac Band of Lake Superior Chippewa	Lac Vieux Desert Band of Lake Superior Chippewa Indians of Michigan	Sokaogon Chippewa Community of Wisconsin
Apache Tribe of Oklahoma	Forest County Potawatomi Community	Little Traverse Bay Bands of Odawa Indians	Spirit Lake Tribe
Bad River Band of Lake Superior Chippewa Indians of Wisconsin	Fort Belknap Indian Community	Mille Lacs Band of Ojibwe Indians	St. Croix Chippewa Indians of Wisconsin
Bah Kho-je – Iowas of Oklahoma	Fort Peck Assiniboine and Sioux Tribes	Oneida Nation of Wisconsin	Standing Rock Sioux Tribe
Bay Mills Indian Community	Grand Portage Band of Lake Superior Chippewa	Red Cliff Band of Lake Superior Chippewa Indians of Wisconsin	Stockbridge-Munsee Band Community Band of Mohican Indians
Bois Forte Band of Chippewa	Grand Traverse Band of Ottawa and Chippewa Indians	Red Lake Band of Chippewa Indians	Three Affiliated Tribes (Mandan, Hidatsa and Arikara Nation)
Caddo Nation of Oklahoma	Hannahville Indian Community	Rosebud Sioux Tribe	Turtle Mountain Band of Chippewa Indians
Cayuga Nation of New York	Ho-Chunk Nation	Sac and Fox Nation of Missouri in Kansas and Nebraska	Upper Sioux Community, Minnesota
Cherokee Nation	Iowa Tribe of Kansas and Nebraska	Sac and Fox Nation of Oklahoma	White Earth Reservation
Cheyenne and Arapaho Tribes of Oklahoma	Iowa Tribe of Oklahoma	Sac and Fox Tribe of the Mississippi in Iowa	Winnebago Tribe of Nebraska
Cheyenne River Sioux Tribe	Kickapoo Traditional Tribe of Texas	Saginaw Chippewa Indian Tribe of Michigan	Yankton Sioux Tribe
Chippewa Cree Tribe of the Rocky Boy's Reservation of Montana	Kickapoo Tribe in Kansas	Santee Sioux Tribe of Nebraska	
Citizen Potawatomi Nation	Kickapoo Tribe of Oklahoma	Sault Ste. Marie Tribe of Chippewa Indians	
Crow Creek Sioux Tribe	Lac Courte Oreilles Band of Lake Superior Chippewa Indians of Wisconsin	Shakopee Mdewakanton Sioux Community of Minnesota	

APPENDIX C

Alternatives Development Process

ALTERNATIVES DEVELOPMENT PROCESS FOR THE CARDINAL-HICKORY CREEK PROJECT ENVIRONMENTAL IMPACT STATEMENT

The purpose of this appendix is to supplement the routing information provided in Chapter 2 for each action alternative and define the transmission line subsegments that comprise each action alternative. This appendix also serves as a preliminary summary of potential resource impacts for each action alternative, which was used as an alternative evaluation tool to ensure the six action alternatives were reasonable and technically feasible.

BACKGROUND

Rural Utilities Service (RUS) used the 27 transmission line segments defined by Dairyland Power Cooperative, American Transmission Company LLC, and ITC Midwest LLC (the Utilities) to develop full alternative transmission line routes connecting the existing Cardinal Substation in Dane County, Wisconsin, with the Hickory Creek Substation in Dubuque County, Iowa (Figure C.1). RUS opted to use the Utilities-defined segments to develop transmission line routes (also referred to as action alternatives) for this environmental impact statement (EIS). The rationale for using the Utilities-defined segments is: 1) to maintain consistency with the state regulatory processes that will be followed by the Utilities to obtain a Certification of Public Convenience and Necessity in Wisconsin and Iowa, and 2) to provide consistent information to the public about the proposed transmission line routes.

The 27 transmission line segments were further broken down into 158 subsegments by the Utilities. RUS used the subsegments to assemble the six action alternatives that are summarized in Chapter 2. All transmission line subsegments, except for four, are included in at least one action alternative considered in this EIS. The incorporation of the majority of the potential subsegments into the action alternatives will facilitate any future reconfiguring of alternatives without the need for substantial revisions to resource impact analyses.

It is important to note, the alternatives are described below as starting on the east end of the project area, at the Cardinal Substation in Dane County, Wisconsin, and ending at the Hickory Creek Substation in Dubuque County, Iowa.

BRIEF DESCRIPTION OF THE ACTION ALTERNATIVES

The following sections briefly describe each of the six action alternatives considered in this EIS. The alternative descriptions are provided at the segment level. Table C-1 lists the subsegments used to assemble each complete alternative route.

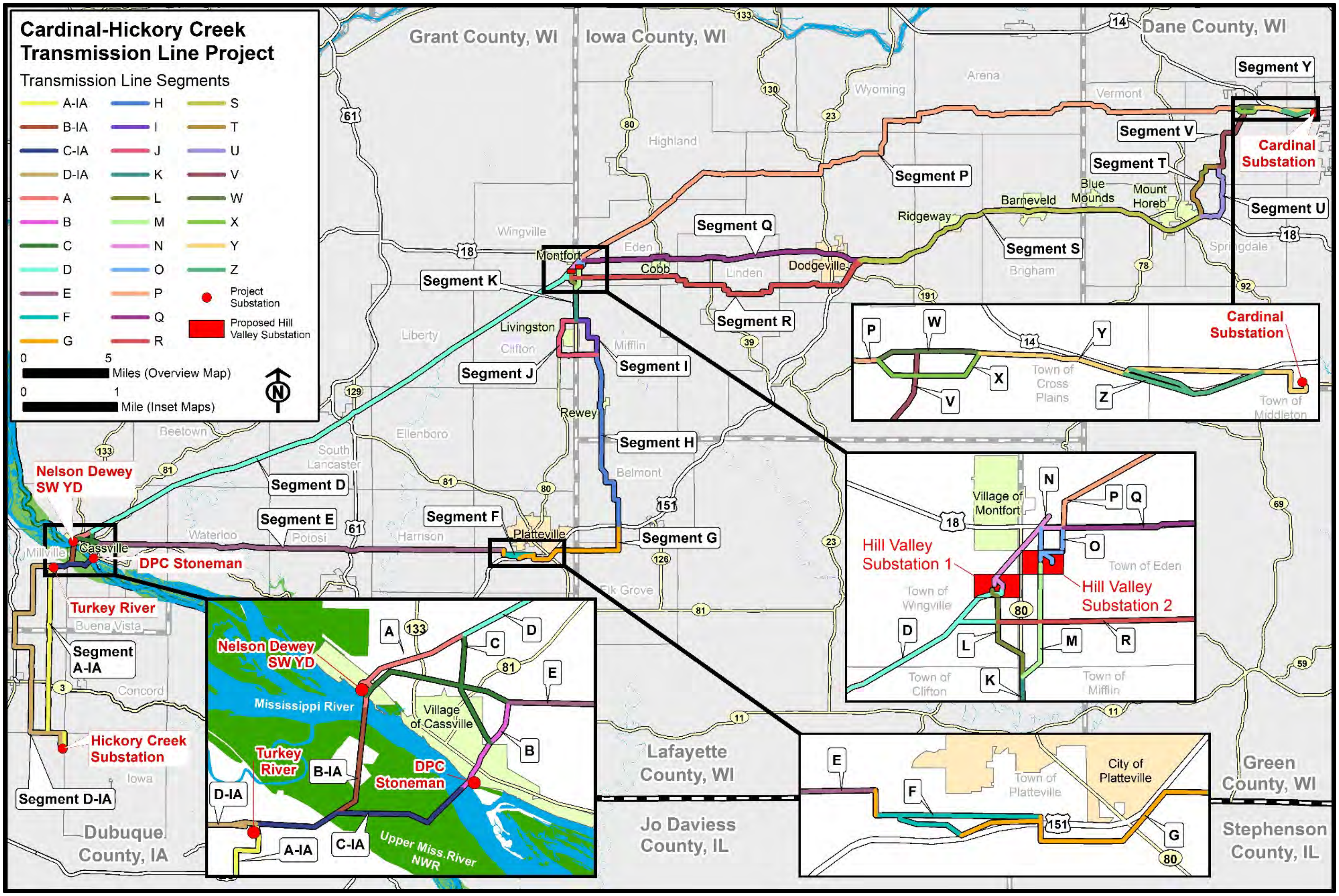

Figure C.1. **Segments used to develop the six action alternatives.**

Alternative 1: North Corridor Baseline

Starting on the east end of Alternative 1 at the Cardinal Substation, Segments Y and W would follow the existing 69-kilovolt (kV) transmission line to Segment P. Segment P would be a section of new transmission line right-of-way (ROW) located along the northern half of the Cardinal-Hickory Creek Project (C-HC Project) study area. Segment P would then connect with Segment N before connecting to the new Hill Valley Substation near Montfort, Wisconsin. Although either Hill Valley Substation alternative (S1 or S2) could be used, it is assumed that Substation Alternative S1 would be constructed for Alternative 1. Segments D and A would then connect the new Hill Valley Substation with the Nelson Dewey Substation, just northwest of Cassville, Wisconsin.

Once the C-HC Project transmission line exits southward from the Nelson Dewey Substation, it would cross the Mississippi River using the remainder of Segment A and Segment B-IA to connect with Segment A-IA which terminates at the Hickory Creek Substation in Clayton County, Iowa. Under this alternative, the existing 161/69-kV double-circuit configuration at the existing Stoneman Substation Mississippi River crossing would be removed, which would also result in a modification of the physical structure of the Stoneman Substation.

Alternative 2: North Corridor with Southern Variation

Alternative 2 would follow much of the same route as Alternative 1. It would leave the Cardinal Substation following Segments Z, Y, X, P, and O; through the new Hill Valley Substation Alternative 2; then follow Segment D before nearing the Mississippi River, where it would cross southeast on Segment C; follow part of Segment B to the Stoneman Substation; exit south of the Stoneman Substation and cross the Mississippi River on the remainder of Segment B; and then follow Segment C-IA and western Segment D-IA into the Hickory Creek Substation.

Alternative 3: North–South Crossover Corridor

Alternative 3 also would initially follow Alternative 1 along segments Y, W, P, and O. The alternative uses the new Hill Valley Substation Alternative 2, although either substation location is feasible. The alternative would generally exit south out of the Hill Valley Substation and follow Segments M and K south. North of Livingston, the alternative would follow Segment I on the east side of the town; then south again on Segment H, then traverse west on Segments G, F, and E; then turn south to follow Segment B and to the Stoneman Substation in Cassville, Wisconsin. The alternative would cross the Mississippi River on the remainder of Segment B, and then follow the eastern Segments C-IA and A-IA into the Hickory Creek Substation.

Alternative 4: South Baseline Corridor

Alternative 4 would leave the Cardinal Substation and traverse westerly on Segments Y and W; just south of Cross Plains it would generally traverse south along Segments V and T until it passes just east of Mount Horeb. Alternative 4 would then follow U.S. Highway 18 along Segment S, until it reaches and then passes on the north side of Dodgeville and traverses west on Segment Q and N; then follow Segment O south in the new Hill Valley Substation Alternative 2.

After leaving the substation, the transmission line would go south on Segments M and K; then just north of Livingston it would follow Segment I on the east side of the town; then south again on Segment H, then traverse west on Segments G, F, and E; then turn south to follow Segment B and to the Stoneman

Substation; cross the Mississippi River on the remainder of Segment B, and then follow the eastern Segments C-IA and A-IA into the Hickory Creek Substation.

Alternative 5: South Alternative Corridor

Alternative 5 would follow much of the same route as Alternative 4, with a few adjustments. It would initially leave the Cardinal Substation and traverse westerly on Segments Y and W. Just south of Cross Plains it would generally traverse south along Segments V and U to pass just west of Klevenville. The alternative would then pass on just south of Mount Horeb, heading southwest along U.S. Highway 18 and along Segment S; then diverge just east of Dodgeville and follow Segment R south of Dodgeville. The alternative would turn west again, traversing north on Segment L to enter the new Hill Valley Substation Alternative 1.

After leaving the substation, the transmission line would travel south on Segments L and K; then just north of Livingston it would follow Segment J to go around the west side of the town; then south again on Segment H, then traverse west on Segments G, F, E, and C; then turn south to the Nelson Dewey Substation. After leaving the Nelson Dewey Substation, the alternative turns south on Segment A and then follows Segment B-IA and the western Segment D-IA into the Hickory Creek Substation. Under this alternative, the existing 161/69-kV double-circuit configuration at the existing Stoneman Substation Mississippi River crossing would be removed, which would also result in a modification of the physical structure of the Stoneman Substation.

Alternative 6: South–North Crossover Corridor

Alternative 6 would initially follow the southernmost route from the Cardinal Substation, using Segments Z, Y, and W. Just south of Cross Plains it would generally traverse south along Segments V and T until it passes just east of Mount Horeb. The alternative then turns southwest along U.S. Highway 18 and along Segment S, until it reaches and then passes on the north side of Dodgeville and traverses west on Segments Q and N into the new Hill Valley Substation Alternative 1.

Once leaving the Hill Valley Substation the route would cross into the southern portion of the Alternative 1 route. It would follow a portion of Segment L before then following Segments D and A to the Nelson Dewey Substation, just northwest of Cassville, Wisconsin. Once the line exits southward from the Nelson Dewey Substation, it would cross the Mississippi River using the remainder of Segment A and Segment B-IA, and generally traverse south on Segment A-IA to terminate at the Hickory Creek Substation in Clayton County, Iowa. Under this alternative, the existing 161/69-kV double-circuit configuration at the existing Stoneman Substation Mississippi River crossing would be removed, which would also result in a modification of the physical structure of the Stoneman Substation.

Table C-1. Details of Proposed Transmission Line Segments

Segment Name*	Action Alternatives					
	1	2	3	4	5	6
	North Baseline	North Alternate	North–South Crossover	South Baseline	South Alternate	South–North Crossover
Z		**X**				**X**
Z02						X
Z01B		X				X
Z01A		X				

Segment Name*	Action Alternatives					
	1	2	3	4	5	6
	North Baseline	North Alternate	North–South Crossover	South Baseline	South Alternate	South–North Crossover
Y	**X**	**X**	**X**	**X**	**X**	**X**
Y08	X	X	X	X	X	X
Y07	X	X	X	X	X	X
Y06B	X		X	X	X	
Y06A	X		X	X	X	X
Y05	X	X	X	X	X	X
Y01B	X	X	X	X	X	X
Y01A	X	X	X	X	X	X
X		**X**				
X02		X				
X01		X				
W	**X**		**X**	**X**	**X**	**X**
W04	X		X	X	X	X
W03	X		X	X	X	X
W02	X		X			
W01	X		X			
V				**X**	**X**	**X**
V06				X	X	X
V05				X	X	X
V04				X	X	X
V03				X	X	X
V02				X	X	X
V01				X	X	X
U					**X**	
U02					X	
U01					X	
T				**X**		**X**
T05				X		X
T04				X		X
T03				X		X
T02				X		X
T01				X		X
S				**X**	**X**	**X**
S13				X	X	X
S12				X	X	X
S11D					X	
S11C						
S11B					X	

Segment Name*	Action Alternatives					
	1	2	3	4	5	6
	North Baseline	North Alternate	North–South Crossover	South Baseline	South Alternate	South–North Crossover
S11A					X	
S10D				X		X
S10C				X		X
S10B				X		X
S10A				X		X
S09				X	X	X
S08				X	X	X
S05				X	X	X
S04				X	X	X
S03				X	X	
S02				X		
S01						X
R					**X**	
R15					X	
R14						
R13						
R11						
R10						
R09					X	
R08					X	
R07					X	
R06					X	
R05					X	
R04					X	
R03					X	
R02					X	
R01					X	
Q				**X**		**X**
Q06				X		X
Q05				X		X
Q04				X		X
Q03				X		X
Q02				X		X
Q01				X		X
P	**X**	**X**	**X**			
P09	X	X	X			
P08	X	X	X			
P07	X	X	X			

Segment Name*	Action Alternatives					
	1	2	3	4	5	6
	North Baseline	North Alternate	North–South Crossover	South Baseline	South Alternate	South–North Crossover
P06	X	X	X			
P05	X	X	X			
P04	X	X	X			
P03	X	X	X			
P02	X	X	X			
P01	X	X	X			
O		**X**	**X**	**X**		
O03		X	X	X		
O02		X	X			
O01		X	X	X		
N	**X**	**X**	**X**	**X**	**X**	**X**
N07	X	X	X	X	X	X
N06	X			X		X
N05	X			X		X
N04	X	X	X	X		X
N03	X				X	X
N01	X				X	X
Substation Alternatives						
Hill Valley Substation 2		X	X	X		
Hill Valley Substation 1	X				X	X
M			**X**	**X**		
M02			X	X		
M01			X	X		
L	**X**				**X**	**X**
L05	X				X	X
L04					X	
L03					X	
L02					X	
L01					X	
K			**X**	**X**	**X**	
K01			X	X	X	
J					**X**	
J04					X	
J03					X	
J02					X	
J01					X	

Segment Name*	Action Alternatives					
	1	2	3	4	5	6
	North Baseline	North Alternate	North–South Crossover	South Baseline	South Alternate	South–North Crossover
I			**X**	**X**		
I09			X	X		
I08			X	X		
I07			X	X		
I06			X	X		
I05			X	X		
I02			X	X		
I01			X	X		
H			**X**	**X**	**X**	
H09			X	X	X	
H07			X	X	X	
H06			X	X	X	
H03			X	X	X	
H02			X	X	X	
H01			X	X	X	
G			**X**	**X**	**X**	
G09			X	X	X	
G08			X	X	X	
G06			X	X	X	
G04			X		X	
G01			X	X	X	
F			**X**	**X**	**X**	
F06			X		X	
F04			X		X	
F03				X		
F02				X		
F01			X	X	X	
E			**X**	**X**	**X**	
E19			X	X	X	
E18			X	X	X	
E16			X	X	X	
E14			X	X	X	
E13			X	X	X	
E12			X	X	X	
E10			X	X	X	
E09			X	X	X	
E07			X	X	X	
E06			X	X	X	

Segment Name*	Action Alternatives					
	1	2	3	4	5	6
	North Baseline	North Alternate	North–South Crossover	South Baseline	South Alternate	South–North Crossover
E04			X	X	X	
E03			X	X	X	
E01			X	X	X	
D	**X**	**X**				**X**
D10	X	X				X
D09B						
D09A	X	X				X
D08	X	X				X
D05	X	X				X
D04	X	X				X
D03	X	X				X
D01	X	X				X
C	**X**	**X**			**X**	
C04					X	
C03		X				
C02B					X	
C02A	X				X	
C01		X				
B		**X**	**X**	**X**		
B04			X	X		
B03			X	X		
B02		X	X	X		
B01		X	X	X		
A	**X**				**X**	**X**
A03	X					X
A02	X					X
A01C	X					
A01B						X
A01A	X				X	X
Iowa						
C-IA		X	X	X		
B-IA	X				X	X
A-IA	X		X	X		X
D-IA		X			X	

* Table 0-1 was developed using version 5 of the Utilities' routing data. Since this table was developed, additional route subsegments have been added to several segments. These additional subsegments were not included in the preliminary screening process.

SUMMARY OF PRELIMINARY RESOURCE IMPACTS BY ALTERNATIVE AND SUBSEGMENT

As part of the alternatives development process, RUS also conducted a preliminary evaluation of potential resource impacts for each action alternative considered in this EIS. This preliminary evaluation is not intended to replace detailed impact analysis the environmental consequences section of this EIS. Instead, this preliminary evaluation was used to determine the reasonableness and technical feasibility of the action alternatives carried forward for detailed analysis. Table C-2 summarizes the evaluation factors used to conduct the preliminary resource impact review. Table C-3 summarizes the results of the preliminary evaluation. These factors are also presented for each action alternative in Table C-4 through Table C-10.

Table C-2. Preliminary Resource Impact Evaluation Factors

Variable	Units of Measurement, within the 300-foot Corridor	Total or Subcategories per Subsegment
Length	Feet and miles	Total
Study Area	Acres within 300-ft analysis area	Total
Off-ROW Access Roads	Number	Total
High-Potential Rusty Patched Bumble Bee (RPBB) Habitat	Acres	Total
Steep Slopes	Acres	Total (slopes equal to and greater than 30%)
Prime Farmlands	Acres	Total (prime farmland and farmland of statewide importance)
Land Cover	Acres	• Forested • Urban/Developed
Sensitive Receptors	Number	Total (including residences, schools, hospitals, daycares, churches/cemeteries)
Wetlands	Acres	Total (based on Cowardin Classifications)
Floodplains	Acres	Total (100-year floodplains)
Water bodies	• Number of streams crossed • Acres	Total
Environmentally sensitive areas	Acres	Total

Table C-3. Summary of Preliminary Resource Impacts by Action Alternative

Variable	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Length (miles)	99	104	116	119	124	105
Study Area (acres)	3,607.3	3,763.3	4,256.2	4,364.8	4,549.1	3,872.9
Off-ROW Access Roads (number)	65.2	66.5	46.7	35.6	40.6	53.8
High-Potential RPBB Habitat (acres)	156.8	175.1	158.4	106.7	95.7	116.4
Steep Slopes (acres)	346	341.7	346.6	184.0	194.6	173.8
Prime Farmland (acres)	1,769.2	1,860.3	2,518.4	3,076.9	3,228.8	2,445.5
Land Cover Forested (acres)	1,050.9	1,073.7	1,048.3	475.3	480	461.4
Land Cover Urban (acres)	139.3	194.4	219.9	612.7	524.5	606.2

Variable	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Length (miles)	99	104	116	119	124	105
Sensitive Receptors (number)	22	43	59	81	59	49
Wetlands (acres)	160.9	196.9	172.5	96.7	78.5	90.7
Floodplains (acres)	304.3	295	226.8	171.3	169.1	228.9
Water bodies (number)	94	95	98	102	118	107
Water bodies (acres)	24.4	20.5	17.3	16.5	18.9	22.8
Environmentally sensitive areas (acres)	69.3	96.3	107.4	112.0	88.6	71.1

Table C-4. Resource Summary for Alternative 1

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forest (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water Bodies (number)	Water Bodies (acres)	Env. Sensitive Areas (acres)
Y08	0.7	25.0	10.8	2.0	10.5	16.5	1.4	0.0	2.8	0.0	0.0	0.0	0.0
Y07	0.0	1.6	0.0	0.0	1.6	0.0	0.4	0.0	0.2	0.0	0.0	0.0	0.0
Y06B	1.4	51.7	18.8	4.0	37.6	10.7	2.0	0.0	6.7	14.6	5.0	0.7	18.3
Y06A	0.1	3.2	3.2	0.0	3.2	0.2	0.8	0.0	0.1	1.6	3.0	0.1	0.1
Y05	0.5	19.4	19.4	0.0	17.7	0.5	4.8	0.0	0.2	6.5	1.0	0.0	0.0
Y01B	0.2	20.3	20.3	0.0	14.6	2.4	6.6	3.0	1.1	1.6	2.0	0.0	0.0
Y01A	0.6	18.6	7.6	0.0	11.8	1.6	8.5	0.0	0.0	0.3	1.0	0.1	0.3
W04	0.1	3.3	0.0	0.0	3.3	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0
W03	0.6	21.2	0.0	0.0	18.5	1.5	5.4	4.0	0.4	0.3	0.0	0.0	0.0
W02	0.3	9.5	0.0	0.6	2.5	4.6	1.5	1.0	0.0	0.0	0.0	0.0	0.0
W01	0.2	6.7	0.0	0.9	0.0	4.9	0.8	0.0	0.0	0.0	0.0	0.0	0.0
P09	23.6	857.8	49.8	123.6	282.8	481.9	15.7	3.0	85.5	55.6	29.0	0.8	1.5
P08	0.4	16.3	0.0	0.0	16.3	0.0	4.6	1.0	0.0	0.0	0.0	0.0	0.0
P07	2.5	89.3	0.0	6.2	50.2	22.9	3.2	0.0	0.3	0.0	1.0	0.0	0.1
P06	1.8	66.1	0.0	0.9	43.7	6.5	10.9	1.0	0.0	0.0	0.0	0.0	0.0
P05	2.9	105.2	0.0	8.6	56.9	30.7	2.4	1.0	0.3	0.0	3.0	0.0	0.0
P04	0.9	33.5	0.0	1.6	29.2	6.4	3.6	0.0	0.0	0.0	0.0	0.0	0.0
P03	3.1	113.4	24.4	14.4	33.2	56.2	2.9	0.0	0.7	4.9	3.0	0.2	0.8
P02	8.7	316.6	1.8	20.7	122.9	86.8	4.4	1.0	4.4	1.7	14.0	0.1	17.7
P01	0.3	10.2	0.0	0.0	7.3	2.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0
N07	0.2	6.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0
N06	0.0	0.3	0.0	0.0	0.3	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
N05	0.2	8.6	0.0	0.0	8.6	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forest (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water Bodies (number)	Water Bodies (acres)	Env. Sensitive Areas (acres)
N04	0.0	0.6	0.0	0.0	0.6	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
N03	0.3	10.5	0.0	0.0	10.5	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
N01	0.7	23.5	0.0	0.0	21.1	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Hill Valley Sub 1	0.0	9.7	0.0	0.0	9.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L05	0.0	1.5	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D10	0.1	5.2	0.0	0.0	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D09A	0.5	19.1	0.0	0.0	19.1	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
D08	14.5	527.5	0.0	27.1	245.2	65.4	6.5	1.0	20.7	49.6	10.0	4.0	0.0
D05	0.3	11.5	0.0	0.0	11.5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
D04	14.5	526.7	0.0	72.3	192.9	130.1	7.6	1.0	11.2	80.7	14.0	6.6	0.0
D03	0.9	29.6	0.0	0.3	19.4	0.6	1.8	1.0	0.0	0.0	0.0	0.0	0.0
D01	1.6	59.5	0.0	8.6	19.7	10.7	0.0	0.0	0.5	0.0	0.0	0.0	0.0
C02A	0.1	4.1	0.0	0.0	0.0	0.0	3.4	0.0	0.0	0.7	0.0	0.0	0.3
A03	1.0	35.7	0.0	11.4	9.9	10.6	2.2	0.0	0.0	0.0	1.0	0.0	0.0
A02	0.2	7.6	0.0	2.5	4.5	1.1	0.7	0.0	0.0	1.7	0.0	0.0	0.0
A01C	0.1	3.1	0.7	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0
A01A	0.1	5.1	0.0	0.0	0.0	0.0	4.1	0.0	0.0	5.0	0.0	4.5	0.4
B-IA	2.1	77.5	0.0	8.4	53.1	10.1	0.3	0.0	23.4	49.5	0.0	6.3	29.8
A-IA	12.3	445.5	0.0	31.9	372.6	85.4	25.0	4.0	1.3	30.0	7.0	1.0	0.0
Total	**98.6**	**3,607.3**	**156.8**	**346.0**	**1,769.2**	**1,050.9**	**139.3**	**22.0**	**160.9**	**304.3**	**94.0**	**24.4**	**69.3**

Table C-5. Resource Summary for Alternative 2

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forested (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water Bodies (number)	Water Bodies (acres)	Env. Sensitive Areas (acres)
Z01B	0.8	28.3	14.4	0.1	25.1	5.8	9.3	1.0	3.2	2.1	1.0	0.0	9.5
Z01A	0.8	26.6	26.6	4.8	14.5	11.9	5.2	0.0	4.5	4.0	3.0	0.1	8.2
Y08	0.7	25.0	10.8	2.0	10.5	16.5	1.4	0.0	2.8	0.0	0.0	0.0	0.0
Y07	0.0	1.6	0.0	0.0	1.6	0.0	0.4	0.0	0.2	0.0	0.0	0.0	0.0
Y05	0.5	19.4	19.4	0.0	17.7	0.5	4.8	0.0	0.2	6.5	1.0	0.0	0.0
Y01B	0.2	20.3	20.3	0.0	14.6	2.4	6.6	3.0	1.1	1.6	2.0	0.0	0.0
Y01A	0.6	18.6	7.6	0.0	11.8	1.6	8.5	0.0	0.0	0.3	1.0	0.1	0.3
X02	0.8	29.6	0.0	0.0	29.5	0.0	2.5	0.0	7.2	10.2	0.0	0.0	0.0
X01	0.5	17.2	0.0	0.9	2.9	7.6	3.0	0.0	0.0	0.0	0.0	0.0	0.0
P09	23.6	857.8	49.8	123.6	282.8	481.9	15.7	3.0	85.5	55.6	29.0	0.8	1.5
P08	0.4	16.3	0.0	0.0	16.3	0.0	4.6	1.0	0.0	0.0	0.0	0.0	0.0
P07	2.5	89.3	0.0	6.2	50.2	22.9	3.2	0.0	0.3	0.0	1.0	0.0	0.1
P06	1.8	66.1	0.0	0.9	43.7	6.5	10.9	1.0	0.0	0.0	0.0	0.0	0.0
P05	2.9	105.2	0.0	8.6	56.9	30.7	2.4	1.0	0.3	0.0	3.0	0.0	0.0
P04	0.9	33.5	0.0	1.6	29.2	6.4	3.6	0.0	0.0	0.0	0.0	0.0	0.0
P03	3.1	113.4	24.4	14.4	33.2	56.2	2.9	0.0	0.7	4.9	3.0	0.2	0.8
P02	8.7	316.6	1.8	20.7	122.9	86.8	4.4	1.0	4.4	1.7	14.0	0.1	17.7
P01	0.3	10.2	0.0	0.0	7.3	2.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0
O03	0.3	9.2	0.0	0.0	9.2	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0
O02	0.5	17.9	0.0	0.0	16.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
O01	0.3	9.5	0.0	0.0	9.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
N07	0.2	6.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0
N04	0.0	0.6	0.0	0.0	0.6	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forested (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water Bodies (number)	Water Bodies (acres)	Env. Sensitive Areas (acres)
Hill Valley Sub 2	0.0	10.4	0.0	0.0	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D10	0.1	5.2	0.0	0.0	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D09B	0.4	15.7	0.0	0.0	14.1	0.0	2.2	0.0	0.0	0.0	1.0	0.0	0.0
D08	14.5	527.5	0.0	27.1	245.2	65.4	6.5	1.0	20.7	49.6	10.0	4.0	0.0
D05	0.3	11.5	0.0	0.0	11.5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
D04	14.5	526.7	0.0	72.3	192.9	130.1	7.6	1.0	11.2	80.7	14.0	6.6	0.0
D03	0.9	29.6	0.0	0.3	19.4	0.6	1.8	1.0	0.0	0.0	0.0	0.0	0.0
D01	1.6	59.5	0.0	8.6	19.7	10.7	0.0	0.0	0.5	0.0	0.0	0.0	0.0
C03	0.6	20.7	0.0	4.7	0.8	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C01	0.7	24.3	0.0	7.4	9.7	11.2	0.7	1.0	0.0	0.0	0.0	0.0	0.0
B02	0.5	17.1	0.0	2.8	10.4	4.7	11.4	20.0	0.0	0.9	0.0	0.0	0.4
B01	0.1	4.2	0.0	0.0	0.0	0.0	0.4	0.0	0.0	4.0	0.0	3.8	1.0
D-IA	16.2	585.4	0.0	26.5	486.2	77.6	70.8	8.0	0.5	13.4	12.0	0.2	0.0
C-IA	2.4	87.3	0.0	8.2	29.6	23.6	0.3	0.0	53.6	59.5	0.0	4.6	56.8
Total	**103.2**	**3,763.3**	**175.1**	**341.7**	**1,860.3**	**1,073.7**	**194.4**	**43.0**	**196.9**	**295.0**	**95.0**	**20.5**	**96.3**

Table C-6. Resource Summary for Alternative 3

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forested (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water Bodies (number)	Water Bodies (acres)	Env. Sensitive Areas (acres)
Y08	0.7	25.0	10.8	2.0	10.5	16.5	1.4	0.0	2.8	0.0	0.0	0.0	0.0
Y07	0.0	1.6	0.0	0.0	1.6	0.0	0.4	0.0	0.2	0.0	0.0	0.0	0.0
Y06B	1.4	51.7	18.8	4.0	37.6	10.7	2.0	0.0	6.7	14.6	5.0	0.7	18.3
Y06A	0.1	3.2	3.2	0.0	3.2	0.2	0.8	0.0	0.1	1.6	3.0	0.1	0.1
Y05	0.5	19.4	19.4	0.0	17.7	0.5	4.8	0.0	0.2	6.5	1.0	0.0	0.0
Y01B	0.2	20.3	20.3	0.0	14.6	2.4	6.6	3.0	1.1	1.6	2.0	0.0	0.0
Y01A	0.6	18.6	7.6	0.0	11.8	1.6	8.5	0.0	0.0	0.3	1.0	0.1	0.3
W04	0.1	3.3	0.0	0.0	3.3	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0
W03	0.6	21.2	0.0	0.0	18.5	1.5	5.4	4.0	0.4	0.3	0.0	0.0	0.0
W02	0.3	9.5	0.0	0.6	2.5	4.6	1.5	1.0	0.0	0.0	0.0	0.0	0.0
W01	0.2	6.7	0.0	0.9	0.0	4.9	0.8	0.0	0.0	0.0	0.0	0.0	0.0
P09	23.6	857.8	49.8	123.6	282.8	481.9	15.7	3.0	85.5	55.6	29.0	0.8	1.5
P08	0.4	16.3	0.0	0.0	16.3	0.0	4.6	1.0	0.0	0.0	0.0	0.0	0.0
P07	2.5	89.3	0.0	6.2	50.2	22.9	3.2	0.0	0.3	0.0	1.0	0.0	0.1
P06	1.8	66.1	0.0	0.9	43.7	6.5	10.9	1.0	0.0	0.0	0.0	0.0	0.0
P05	2.9	105.2	0.0	8.6	56.9	30.7	2.4	1.0	0.3	0.0	3.0	0.0	0.0
P04	0.9	33.5	0.0	1.6	29.2	6.4	3.6	0.0	0.0	0.0	0.0	0.0	0.0
P03	3.1	113.4	24.4	14.4	33.2	56.2	2.9	0.0	0.7	4.9	3.0	0.2	0.8
P02	8.7	316.6	1.8	20.7	122.9	86.8	4.4	1.0	4.4	1.7	14.0	0.1	17.7
P01	0.3	10.2	0.0	0.0	7.3	2.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0
O03	0.3	9.2	0.0	0.0	9.2	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0
O02	0.5	17.9	0.0	0.0	16.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
O01	0.3	9.5	0.0	0.0	9.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
N07	0.2	6.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forested (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water Bodies (number)	Water Bodies (acres)	Env. Sensitive Areas (acres)
N04	0.0	0.6	0.0	0.0	0.6	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Hill Valley Sub 2	0.0	10.4	0.0	0.0	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M02	0.6	22.5	0.0	0.0	16.0	0.0	0.2	0.0	1.0	0.0	1.0	0.0	0.0
M01	0.7	24.6	0.0	0.0	23.7	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
K01	2.0	70.9	0.0	0.0	70.9	0.0	11.8	1.0	0.3	0.0	1.0	0.0	0.0
I09	0.7	25.5	0.0	0.0	25.5	0.0	2.2	0.0	0.7	0.0	0.0	0.0	0.0
I08	1.0	36.4	0.0	0.3	33.6	0.1	0.1	0.0	2.3	2.4	2.0	0.5	0.0
I07	0.3	12.9	0.0	0.0	12.9	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0
I06	0.2	6.4	0.0	0.0	6.4	0.0	1.0	1.0	0.6	0.0	1.0	0.0	0.0
I05	0.6	20.6	0.0	0.0	20.4	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0
I02	0.3	11.8	0.0	0.0	11.8	0.0	1.8	1.0	0.0	0.0	0.0	0.0	0.0
I01	0.1	3.0	0.0	0.0	3.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0
H09	2.0	70.9	0.0	0.0	69.1	2.0	10.8	3.0	0.0	0.0	1.0	0.0	0.0
H07	1.4	49.9	0.0	0.0	49.9	0.1	6.6	1.0	0.0	0.0	0.0	0.0	0.0
H06	3.4	116.7	0.0	0.9	106.2	2.0	15.4	2.0	0.0	0.0	2.0	0.0	0.0
H03	0.6	21.1	0.0	0.1	17.1	0.0	2.9	2.0	1.1	0.0	1.0	0.0	0.0
H02	3.3	119.2	0.0	0.2	109.6	1.1	4.3	3.0	0.3	0.0	1.0	0.2	0.0
H01	0.5	18.2	0.0	0.0	18.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.7
G09	1.5	54.2	0.0	0.0	54.2	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
G08	3.7	133.9	0.0	0.0	133.9	0.4	1.1	1.0	1.1	0.0	3.0	0.0	0.0
G06	1.8	67.1	0.0	0.0	67.1	0.1	11.0	3.0	1.5	0.0	0.0	0.0	0.0
G04	0.9	31.9	0.0	0.0	31.9	0.0	4.2	0.0	0.0	0.0	0.0	0.0	0.0
G01	0.3	9.8	0.0	0.0	9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F06	0.2	7.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F04	0.6	20.1	2.3	0.0	20.1	0.6	0.3	0.0	0.0	0.0	0.0	0.0	0.0

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forested (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water Bodies (number)	Water Bodies (acres)	Env. Sensitive Areas (acres)
F01	0.3	9.4	0.0	0.0	9.4	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
E19	4.0	145.7	0.0	17.5	75.7	31.7	2.0	0.0	0.4	2.8	4.0	0.4	9.7
E18	0.4	15.5	0.0	0.0	5.7	0.0	1.6	1.0	0.0	0.0	0.0	0.0	0.0
E16	4.1	151.0	0.0	24.3	60.8	35.5	1.9	1.0	2.4	7.7	7.0	1.1	0.0
E14	0.8	31.0	0.0	0.1	17.5	0.0	1.2	0.0	0.5	0.0	0.0	0.0	0.0
E13	0.2	8.7	0.0	0.0	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E12	0.4	16.0	0.0	0.0	16.0	0.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0
E10	4.6	166.3	0.0	27.9	70.5	43.8	3.5	0.0	2.0	0.0	2.0	1.4	0.0
E09	0.6	21.1	0.0	0.8	5.7	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
E07	3.9	140.0	0.0	28.1	37.1	38.9	2.7	0.0	0.2	32.4	0.0	2.2	0.0
E06	0.6	25.5	0.0	0.3	8.0	3.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0
E04	0.5	18.6	0.0	0.2	7.8	2.2	0.7	0.0	0.0	0.0	0.0	0.0	0.0
E03	0.3	11.7	0.0	0.0	8.4	0.0	2.2	0.0	0.1	0.0	0.0	0.0	0.0
E01	3.5	126.7	0.0	14.7	41.5	25.8	1.1	0.0	0.4	0.0	1.0	0.1	0.0
B04	0.4	13.5	0.0	3.1	6.3	4.7	0.2	0.0	0.0	0.0	1.0	0.0	0.0
B03	0.1	4.3	0.0	1.7	1.1	3.4	0.0	0.0	0.0	0.0	1.0	0.0	0.0
B02	0.5	17.1	0.0	2.8	10.4	4.7	11.4	20.0	0.0	0.9	0.0	0.0	0.4
B01	0.1	4.2	0.0	0.0	0.0	0.0	0.4	0.0	0.0	4.0	0.0	3.8	1.0
C-IA	2.4	87.3	0.0	8.2	29.6	23.6	0.3	0.0	53.6	59.5	0.0	4.6	56.8
A-IA	12.3	445.5	0.0	31.9	372.6	85.4	25.0	4.0	1.3	30.0	7.0	1.0	0.0
Total	**116.9**	**4,256.2**	**158.4**	**346.6**	**2,518.4**	**1,048.3**	**219.9**	**59.0**	**172.5**	**226.8**	**98.0**	**17.3**	**107.4**

Table C-7. Resource Summary for Alternative 4

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forested (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water bodies (number)	Water bodies (acres)	Env. Sensitive Areas (acres)
Y08	0.7	25.0	10.8	2.0	10.5	16.5	1.4	0.0	2.8	0.0	0.0	0.0	0.0
Y07	0.0	1.6	0.0	0.0	1.6	0.0	0.4	0.0	0.2	0.0	0.0	0.0	0.0
Y06B	1.4	51.7	18.8	4.0	37.6	10.7	2.0	0.0	6.7	14.6	5.0	0.7	18.3
Y06A	0.1	3.2	3.2	0.0	3.2	0.2	0.8	0.0	0.1	1.6	3.0	0.1	0.1
Y05	0.5	19.4	19.4	0.0	17.7	0.5	4.8	0.0	0.2	6.5	1.0	0.0	0.0
Y01B	0.2	20.3	20.3	0.0	14.6	2.4	6.6	3.0	1.1	1.6	2.0	0.0	0.0
Y01A	0.6	18.6	7.6	0.0	11.8	1.6	8.5	0.0	0.0	0.3	1.0	0.1	0.3
W04	0.1	3.3	0.0	0.0	3.3	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0
W03	0.6	21.2	0.0	0.0	18.5	1.5	5.4	4.0	0.4	0.3	0.0	0.0	0.0
V06	0.2	7.0	0.0	0.3	3.4	2.4	1.4	0.0	0.0	0.0	0.0	0.0	0.0
V05	0.1	2.4	0.0	0.0	0.5	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0
V04	3.0	107.5	0.0	8.3	35.1	37.5	9.5	1.0	0.0	0.0	2.0	0.0	0.0
V03	0.7	25.6	0.0	0.7	18.3	0.5	1.2	0.0	0.4	0.0	0.0	0.0	0.0
V02	0.4	14.0	0.0	0.1	6.5	3.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0
V01	0.3	9.0	0.0	0.0	8.1	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
T05	0.8	27.5	0.0	0.1	23.3	4.0	4.7	2.0	0.1	0.0	0.0	0.0	0.0
T04	0.5	20.4	0.0	0.0	13.7	4.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0
T03	1.3	47.2	0.0	1.8	23.6	15.4	0.3	0.0	0.5	0.0	3.0	0.0	0.0
T02	0.4	16.0	0.0	0.0	2.3	0.1	2.5	0.0	0.0	0.0	0.0	0.0	0.0
T01	1.2	44.1	0.0	1.1	15.4	10.5	1.7	0.0	1.0	0.0	1.0	0.0	1.0
S13	10.4	379.8	13.3	1.2	195.7	26.0	100.0	2.0	4.9	0.1	23.0	0.1	6.8
S12	0.5	19.4	0.0	0.0	8.4	0.0	14.1	0.0	0.3	0.0	2.0	0.0	0.0
S10D	0.4	12.6	0.0	0.0	10.8	0.0	11.3	0.0	0.0	0.0	0.0	0.0	0.0

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forested (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water bodies (number)	Water bodies (acres)	Env. Sensitive Areas (acres)
S10C	0.2	5.5	0.0	0.0	2.9	0.0	2.8	1.0	0.0	0.0	0.0	0.0	0.0
S10B	0.8	28.9	0.0	0.1	18.6	0.6	10.6	0.0	0.0	0.0	1.0	0.0	16.7
S10A	0.1	2.7	0.0	0.0	2.7	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.2
S09	3.6	131.6	0.0	0.6	71.8	12.8	32.6	1.0	0.0	0.1	7.0	0.0	0.0
S08	1.6	83.2	0.0	0.0	82.5	0.0	13.6	1.0	0.0	0.0	0.0	0.0	0.0
S05	0.0	2.2	0.0	0.0	2.2	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
S04	0.9	32.0	0.0	0.0	27.6	0.0	8.8	0.0	0.0	0.0	0.0	0.0	0.0
S03	3.1	109.8	0.0	0.6	50.0	3.5	20.9	1.0	0.2	0.3	5.0	0.0	0.0
S02	0.1	3.7	0.0	0.0	3.7	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0
Q06	0.6	20.5	0.0	0.0	14.8	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0
Q05	1.0	36.3	0.0	0.0	34.6	0.5	17.1	0.0	3.8	0.0	2.0	0.0	0.0
Q04	0.5	19.1	0.0	0.0	19.1	2.8	14.4	2.0	0.0	0.0	0.0	0.0	0.0
Q03	0.5	19.8	0.0	0.0	19.8	0.4	5.4	0.0	0.0	0.0	0.0	0.0	0.0
Q02	13.2	479.7	0.0	0.0	467.3	2.0	155.1	17.0	4.2	6.3	8.0	0.2	0.0
Q01	1.1	39.0	0.0	0.0	33.1	0.0	10.8	2.0	0.0	0.0	0.0	0.0	0.0
O03	0.3	9.2	0.0	0.0	9.2	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0
O01	0.3	9.5	0.0	0.0	9.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
N07	0.2	6.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0
N06	0.0	0.3	0.0	0.0	0.3	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
N05	0.2	8.6	0.0	0.0	8.6	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0
N04	0.0	0.6	0.0	0.0	0.6	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Hill Valley Sub 2	0.0	10.4	0.0	0.0	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
M02	0.6	22.5	0.0	0.0	16.0	0.0	0.2	0.0	1.0	0.0	1.0	0.0	0.0
M01	0.7	24.6	0.0	0.0	23.7	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forested (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water bodies (number)	Water bodies (acres)	Env. Sensitive Areas (acres)
K01	2.0	70.9	0.0	0.0	70.9	0.0	11.8	1.0	0.3	0.0	1.0	0.0	0.0
I09	0.7	25.5	0.0	0.0	25.5	0.0	2.2	0.0	0.7	0.0	0.0	0.0	0.0
I08	1.0	36.4	0.0	0.3	33.6	0.1	0.1	0.0	2.3	2.4	2.0	0.5	0.0
I07	0.3	12.9	0.0	0.0	12.9	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0
I06	0.2	6.4	0.0	0.0	6.4	0.0	1.0	1.0	0.6	0.0	1.0	0.0	0.0
I05	0.6	20.6	0.0	0.0	20.4	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0
I02	0.3	11.8	0.0	0.0	11.8	0.0	1.8	1.0	0.0	0.0	0.0	0.0	0.0
I01	0.1	3.0	0.0	0.0	3.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0
H09	2.0	70.9	0.0	0.0	69.1	2.0	10.8	3.0	0.0	0.0	1.0	0.0	0.0
H07	1.4	49.9	0.0	0.0	49.9	0.1	6.6	1.0	0.0	0.0	0.0	0.0	0.0
H06	3.4	116.7	0.0	0.9	106.2	2.0	15.4	2.0	0.0	0.0	2.0	0.0	0.0
H03	0.6	21.1	0.0	0.1	17.1	0.0	2.9	2.0	1.1	0.0	1.0	0.0	0.0
H02	3.3	119.2	0.0	0.2	109.6	1.1	4.3	3.0	0.3	0.0	1.0	0.2	0.0
H01	0.5	18.2	0.0	0.0	18.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.7
G09	1.5	54.2	0.0	0.0	54.2	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
G08	3.7	133.9	0.0	0.0	133.9	0.4	1.1	1.0	1.1	0.0	3.0	0.0	0.0
G06	1.8	67.1	0.0	0.0	67.1	0.1	11.0	3.0	1.5	0.0	0.0	0.0	0.0
G01	0.3	9.8	0.0	0.0	9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F03	1.1	41.0	7.8	0.0	41.0	2.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0
F02	0.4	13.6	5.4	0.0	12.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F01	0.3	9.4	0.0	0.0	9.4	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
E19	4.0	145.7	0.0	17.5	75.7	31.7	2.0	0.0	0.4	2.8	4.0	0.4	9.7
E18	0.4	15.5	0.0	0.0	5.7	0.0	1.6	1.0	0.0	0.0	0.0	0.0	0.0
E16	4.1	151.0	0.0	24.3	60.8	35.5	1.9	1.0	2.4	7.7	7.0	1.1	0.0

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forested (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water bodies (number)	Water bodies (acres)	Env. Sensitive Areas (acres)
E14	0.8	31.0	0.0	0.1	17.5	0.0	1.2	0.0	0.5	0.0	0.0	0.0	0.0
E13	0.2	8.7	0.0	0.0	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E12	0.4	16.0	0.0	0.0	16.0	0.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0
E10	4.6	166.3	0.0	27.9	70.5	43.8	3.5	0.0	2.0	0.0	2.0	1.4	0.0
E09	0.6	21.1	0.0	0.8	5.7	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
E07	3.9	140.0	0.0	28.1	37.1	38.9	2.7	0.0	0.2	32.4	0.0	2.2	0.0
E06	0.6	25.5	0.0	0.3	8.0	3.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0
E04	0.5	18.6	0.0	0.2	7.8	2.2	0.7	0.0	0.0	0.0	0.0	0.0	0.0
E03	0.3	11.7	0.0	0.0	8.4	0.0	2.2	0.0	0.1	0.0	0.0	0.0	0.0
E01	3.5	126.7	0.0	14.7	41.5	25.8	1.1	0.0	0.4	0.0	1.0	0.1	0.0
B04	0.4	13.5	0.0	3.1	6.3	4.7	0.2	0.0	0.0	0.0	1.0	0.0	0.0
B03	0.1	4.3	0.0	1.7	1.1	3.4	0.0	0.0	0.0	0.0	1.0	0.0	0.0
B02	0.5	17.1	0.0	2.8	10.4	4.7	11.4	20.0	0.0	0.9	0.0	0.0	0.4
B01	0.1	4.2	0.0	0.0	0.0	0.0	0.4	0.0	0.0	4.0	0.0	3.8	1.0
C-IA	2.4	87.3	0.0	8.2	29.6	23.6	0.3	0.0	53.6	59.5	0.0	4.6	56.8
A-IA	12.3	445.5	0.0	31.9	372.6	85.4	25.0	4.0	1.3	30.0	7.0	1.0	0.0
Total	**119.2**	**4,364.7**	**106.6**	**184.0**	**3,076.90**	**475.3**	**612.8**	**81.0**	**96.7**	**171.4**	**102.0**	**16.5**	**112.0**

Table C-8. Resource Summary for Alternative 5

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forested (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water Bodies (number)	Water Bodies (acres)	Env. Sensitive Areas (acres)
Y08	0.7	25.0	10.8	2.0	10.5	16.5	1.4	0.0	2.8	0.0	0.0	0.0	0.0
Y07	0.0	1.6	0.0	0.0	1.6	0.0	0.4	0.0	0.2	0.0	0.0	0.0	0.0
Y06B	1.4	51.7	18.8	4.0	37.6	10.7	2.0	0.0	6.7	14.6	5.0	0.7	18.3
Y06A	0.1	3.2	3.2	0.0	3.2	0.2	0.8	0.0	0.1	1.6	3.0	0.1	0.1
Y05	0.5	19.4	19.4	0.0	17.7	0.5	4.8	0.0	0.2	6.5	1.0	0.0	0.0
Y01B	0.2	20.3	20.3	0.0	14.6	2.4	6.6	3.0	1.1	1.6	2.0	0.0	0.0
Y01A	0.6	18.6	7.6	0.0	11.8	1.6	8.5	0.0	0.0	0.3	1.0	0.1	0.3
W04	0.1	3.3	0.0	0.0	3.3	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0
W03	0.6	21.2	0.0	0.0	18.5	1.5	5.4	4.0	0.4	0.3	0.0	0.0	0.0
V06	0.2	7.0	0.0	0.3	3.4	2.4	1.4	0.0	0.0	0.0	0.0	0.0	0.0
V05	0.1	2.4	0.0	0.0	0.5	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0
V04	3.0	107.5	0.0	8.3	35.1	37.5	9.5	1.0	0.0	0.0	2.0	0.0	0.0
V03	0.7	25.6	0.0	0.7	18.3	0.5	1.2	0.0	0.4	0.0	0.0	0.0	0.0
V02	0.4	14.0	0.0	0.1	6.5	3.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0
V01	0.3	9.0	0.0	0.0	8.1	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
U02	3.2	116.2	0.0	0.2	77.0	17.1	8.9	0.0	1.9	3.9	5.0	0.0	0.7
U01	1.0	38.0	0.0	0.0	14.9	0.0	7.9	0.0	0.1	0.0	1.0	0.0	0.0
S13	10.4	379.8	13.3	1.2	195.7	26.0	100.0	2.0	4.9	0.1	23.0	0.1	6.8
S12	0.5	19.4	0.0	0.0	8.4	0.0	14.1	0.0	0.3	0.0	2.0	0.0	0.0
S11D	0.4	14.3	0.0	0.0	13.8	0.0	5.0	0.0	0.0	0.0	0.0	0.0	3.5
S11B	0.9	37.4	0.0	0.1	26.0	0.1	10.1	0.0	0.0	0.0	0.0	0.0	17.7
S11A	0.1	3.7	0.0	0.0	3.7	0.7	1.3	0.0	0.0	0.0	0.0	0.0	0.3
S09	3.6	131.6	0.0	0.6	71.8	12.8	32.6	1.0	0.0	0.1	7.0	0.0	0.0

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forested (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water Bodies (number)	Water Bodies (acres)	Env. Sensitive Areas (acres)
S08	1.6	83.2	0.0	0.0	82.5	0.0	13.6	1.0	0.0	0.0	0.0	0.0	0.0
S05	0.0	2.2	0.0	0.0	2.2	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
S04	0.9	32.0	0.0	0.0	27.6	0.0	8.8	0.0	0.0	0.0	0.0	0.0	0.0
S03	3.1	109.8	0.0	0.6	50.0	3.5	20.9	1.0	0.2	0.3	5.0	0.0	0.0
R15	1.9	65.0	0.0	0.5	35.0	12.2	9.8	0.0	1.1	0.0	4.0	0.0	0.0
R10	0.1	3.1	0.0	0.0	1.9	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
R09	7.6	275.7	0.0	0.1	233.3	5.5	43.5	11.0	9.8	5.9	11.0	0.2	0.0
R08	0.3	9.4	0.0	0.0	9.4	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0
R07	1.0	37.0	0.0	0.0	37.0	1.1	2.9	0.0	0.8	0.0	1.0	0.0	0.0
R06	1.3	46.4	0.0	0.0	39.7	0.1	5.5	1.0	1.9	1.1	2.0	0.1	0.0
R05	1.0	35.0	0.0	0.1	31.1	9.6	0.1	0.0	3.3	0.5	3.0	0.0	0.0
R04	0.3	11.2	0.0	0.0	11.2	0.0	1.4	0.0	0.2	0.0	1.0	0.0	0.0
R03	5.7	207.7	0.0	0.0	203.1	0.5	44.8	10.0	4.4	1.8	6.0	0.3	0.0
R02	0.2	6.6	0.0	0.0	5.4	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0
R01	0.3	9.9	0.0	0.0	9.9	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0
N07	0.2	6.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0
N03	0.3	10.5	0.0	0.0	10.5	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
N01	0.7	23.5	0.0	0.0	21.1	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Hill Valley Sub 1	0.0	9.7	0.0	0.0	9.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L05	0.0	1.5	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L04	0.3	12.3	0.0	0.0	11.2	0.7	0.3	0.0	0.5	0.0	1.0	0.0	0.0
L03	0.0	1.5	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L02	0.5	17.0	0.0	0.0	17.0	0.0	0.3	0.0	0.0	0.0	1.0	0.0	0.0
L01	0.2	8.7	0.0	0.0	8.7	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forested (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water Bodies (number)	Water Bodies (acres)	Env. Sensitive Areas (acres)
K01	2.0	70.9	0.0	0.0	70.9	0.0	11.8	1.0	0.3	0.0	1.0	0.0	0.0
J04	0.8	29.8	0.0	0.0	29.8	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0
J03	1.0	37.7	0.0	0.0	37.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
J02	1.0	38.0	0.0	0.0	38.0	0.0	4.6	1.0	0.0	0.0	0.0	0.0	0.0
J01	2.2	80.9	0.0	0.0	80.9	0.0	8.6	1.0	2.1	0.0	1.0	0.0	0.0
H09	2.0	70.9	0.0	0.0	69.1	2.0	10.8	3.0	0.0	0.0	1.0	0.0	0.0
H07	1.4	49.9	0.0	0.0	49.9	0.1	6.6	1.0	0.0	0.0	0.0	0.0	0.0
H06	3.4	116.7	0.0	0.9	106.2	2.0	15.4	2.0	0.0	0.0	2.0	0.0	0.0
H03	0.6	21.1	0.0	0.1	17.1	0.0	2.9	2.0	1.1	0.0	1.0	0.0	0.0
H02	3.3	119.2	0.0	0.2	109.6	1.1	4.3	3.0	0.3	0.0	1.0	0.2	0.0
H01	0.5	18.2	0.0	0.0	18.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.7
G09	1.5	54.2	0.0	0.0	54.2	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
G08	3.7	133.9	0.0	0.0	133.9	0.4	1.1	1.0	1.1	0.0	3.0	0.0	0.0
G06	1.8	67.1	0.0	0.0	67.1	0.1	11.0	3.0	1.5	0.0	0.0	0.0	0.0
G04	0.9	31.9	0.0	0.0	31.9	0.0	4.2	0.0	0.0	0.0	0.0	0.0	0.0
G01	0.3	9.8	0.0	0.0	9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F06	0.2	7.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F04	0.6	20.1	2.3	0.0	20.1	0.6	0.3	0.0	0.0	0.0	0.0	0.0	0.0
F01	0.3	9.4	0.0	0.0	9.4	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
E19	4.0	145.7	0.0	17.5	75.7	31.7	2.0	0.0	0.4	2.8	4.0	0.4	9.7
E18	0.4	15.5	0.0	0.0	5.7	0.0	1.6	1.0	0.0	0.0	0.0	0.0	0.0
E16	4.1	151.0	0.0	24.3	60.8	35.5	1.9	1.0	2.4	7.7	7.0	1.1	0.0
E14	0.8	31.0	0.0	0.1	17.5	0.0	1.2	0.0	0.5	0.0	0.0	0.0	0.0
E13	0.2	8.7	0.0	0.0	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forested (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water Bodies (number)	Water Bodies (acres)	Env. Sensitive Areas (acres)
E12	0.4	16.0	0.0	0.0	16.0	0.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0
E10	4.6	166.3	0.0	27.9	70.5	43.8	3.5	0.0	2.0	0.0	2.0	1.4	0.0
E09	0.6	21.1	0.0	0.8	5.7	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
E07	3.9	140.0	0.0	28.1	37.1	38.9	2.7	0.0	0.2	32.4	0.0	2.2	0.0
E06	0.6	25.5	0.0	0.3	8.0	3.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0
E04	0.5	18.6	0.0	0.2	7.8	2.2	0.7	0.0	0.0	0.0	0.0	0.0	0.0
E03	0.3	11.7	0.0	0.0	8.4	0.0	2.2	0.0	0.1	0.0	0.0	0.0	0.0
E01	3.5	126.7	0.0	14.7	41.5	25.8	1.1	0.0	0.4	0.0	1.0	0.1	0.0
C04	0.5	19.8	0.0	5.9	6.6	7.6	0.6	0.0	0.0	0.0	0.0	0.0	0.0
C02B	1.0	37.5	0.0	14.5	11.8	18.7	1.6	0.0	0.1	2.4	0.0	0.1	0.0
C02A	0.1	4.1	0.0	0.0	0.0	0.0	3.4	0.0	0.0	0.7	0.0	0.0	0.3
A01A	0.1	5.1	0.0	0.0	0.0	0.0	4.1	0.0	0.0	5.0	0.0	4.5	0.4
B-IA	2.1	77.5	0.0	8.4	53.1	10.1	0.3	0.0	23.4	49.5	0.0	6.3	29.8
A-IA	12.3	445.5	0.0	31.9	372.6	85.4	25.0	4.0	1.3	30.0	7.0	1.0	0.0
Total	**124.0**	**4,549.1**	**95.7**	**194.6**	**3,228.8**	**480.0**	**524.5**	**59.0**	**78.5**	**169.1**	**118.0**	**18.9**	**88.6**

Table C-9. Resource Summary for Alternative 6

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forested (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water bodies (number)	Water bodies (acres)	Env. Sensitive Areas (acres)
Z02	0.7	26.9	26.9	0.2	19.8	1.7	3.0	0.0	2.6	9.1	9.0	0.6	4.6
Z01B	0.8	28.3	14.4	0.1	25.1	5.8	9.3	1.0	3.2	2.1	1.0	0.0	9.5
Y08	0.7	25.0	10.8	2.0	10.5	16.5	1.4	0.0	2.8	0.0	0.0	0.0	0.0
Y07	0.0	1.6	0.0	0.0	1.6	0.0	0.4	0.0	0.2	0.0	0.0	0.0	0.0
Y06A	0.1	3.2	3.2	0.0	3.2	0.2	0.8	0.0	0.1	1.6	3.0	0.1	0.1
Y05	0.5	19.4	19.4	0.0	17.7	0.5	4.8	0.0	0.2	6.5	1.0	0.0	0.0
Y01B	0.2	20.3	20.3	0.0	14.6	2.4	6.6	3.0	1.1	1.6	2.0	0.0	0.0
Y01A	0.6	18.6	7.6	0.0	11.8	1.6	8.5	0.0	0.0	0.3	1.0	0.1	0.3
W04	0.1	3.3	0.0	0.0	3.3	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0
W03	0.6	21.2	0.0	0.0	18.5	1.5	5.4	4.0	0.4	0.3	0.0	0.0	0.0
V06	0.2	7.0	0.0	0.3	3.4	2.4	1.4	0.0	0.0	0.0	0.0	0.0	0.0
V05	0.1	2.4	0.0	0.0	0.5	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0
V04	3.0	107.5	0.0	8.3	35.1	37.5	9.5	1.0	0.0	0.0	2.0	0.0	0.0
V03	0.7	25.6	0.0	0.7	18.3	0.5	1.2	0.0	0.4	0.0	0.0	0.0	0.0
V02	0.4	14.0	0.0	0.1	6.5	3.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0
V01	0.3	9.0	0.0	0.0	8.1	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
T05	0.8	27.5	0.0	0.1	23.3	4.0	4.7	2.0	0.1	0.0	0.0	0.0	0.0
T04	0.5	20.4	0.0	0.0	13.7	4.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0
T03	1.3	47.2	0.0	1.8	23.6	15.4	0.3	0.0	0.5	0.0	3.0	0.0	0.0
T02	0.4	16.0	0.0	0.0	2.3	0.1	2.5	0.0	0.0	0.0	0.0	0.0	0.0
T01	1.2	44.1	0.0	1.1	15.4	10.5	1.7	0.0	1.0	0.0	1.0	0.0	1.0
S13	10.4	379.8	13.3	1.2	195.7	26.0	100.0	2.0	4.9	0.1	23.0	0.1	6.8

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forested (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water bodies (number)	Water bodies (acres)	Env. Sensitive Areas (acres)
S12	0.5	19.4	0.0	0.0	8.4	0.0	14.1	0.0	0.3	0.0	2.0	0.0	0.0
S10D	0.4	12.6	0.0	0.0	10.8	0.0	11.3	0.0	0.0	0.0	0.0	0.0	0.0
S10C	0.2	5.5	0.0	0.0	2.9	0.0	2.8	1.0	0.0	0.0	0.0	0.0	0.0
S10B	0.8	28.9	0.0	0.1	18.6	0.6	10.6	0.0	0.0	0.0	1.0	0.0	16.7
S10A	0.1	2.7	0.0	0.0	2.7	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.2
S09	3.6	131.6	0.0	0.6	71.8	12.8	32.6	1.0	0.0	0.1	7.0	0.0	0.0
S08	1.6	83.2	0.0	0.0	82.5	0.0	13.6	1.0	0.0	0.0	0.0	0.0	0.0
S05	0.0	2.2	0.0	0.0	2.2	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0
S04	0.9	32.0	0.0	0.0	27.6	0.0	8.8	0.0	0.0	0.0	0.0	0.0	0.0
S01	3.2	112.4	0.0	0.1	57.4	0.0	23.5	1.0	0.0	1.0	4.0	0.1	1.4
Q06	0.6	20.5	0.0	0.0	14.8	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0
Q05	1.0	36.3	0.0	0.0	34.6	0.5	17.1	0.0	3.8	0.0	2.0	0.0	0.0
Q04	0.5	19.1	0.0	0.0	19.1	2.8	14.4	2.0	0.0	0.0	0.0	0.0	0.0
Q03	0.5	19.8	0.0	0.0	19.8	0.4	5.4	0.0	0.0	0.0	0.0	0.0	0.0
Q02	13.2	479.7	0.0	0.0	467.3	2.0	155.1	17.0	4.2	6.3	8.0	0.2	0.0
Q01	1.1	39.0	0.0	0.0	33.1	0.0	10.8	2.0	0.0	0.0	0.0	0.0	0.0
N07	0.2	6.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0
N06	0.0	0.3	0.0	0.0	0.3	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
N05	0.2	8.6	0.0	0.0	8.6	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0
N04	0.0	0.6	0.0	0.0	0.6	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
N03	0.3	10.5	0.0	0.0	10.5	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
N01	0.7	23.5	0.0	0.0	21.1	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Hill Valley Sub 1	0.0	9.7	0.0	0.0	9.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
L05	0.0	1.5	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forested (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water bodies (number)	Water bodies (acres)	Env. Sensitive Areas (acres)
D10	0.1	5.2	0.0	0.0	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D09A	0.5	19.1	0.0	0.0	0.0	0.0	19.1	0.0	0.6	0.0	0.0	0.0	0.0
D08	14.5	527.5	0.0	27.1	245.2	65.4	6.5	1.0	20.7	49.6	10.0	4.0	0.0
D05	0.3	11.5	0.0	0.0	11.5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
D04	14.5	526.7	0.0	72.3	192.9	130.1	7.6	1.0	11.2	80.7	14.0	6.6	0.0
D03	0.9	29.6	0.0	0.3	19.4	0.6	1.8	1.0	0.0	0.0	0.0	0.0	0.0
D01	1.6	59.5	0.0	8.6	19.7	10.7	0.0	0.0	0.5	0.0	0.0	0.0	0.0
A03	1.0	35.7	0.0	11.4	9.9	10.6	2.2	0.0	0.0	0.0	1.0	0.0	0.0
A02	0.2	7.6	0.0	2.5	4.5	1.1	0.7	0.0	0.0	1.7	0.0	0.0	0.0
A01B	0.2	8.6	0.5	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.3
A01A	0.1	5.1	0.0	0.0	0.0	0.0	4.1	0.0	0.0	5.0	0.0	4.5	0.4
D-IA	16.2	585.4	0.0	26.5	486.2	77.6	70.8	8.0	0.5	13.4	12.0	0.2	0.0
B-IA	2.1	77.5	0.0	8.4	53.1	10.1	0.3	0.0	23.4	49.5	0.0	6.3	29.8
Total	**105.4**	**3,872.9**	**116.4**	**173.8**	**2,445.5**	**461.4**	**606.2**	**49.0**	**90.7**	**228.9**	**107.0**	**22.8**	**71.1**

Table C-10. Resource Summary for Subsegments Not Included in Alternatives

Sub-segment	Length (miles)	Study Area (acres)	High-Potential RPBB Habitat (acres)	Steep Slopes (acres)	Prime Farmland (acres)	Land Cover Forested (acres)	Land Cover Urban (acres)	Sensitive Receptors (number)	Wetlands (acres)	Floodplains (acres)	Water Bodies (number)	Water Bodies (acres)	Env. Sensitive Areas (acres)
D09B	0.4	15.7	0.0	0.0	0.0	0.0	14.1	0.0	2.2	0.0	1.0	0.0	0.0
R11	1.0	34.1	0.0	0.6	12.9	6.5	7.9	1.0	0.7	0.0	2.0	0.0	0.0
R13	0.4	17.3	0.0	0.0	11.4	4.1	4.3	0.0	0.2	0.0	2.0	0.0	0.0
R14	0.3	12.5	0.0	0.0	8.2	0.3	3.3	0.0	0.1	0.0	0.0	0.0	0.0
S11C	0.1	1.9	0.0	0.0	1.9	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**2.2**	**81.5**	**0**	**0.6**	**34.4**	**10.9**	**30.6**	**1.0**	**3.2**	**0.0**	**5.0**	**0.0**	**0.0**

APPENDIX D

Best Management Practices

BEST MANAGEMENT PRACTICES

This section presents an overview of the best management practices (BMPs) discussed in the draft environmental impact statement (DEIS) for the proposed Cardinal-Hickory Creek Project (C-HC Project). A BMP is defined by 40 Code of Federal Regulations (CFR) 130 as a practice, or combination of practices, that have been determined to be most effective and practicable in preventing or reducing the amount of pollution generated by diffuse sources to a level compatible with water quality goals.[1] The typical BMPs for the project would be maintained throughout the project area in Wisconsin and Iowa. In certain cases in Wisconsin, BMPs and prescribed steps would be taken in compliance with State-required impact minimization measures. These BMPs would be implemented in conjunction with the environmental commitments discussed in Table 3.1-4 in Section 3.1. BMPs would be applied throughout the entire length of the proposed project. Specific environmental commitments would apply to certain areas within the project area, such as the Upper Mississippi River National Wildlife and Fish Refuge (Refuge) or other areas where special conditions occur. These BMPs would be implemented, where appropriate, during design, construction or operations by Dairyland Power Cooperative, American Transmission Company LLC, and ITC Midwest LLC (the Utilities) and are embedded in numerous policies and orders. This section is organized to describe BMPs related to construction timing, environmental and agricultural monitors, and resource topic.

Construction Timing

The seasonal timing of construction could affect the severity of construction impacts to croplands, wetlands, high-quality natural areas, threatened and endangered species, and the potential spread of invasive species and plant diseases (e.g., oak wilt). Limiting construction to winter months or to times of the year when plants are dormant and the ground is frozen could reduce many adverse impacts. However, 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.

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 (OHWM) would be restricted for trout streams and navigable tributaries to trout streams. The Utilities have developed construction protocols that would minimize or eliminate construction-related impacts on certain protected species, including seasonal restrictions, movement barriers, and other methods. The Utilities will coordinate with the U.S. Fish and Wildlife Service (USFWS), Wisconsin Department of Natural Resources (WDNR), and the Iowa Department of Natural Resources (IDNR) on project schedule to ensure protection of threatened and endangered species.

Environmental and Agricultural Monitors

Independent third-party environmental monitors (IEMs) could be required by the Public Service Commission of Wisconsin (PSCW) to monitor construction of the C-HC Project transmission line. Construction activities subject to monitoring and reporting by the IEMs could include activities that affect wetlands and bodies of water, habitats and occurrences of protected species, archaeological 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 and

[1] Note, this definition comes from the Clean Water Act but the term is commonly applied to measures and practices to minimize impacts from construction and disturbance activities.

potentially 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. In lieu of a required IEM, the Utilities’ standard practice is to have a qualified member of the utility staff or trained contractor serve as a monitor for special resource concerns.

Visual Quality and Aesthetics Best Management Practices

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 construction material. Structures installed for the C-HC Project would be constructed of rust-brown oxidized steel, which may blend better with wooded landscapes. Stronger conductors can minimize line sag and provide a sleeker profile.

Agricultural Best Management Practices

Each agricultural landowner would be consulted regarding farm operations (e.g., irrigation systems, drainage tiles), locations of farm animals and crops, current farm biological security practices, landowner concerns, and use of access routes. Potential impacts to each farm property along the route would be identified, and where practicable, construction impact minimization measures may be implemented. Site-specific practices would vary according to the activities of the landowner/farm operator, the type of agricultural operation, the susceptibility of site-specific soils to compaction, the degree of construction occurring on the parcel, and the ability to avoid areas of potential concern.

Short-term impacts to agricultural lands would be mitigated by providing compensation to producers and by restoring agricultural lands to the extent practicable. Where appropriate, minimization techniques, such as topsoil replacement and deep tilling, may be used.

Long-term impacts associated with constructing the transmission line across agricultural lands would be minimized through careful consideration of alignment routing and individual structure siting. Where possible, siting in agricultural areas would be along fence lines or between fields or along public road right-of-way (ROW) so that the proposed structures would be located along the edge of the land area used for agricultural purposes. If conflicts occur, landowners would be consulted during the real estate acquisition process to accommodate landowner needs to the extent practicable.

In the case of organic farms, landowners would be consulted to minimize potential impacts to their organic farming status due to the transmission line routing or construction. Methods to minimize impacts could include offsetting the transmission line structures from the property line so that tree lines or other buffers would be maintained. Additionally, construction vehicles may be cleaned before entering the organic farm parcels, in accordance with input from the landowner. Furthermore, to protect organic farms during vegetation management activities once the line is in operation, herbicide would not be applied within portions of the ROW where the landowner does not wish to introduce it.

Drain tiles are common in portions of Wisconsin and Iowa, and there is no consistent data source to identify them. During the final design process, landowner input would be obtained to place structures such that impacts to drain tiles would be minimized to the extent practicable. During construction, matting may be used to more evenly distribute the weight of heavy equipment, and low ground-pressure construction equipment may also be used. After construction, damaged drain tiles would be repaired to preconstruction conditions.

If construction activity occurs during wet conditions and soils are rutted, repairing the ruts as soon as possible could reduce the potential for impacts. However, if improperly timed, impact minimization 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 BMP. Soils would be evaluated to determine when the soil is friable enough to allow rutting to be remediated properly.

To minimize soil compaction during construction in agricultural lands, low-lying areas, saturated soils, or sensitive soils, low-impact machinery with wide tracks could be used. 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 (such as with a soil penetrometer) and compared with penetrometer readings on soils outside the ROW, as necessary. If compaction within the ROW is detected, either the landowner would be compensated for lost productivity or appropriate equipment should be used to restore the soil tilth. Figure D.2 through Figure D.5 illustrate how ruts made by heavy equipment could be repaired.

Problems with potential damage to soil productivity from the impacts of soil mixing, soil compaction, and soil erosion would 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 used 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 topsoils or soil horizons during excavation and construction to minimize soil mixing.
- Decompacting 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.

Figure D.2. Minor soil rutting in pastureland.

Figure D.3. Rutting of topsoil in cropland—no soil mixing.

Figure D.4. Ruts being smoothed with blade.

Figure D.5. Smoothing out ruts by backblading with a dozer.

Best Management Practices for Protected and Rare Species and their Habitats

The USFWS, WDNR, and IDNR will be consulted during the environmental review phase of the C-HC Project. Appropriate conservation measures, mitigation measures, and BMPs identified by these agencies will be incorporated into an avoidance and minimization plan by the Utilities and implemented during construction.

Impacts to protected and rare 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, planning construction during times of the year when the species is not present or active, or using exclusionary devices.

An example of a common BMP is reptile exclusion 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 0.6 shows an area fenced to keep rare turtles away from the construction zone. This fencing is removed when construction and restoration in the area are completed.

Figure D.6. Turtle exclusion fence.

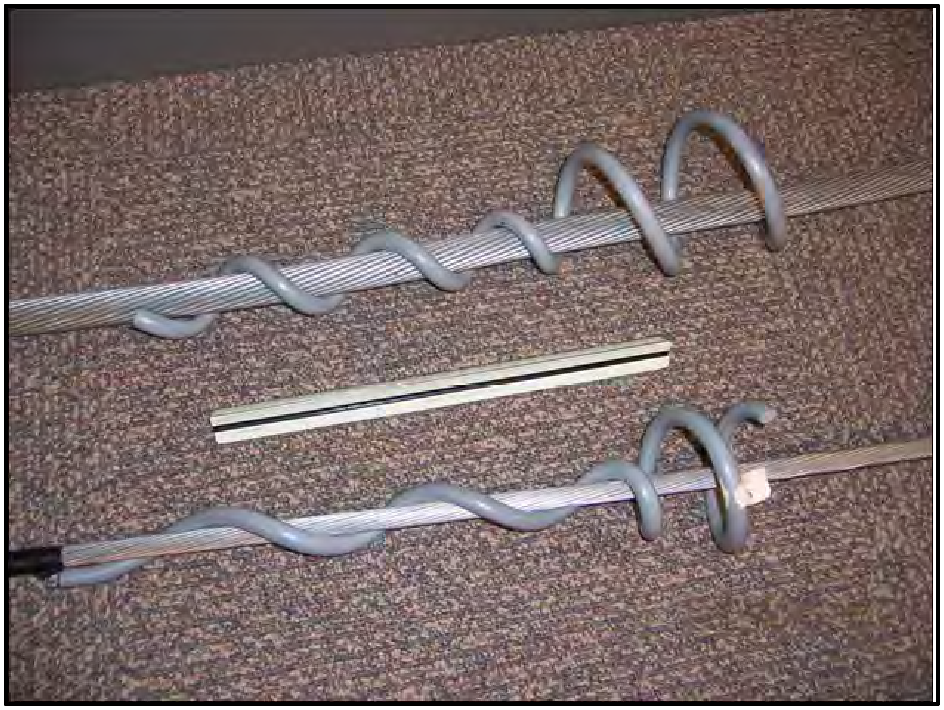

Figure D.7. Close-up of bird flight diverters used on shield wires of a transmission line.

Best Management Practices for Migratory Birds

Bird flight diverters (BFDs) are a common BMP used to mitigate impacts to avian species. BFDs would 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 that birds can see it and fly under or over the wires to avoid colliding with them. Several designs of BFDs are available (Figure D.7). Ideally, BFDs should be noticeable by birds but should not draw unwanted attention by people. BFDs would be installed as outlined by the Avian Powerline Interaction Committee (APLIC 2012) and/or manufacturer's recommendations and would be inspected periodically and replaced when necessary.

There are a number of avian-protection considerations that will occur throughout the design and construction of the C-HC Project:

- Design standards for this project will meet avian-safe guidelines as outlined by APLIC for minimizing potential avian electrocution risk.
- The Utilities will work with the IDNR and WDNR to determine locations where state-listed bird species habitat is present, and implement appropriate measures to avoid and/or minimize impacts to those species.
- The Utilities have also worked with USFWS to identify measures to minimize avian impacts at the Mississippi River crossing location. These measures are discussed in detail in the Alternative Crossing Analysis report and include limiting structure height through the Refuge, horizontal configuration, and installation of bird flight diverters.
- The Utilities factored existing avian data into the routing and siting process, including known eagle nest locations and designated Important Bird Areas.

- The Utilities will identify locations in coordination with USFWS, WDNR, and IDNR where the installation of BFDs will be recommended to minimize the potential for avian collisions.

Removal of woody vegetation and trees within habitat for threatened and endangered bird species will occur outside of the nesting season for those species. During the nesting season, the Utilities will complete a field review of the final ROW to identify existing stick nests prior to clearing woody vegetation and trees. Tree-clearing crews will also be trained to stop work and notify environmental staff if they discover an unanticipated nest. Any identified active nest will be avoided during the nesting season.

Best Management Practices for Invasive Species

Standard BMPs have been developed by the Wisconsin Council on Forestry to avoid and minimize the spread of invasive species. The Utilities would use the appropriate BMPs based on conditions encountered in the ROW, according to the degree of invasiveness, severity of the current infestation, and susceptibility of non-infested areas to invasion (see attachment at the end of this appendix).

It is the Utilities' standard practice to restore work areas either by allowing the native seed bank to regenerate, or applying a seed mix that is consistent with preconstruction conditions and would not include invasive species (or that is appropriate to the surrounding area in work locations that were previously forested or shrubland). The Utilities follow BMPs during construction to avoid introducing invasive species into areas where they did not previously exist.

Additional evaluation would be conducted on the selected route to further identify invasive species, their locations, and locations where site-specific BMPs would be appropriate. Appropriate BMPs would be implemented during construction.

Because construction measures may not be completely effective in controlling the introduction and spread of invasive species, post-construction activities are often required. Uninfested natural areas, such as high-quality wetlands, forests, and prairies, would be surveyed for invasive species following construction and site revegetation. If new infestations of invasive species due to construction of the C-HC Project are discovered, 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. The WDNR or IDNR, as applicable, would be consulted to determine the best methods for control of encountered invasive species.

Standard revegetation goals often required by WDNR permits include the following:

- Final site stabilization in wetlands that were non-forested prior to construction, and on streambanks, requires reestablishment of vegetation at least 70% of the type, density, and distribution of the vegetation that was documented in the area prior to construction; or
- Final site stabilization in wetlands requires the reestablishment of native or pre-existing perennial vegetation to at least 70% vegetative cover.

Best Management Practices for Stray Voltage

"Stray voltage" is a special case of low-level voltage in which a voltage is present across points (generally grounded metal objects) in which a current flow is produced when an animal comes into contact with them. It can be caused by premises wiring or from off-premises sources. Transmission lines do not, by themselves, create stray voltage because the transmission system operates and is configured differently than the distributed system. Transmission lines, however, can induce voltage on a distribution circuit that is parallel and closely adjacent to the transmission line. If the proposed transmission lines parallel or cross distribution lines, appropriate environmental commitments can be taken to address any induced voltages. When stray voltage is a concern, electrical measurements in confined livestock areas should be conducted using established testing procedures with the appropriate equipment by qualified personnel. These testing protocols have been developed to collect a science-based set of data useful in the analysis of possible stray voltage exposure including the source, both on-farm versus off-farm.

Investigation and avoidance 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. In Wisconsin, farm operators may receive technical assistance from the Wisconsin Rural Electric Power Services (REPS) program, which is jointly managed by the PSCW and the Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP). DATCP provides an ombudsman, a veterinarian, an energy technical advisor, and a program assistant to the REPS program. REPS staff members provide information about stray voltage and power-quality issues; work to answer regulatory questions; conduct on-farm and distribution-system investigations that can help farmers work 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.

Surface Waters Best Management Practices

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.

Work below the OHWM of waterways would be avoided to the extent practicable; the most likely activity would be withdrawing water to stabilize excavations. Before moving construction equipment and material between waterway construction locations where equipment or materials are placed below the OHWM of a waterway, standard inspection and disinfection procedures would be incorporated into construction methods as applicable (see Wisconsin Administrative Code [WAC] NR 329.04(5)).

Methods to minimize impacts to water bodies include avoiding pole placements adjacent to the resource, using WDNR- and IDNR-approved erosion control methods, and using alternative construction methods such as helicopter construction.

In coordination with WDNR and IDNR, an erosion control plan would be prepared once a route is ordered, and BMPs would be employed to minimize the potential for erosion and to prevent any sediments from entering waterways. Proper erosion control would be necessary for all construction activities, especially those that may affect water resources. BMPs should be employed before, during, and immediately after construction of the project to reduce the risk of excess siltation into streams. Erosion controls would be regularly inspected and maintained throughout the construction phase of a project until exposed soil has been adequately stabilized.

Several waterways would be crossed for construction access. These crossings would require a temporary clear span bridge (TCSB). The use of properly designed temporary bridge structures would avoid the necessity of driving construction equipment through streams.

TCSBs would be placed to avoid in-stream disturbance. Each TCSB would consist of construction mats, steel I-beam frames, or other similar material placed above the OHWM on either side to span the streambank. Preparation for setting the bridge may include minor blading and excavation confined to the minimum area necessary for safe bridge installation. Removal of low-growing trees, shrubs, and other shoreline vegetation would be kept to a minimum.

The use of TCSBs would be minimized where possible by accessing the ROW from either side of the stream or by using existing public crossings to the extent practical. The Utilities would work with private landowners to identify alternative access routes to further reduce the use of stream crossings, if possible.

For those streams that would not be crossed by construction vehicles and where stream-crossing permits have not been acquired, wire would be pulled across those waterways by boat, by helicopter, or by a person traversing across the waterway. Wire-stringing activity may require that waterways be temporarily closed to navigation.

Wetlands Best Management Practices

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 practicable; and
- Using WDNR- and IDNR-approved erosion control methods on adjacent lands.

Construction methods that can reduce impacts to wetlands include

- 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;
- Careful cleaning of construction equipment and mats after working in areas infested by invasive species; and
- Using vibratory caisson foundations that eliminate the need for concrete or other fill.

Matting can provide a safe, stable work surface and travel lane for cranes, concrete, 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 preconstruction vegetation can reestablish more quickly after construction is completed. Figure D.8 and Figure D.9 show the use of mats in different wetland conditions. 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, for the erection of the towers, and for wire stringing.

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 that 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. Typical construction methods include cutting the pole off at or just below the ground surface. The Utilities 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 2 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.

Figure D.8. Mats in wet meadow.

Figure D.9.Timber mats being placed in wooded wetland.

Woodlands Best Management Practices

To minimize the spread of oak wilt, the cutting or pruning of oak trees would be conducted in accordance with WAC PSC 113.051 (April 15–July 1). Other recommended restricted times that fall outside of this window may also be followed (e.g., WDNR or local restrictions) if practicable. In Iowa, oak trees may be removed during maintenance activities but pruning oak trees would only occur during dormant periods.

Practices that minimize the spread of emerald ash borer (*Agrilus planipennis*) would be employed for the project. All of the project area in Wisconsin would be located in the emerald ash borer quarantine area. The IDNR has also identified emerald ash borer as being present in much of eastern Iowa, including parts of Clayton County and Dubuque County where the project is proposed to cross. Additionally, the Iowa Department of Agriculture and Land Stewardship—under the authority of Iowa Code Chapter 177A, including Sections 5, 7, 11, 12, 13, 14, 16, 17, and Iowa Administrative Code Chapter 46.15—issued Order No. ENT-14-1 that establishes quarantine practices for the emerald ash borer. Practices that minimize the spread include avoiding movement of ash wood products (logs, posts, pulpwood, bark and bark products, and slash and chipped wood from tree clearing) and hardwood firewood from emerald ash borer quarantine areas to nonquarantine areas (see, for example, WAC ATCP 21.17). Where ash wood products cannot be left on-site, alternative plans would be developed to meet the requirements.

Some of the Wisconsin portion of the project would be located within the gypsy moth (*Lymantria dispar*) quarantine area. Standard practices used in the quarantine area to avoid the spread of gypsy moth damage include inspections and avoiding movement of wood products (logs, posts, pulpwood, bark and bark products, firewood, and slash and chipped wood from tree clearing) from gypsy moth quarantine areas to nonquarantine areas, according to WAC ATCP 21.10.

Special Areas of Resource Concern Best Management Practices

Conservation Easements

Conservation land interests, to the extent data were available, were considered in the routing and siting process to inform the selection of proposed route segments while avoiding, to the extent practicable, properties with recorded conservation land interests. There are many types of conservation easements and encumbrances that exist today. Some of the conservation easements are held by state and federal agencies, while other conservation land interests are held by private organizations. These land rights are generally not known until the easement acquisition process begins with the landowner of record or are identified during public outreach. Efforts would be made to work with landowners to accommodate existing agreements or to make them whole if there are additional monetary burdens landowners would incur.

Cultural Resources and Human Remains

If unanticipated archaeological resources or human remains are identified during construction, the Utilities shall stop work at that location and shall immediately report it to the Utilities' Construction Manager and Environmental Monitor. Work shall not commence in that location until the Wisconsin Historical Society or Iowa State Historic Preservation Office (SHPO) and PSCW are notified and direction sought from the Wisconsin Historical Society or Iowa SHPO. Interested tribes would also be notified during this time. Construction may resume after the direction is followed and the qualified archaeologist's reports, if any, are received and approved by the Wisconsin Historical Society or Iowa SHPO.

Upper Mississippi River National Wildlife and Fish Refuge

In developing their alternatives for crossing the Mississippi River, the Utilities have applied the USFWS's revised mitigation policy of avoid, minimize, mitigate (USFWS 2016). Under this policy, an applicant for use of USFWS lands must first demonstrate that impacts to Refuge lands cannot be avoided. Once this showing has been made, USFWS must evaluate compatibility, impact minimization, and then compensation/mitigation.

After concluding that the Refuge could not be avoided to meet the project's purpose and need, the Utilities evaluated how it could minimize the impact to the Refuge. The following are minimization steps that the Utilities propose to take in the Refuge:

- For the portion of the C-HC Project within the Refuge, preliminary low-profile structures are proposed with a design height of approximately 75 feet to reduce the likelihood of avian collisions.
- The structures would be horizontal-symmetrical H-frame structures on concrete foundations with a typical span length of approximately 500 feet and would consist primarily of tubular steel H-frame structures.
- All conductors on these low-profile structures would be placed on one horizontal plane and the shield wire would be marked with avian flight diverters.
- For Alternatives 1, 5, and 6, where the C-HC Project would cross the Mississippi River at the Nelson Dewey Substation, additional minimization steps are proposed:

- The Utilities propose to relocate the existing transmission lines that cross the Mississippi River at Stoneman Substation and revegetate those Refuge lands within the existing ROW.
- The Utilities also propose to revegetate portions of the Refuge to replicate some of the natural vegetative breaks. These measures would be developed in conjunction with existing revegetation programs that are currently in place within the Refuge. The intent of possible revegetation efforts would be to expand the extent of mature woodlands to provide additional vegetative breaks in order to reduce the visual impacts of the transmission line.

Revegetation at the Refuge would be conducted in concert with USFWS review and direction and in compliance with applicable North American Electric Reliability Corporation (NERC)-regulated vegetation standards. As with the design of the project, the Utilities would work closely with the USFWS to identify the location, type, and overall revegetation plan that would be appropriate for the project and this specific location of the Refuge.

In addition to the measures outlined above, the Utilities would employ site-specific minimization and mitigation measures to be identified before construction in consultation with the USFWS.

LITERATURE CITED

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

U.S. Fish and Wildlife Service (USFWS). 2016. Final Mitigation Policy. *Federal Register* 8(224):83440–83492. Available at: https://www.fws.gov/ecological-services/es-library/pdfs/81FR83440.pdf. Accessed June 21, 2018.

Rights-of-Way Best Management Practices for Invasive Species

This is a consolidated list of BMPs, taken from the "Transportation & Utility Rights-of-Way BMPs" manual. For more information as well as guidance on how to implement the BMPs listed below, view the full manual at: http://dnr.wi.gov/invasives/bmp.htm.

Soil Disturbance BMPs

Planning

BMP SD 1: Prior to implementing activities scout for and locate invasive species infestations, consistent with the scale and intensity of operations.

BMP SD 2: Consider the need for action based on: 1) the degree of invasiveness; 2) severity of the current infestation; 3) amount of additional habitat or hosts at risk for invasion; 4) potential impacts; and, 5) feasibility of control with available methods and resources.

BMP SD 3: Plan activities to limit the potential for introduction and spread of invasive species, prior to construction.

Activities

BMP SD 4: Minimize soil disturbance which may include using existing roads, access points, staging areas and alternative construction.

BMP SD 5: Avoid invasive species populations when feasible and minimize the spread of invasive species during soil disturbance activities.

BMP SD 6: Prior to moving equipment out of an infested area and then into an uninfested area, clean soils, seeds, plant parts, or invertebrates from exterior surfaces, to the extent practical.

BMP SD 7: Stabilize disturbed soils as soon as possible.

BMP SD 8: Use non-invasive cover crops or native seed for revegetation.

BMP SD 9: Provide appropriate resources in identification of known invasive species for corridor workers.

Vegetation Management and Inspection/Monitoring BMPs

Planning

BMP VM 1: Prior to implementing activities scout for, locate and document invasive species infestations, consistent with the scale and intensity of operations.

BMP VM 2: Plan activities to limit the potential introduction and spread of invasive species, prior to construction.

BMP VM 3: Assess current available resources and seek new resources to prevent invasive species spread.

Activities

BMP VM 4: Prior to moving equipment out of an infested area and then into an uninfested area, clean soils, seeds, plant parts, or invertebrates from exterior surfaces, to the extent practical.

BMP VM 5: Inspect and clean clothing, footwear and gear for soils, seeds, plant parts, and invertebrates before and after activities.

BMP VM 6: Carefully dispose of soils, seeds, plant parts or invertebrates found during inspection and cleaning.

BMP VM 7: Locate and use staging areas that are free of invasive plants to avoid spreading seeds and other viable plant parts.

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BMP VM 8: Consider the likely response of invasive species when conducting activities that result in disturbed soil, increased sunlight, fire, etc.

BMP VM 9: Ensure that invasive species control treatments are applied within the appropriate time window.

BMP VM 10: Monitor right-of-ways during day-to-day activities and post-management activities; determine necessary treatments based on presence of invasive species.

BMP VM 11: Provide training in identification, control and prevention of known invasive species to employees and contractors performing vegetation management

Transport of Materials BMPs

Planning

BMP TM 1: Take steps to avoid the movement of invasives to non-infested areas during transport activities.

BMP TM 2: Prior to transporting materials, manage the load to limit the spread of invasive species.

BMP TM 3: Prior to moving equipment out of an infested area and then into an uninfested area, clean soils, seeds, plant parts, or invertebrates from exterior surfaces, to the extent practical.

BMP TM 4: Dispose of soils, seeds, plant parts or invertebrates found during inspection and cleaning.

BMP TM 5: Establish staging areas and temporary facilities in locations that are free of invasive species.

BMP TM6: Use soil and aggregate material from sources that are free of invasive species.

BMP TM 7: Manage stock piles to limit the spread of invasive species.

BMP TM 8: Do not transport woody material that may contain invasive species.

BMP TM 9: If you must transport woody material that may contain invasive species, bring them to a designated area for appropriate disposal.

BMP TM 10: Keep and reuse onsite materials rather than importing new materials.

Revegetation and Landscaping BMPs

Planning

BMP RV 1: Plan activities to limit the potential introduction and spread of invasive species, prior to revegetation.

BMP RV 2: Select appropriate species for revegetation and landscaping activities.

Activities

BMP RV 3: Inspect and clean clothing, footwear and gear for soils, seeds, plant parts, or invertebrates before and after activities.

BMP RV 4: Prior to moving equipment out of an infested area and into an uninfested area clean soil and debris from exterior surfaces, to the extent practical, to minimize the risk of transporting propagules.

BMP RV 5: Revegetate disturbed soils as soon as feasible to minimize invasive species establishment.

BMP RV 6: Where site conditions permit, allow natural revegetation of the ground layer to occur.

BMP RV 7: Ensure the species specified in the plan are the ones being used.

BMP RV 8: Monitor the revegetation site.

For more information on best management practices for invasive species, contact:
Thomas Boos, DNR Forest Invasive Plant Specialist, 608.266.9276

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APPENDIX E

Special Status Plants List

Table E-1. Special Status Plant Species with the Potential to Occur in Counties Crossed by the Cardinal-Hickory Creek Project

Common Name	Scientific Name	State Status		Federal Status
		Iowa	Wisconsin	
Alderleaf buckthorn	*Rhamnus alnifolia*	SC		
American speedwell	*Veronica americana*	SC		
Back's sedge	*Carex backii*	SC		
Balsam fir	*Abies balsamea*	SC		
Blue giant hyssop	*Agastache foeniculum*	E		
Bog bedstraw	*Galium labradoricum*	E		
Bog birch	*Betula pumila*	T		
Bog bluegrass	*Poa paludigena*	SC		
Bog willow	*Salix pedicellaris*	T		
Bunchberry	*Cornus canadensis*	T		
Canada plum	*Prunus nigra*	E		
Carey's sedge	*Carex careyana*	SC		
Chinquapin oak	*Quercus muehlenbergii*		SC	
Christmas fern	*Polystichum acrostichoides*		SC	
Cinnamon fern	*Osmunda cinnamomea*	E		
Crowfoot clubmoss	*Lycopodium digitatum*	SC		
Cutleaf watermilfoil	*Myriophyllum pinnatum*	SC		
Drooping bluegrass	*Poa languida*	SC		
Dwarf scouringrush	*Equisetum scirpoides*	SC		
Earleaf foxglove	*Tomanthera auriculata*	SC		
Eastern prairie fringed orchid	*Platanthera leucophaea*			T
False mermaid-weed	*Floerkea proserpinacoides*	E		
Field sedge	*Carex conoidea*	SC		
Fireberry hawthorn	*Crataegus chrysocarpa*	SC		
Flat-top white aster	*Aster pubentior*	SC		
Frost grape	*Vitis vulpina*	SC		
Glandular wood fern	*Dryopteris intermedia*	T		
Glomerate sedge	*Carex aggregata*	SC		
Golden saxifrage	*Chrysosplenium iowense*	T		
Golden-seal	*Hydrastis canadensis*		SC	
Grape-stemmed clematis	*Clematis occidentalis*	SC		
Grass pink	*Calopogon tuberosus*	SC		
Great Plains ladies'-tresses	*Spiranthes magnicamporum*	SC		
Great water-leaf	*Hydrophyllum appendiculatum*		SC	
Green violet	*Hybanthus concolor*	T		
Heart-leaved skullcap	*Scutellaria ovata* ssp. *ovata*		SC	
Hedge nettle	*Stachys aspera*	SC		

Common Name	Scientific Name	State Status		Federal Status
		Iowa	Wisconsin	
Hidden sedge	*Carex umbellata*	SC		
Hill's thistle	*Cirsium hillii*	SC	T	
Hooker's orchid	*Platanthera hookeri*	T	SC	
Intermediate sedge	*Carex media*	SC		
Jeweled shooting star	*Dodecatheon amethystinum*	T		
Jeweled shooting star	*Primula fassettii*		SC	
Kentucky coffee-tree	*Gymnocladus dioicus*		SC	
Kidney-leaf white violet	*Viola renifolia*	T		
Lanced-leaved buckthorn	*Rhamnus lanceolata* var. *glabrata*		SC	
Leathery grape fern	*Botrychium multifidum*	T		
Ledge spikemoss	*Selaginella rupestris*	SC		
Limestone oak fern	*Gymnocarpium robertianum*	SC	SC	
Limestone rockcress	*Arabis divaricarpa*	SC		
Low bindweed	*Calystegia spithamaea*	SC		
Low sweet blueberry	*Vaccinium angustifolium*	T		
Marginal shield fern	*Dryopteris marginalis*	T		
Mead's milkweed	*Asclepias meadii*			T
Meadow bluegrass	*Poa wolfii*	SC		
Mountain maple	*Acer spicatum*	SC		
Mountain ricegrass	*Oryzopsis asperifolia*	SC		
Muskroot	*Adoxa moschatellina*	SC		
Narrowleaf pinweed	*Lechea intermedia*	T		
Narrow-leaved vervain	*Verbena simplex*		SC	
Nodding onion	*Allium cernuum*	T		
Nodding pogonia	*Triphora trianthophora*		SC	
Northern adder's-tongue	*Ophioglossum pusillum*	SC		
Northern black currant	*Ribes hudsonianum*	T		
Northern lungwort	*Mertensia paniculata*	E		
Northern monkshood	*Aconitum noveboracense*	T		T
Northern panic-grass	*Dichanthelium boreale*	E		
Oak fern	*Gymnocarpium dryopteris*	T		
October lady's-tresses	*Spiranthes ovalis* var. *erostellata*		SC	
Oval ladies'-tresses	*Spiranthes ovalis*	T		
Ovate spikerush	*Eleocharis ovata*	SC		
Pale false foxglove	*Agalinis skinneriana*	E		
Pale purple coneflower	*Echinacea pallida*		T	
Partridge berry	*Mitchella repens*	T		
Pearly everlasting	*Anaphalis margaritacea*	SC		
Pinesap	*Monotropa hypopithys*	T		

Common Name	Scientific Name	State Status		Federal Status
		Iowa	Wisconsin	
Pinnatifid spleenwort	*Asplenium pinnatifidum*		T	
Prairie bush clover	*Lespedeza leptostachya*		E	T
Prairie dock	*Silphium terebinthinaceum*	SC		
Prairie false-dandelion	*Nothocalais cuspidata*		SC	
Prairie Indian-plantain	*Arnoglossum plantagineum*		SC	
Prairie ragwort	*Packera plattensis*		SC	
Prairie turnip	*Pediomelum esculentum*		SC	
Prickly rose	*Rosa acicularis*	E		
Purple angelica	*Angelica atropurpurea*	SC		
Purple cliff-brake fern	*Pellaea atropurpurea*	E		
Purple milkweed	*Asclepias purpurascens*		E	
Putty root	*Aplectrum hyemale*		SC	
Richardson sedge	*Carex richardsonii*	SC		
Rock clubmoss	*Lycopodium porophilum*	T		
Rock clubmoss	*Huperzia porophila*		SC	
Rock sandwort	*Minuartia michauxii*	SC		
Rosy twisted stalk	*Streptopus roseus*	T		
Rough bedstraw	*Galium asprellum*	SC		
Rough buttonweed	*Diodia teres*	SC		
Sage willow	*Salix candida*	SC		
Saskatoon service-berry	*Amelanchier alnifolia*	SC		
Scarlet hawthorn	*Crataegus coccinea*	SC		
Schweinitz's sedge	*Carex schweinitzii*		SC	
Sedge	*Carex cephalantha*	SC		
Shadbush	*Amelanchier sanguinea*	SC		
Short's rock-cress	*Boechera dentata*		SC	
Showy lady's slipper	*Cypripedium reginae*	T		
Slender mountain-ricegrass	*Oryzopsis pungens*	E		
Slender sedge	*Carex tenera*	SC		
Slim-leaved panic grass	*Dichanthelium linearifolium*	T		
Smooth-sheathed sedge	*Carex laevivaginata*		E	
Snowberry	*Symphoricarpos albus*	SC		
Solomon's seal	*Polygonatum pubescens*	SC		
Spotted coralroot	*Corallorhiza maculata*	T		
Spreading chervil	*Chaerophyllum procumbens*		SC	
Spreading hawthorn	*Crataegus disperma*	SC		
Spurge	*Euphorbia commutata*	SC		
Sterile sedge	*Carex sterilis*	SC		
Summer grape	*Vitis aestivalis*	SC		

Common Name	Scientific Name	State Status		Federal Status
		Iowa	Wisconsin	
Tall cotton grass	*Eriophorum angustifolium*	SC		
Three-flowered melic grass	*Melica nitens*	-	-	-
Tree clubmoss	*Lycopodium dendroideum*	T		
Twinflower	*Linnaea borealis*	T		
Twinleaf	*Jeffersonia diphylla*	T	SC	
Upland boneset	*Eupatorium sessilifolium*	SC		
Valerian	*Valeriana edulis*	SC		
Velvet leaf blueberry	*Vaccinium myrtilloides*	T		
Wafer-ash	*Ptelea trifoliata* ssp. *trifoliata* var. *trifoliata*		SC	
Western prairie fringed orchid	*Platanthera praeclara*	T		T
White lady's-slipper	*Cypripedium candidum*		T	
Wilcox's panic grass	*Dichanthelium wilcoxianum*		SC	
Wild hyacinth	*Camassia scilloides*		E	
Woolly milkweed	*Asclepias lanuginosa*		T	
Yellow monkeyflower	*Mimulus glabratus*	T		
Yellow trout-lily	*Erythronium americanum*	T		

Note: E = Endangered; SC = Special Concern; T = Threatened

APPENDIX F

Connected Actions Analysis

INTRODUCTION

This appendix presents an analysis of the connected actions discussed in the draft environmental impact statement (DEIS) for the proposed Cardinal-Hickory Creek Project (C-HC Project). The Council on Environmental Quality defines a connected action as actions that automatically trigger other actions that may require an environmental impact statement (EIS) per 40 Code of Federal Regulations (CFR) 1508.25. Connected actions cannot or will not proceed unless other actions are taken previously or simultaneously, or are interdependent parts of a larger action and depend on the larger action for their justification.

This appendix is organized as follows:

1. Description of the connected actions,
2. Summary of methods and data used to complete the analyses of resource impacts associated with the connected actions, and
3. Presentation of potential impacts that the connected actions would have on those resources.

CONNECTED ACTIONS

Based on the definition above, there are two connected actions associated with the C-HC Project:

1. The retirement of Dairyland Power Cooperative's (Dairyland's) 69-kilovolt (kV) transmission line (referred to as the N-9 transmission line in this DEIS) that crosses the Upper Mississippi River National Wildlife and Fish Refuge (Refuge) in Iowa and is shown in Figure F.1.
2. The installation of minor equipment at one of two substations in Wisconsin, depending on the selected alternative.

The implementation of the C-HC Project could trigger these actions which may require an EIS, therefore these two actions described below will be analyzed in this document.

Retirement of Dairyland's N-9 Transmission Line in Iowa

Upon completion the C-HC Project construction and energization at the Turkey River Substation, Dairyland would retire and decommission approximately 2.8 miles of the existing N-9 transmission line (69-kV) starting in Cassville, Wisconsin, at the Stoneman Substation, then crossing the Mississippi River and ending at a new segment of transmission line that would be built to connect the existing N-9 transmission line with the remaining portion of Dairyland's N-9 transmission line at the Turkey River Substation in Clayton County, Iowa (Figure F.2). This new transmission line segment, also referred to as a "tap line," would be approximately 0.2 mile long and would cross private lands and portions of the public right-of-way (ROW) for 360th Street and Great River Road (CY9). Dairyland is proposing to decommission the N-9 transmission line during the winter months, which present the best opportunity to work during frozen ground conditions within the Refuge. It is anticipated that the connected action would take approximately 2 months to complete (decommissioning of the existing transmission line and building the new connection with the Turkey River Substation).

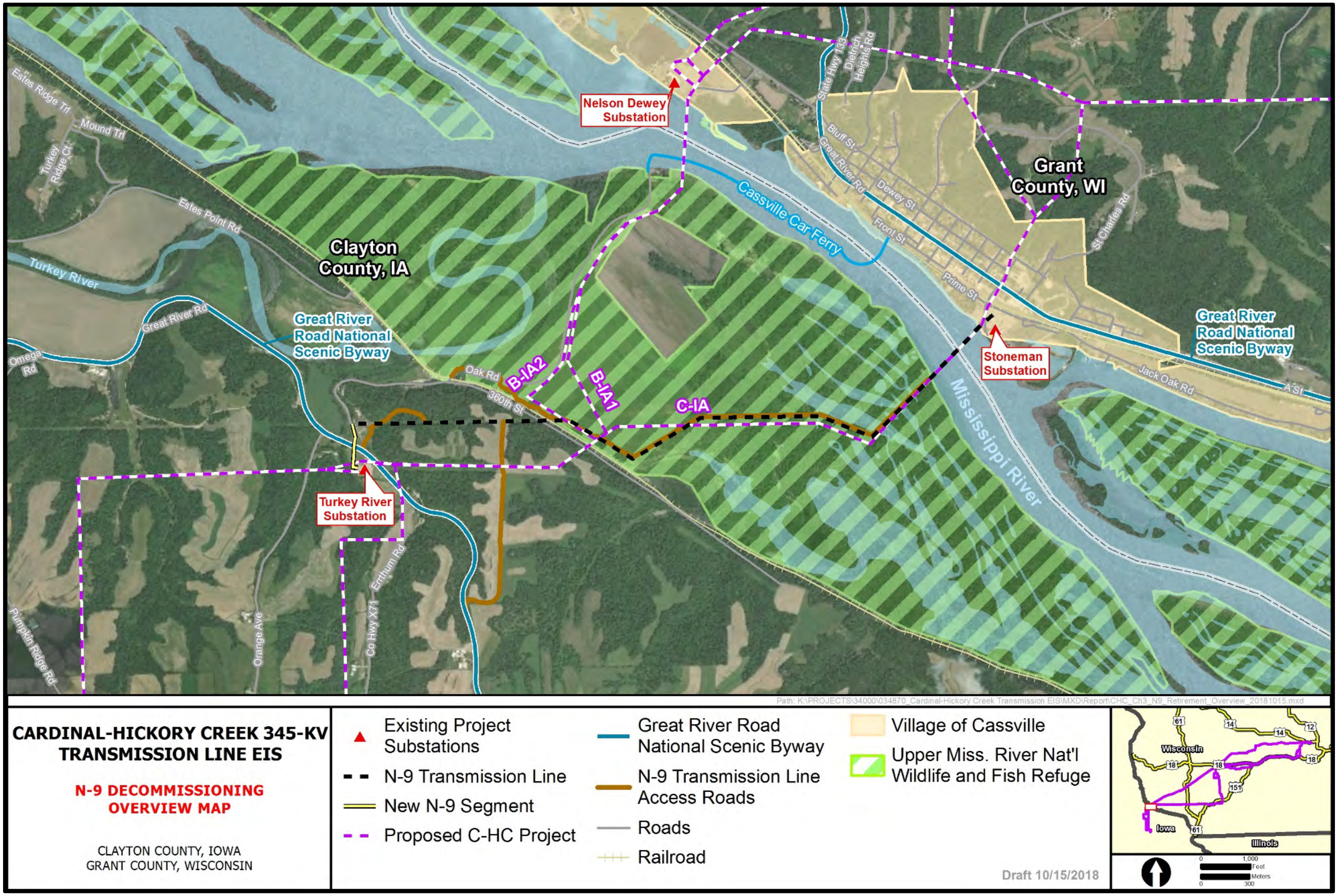

Figure F.1. N-9 decommissioning overview map.

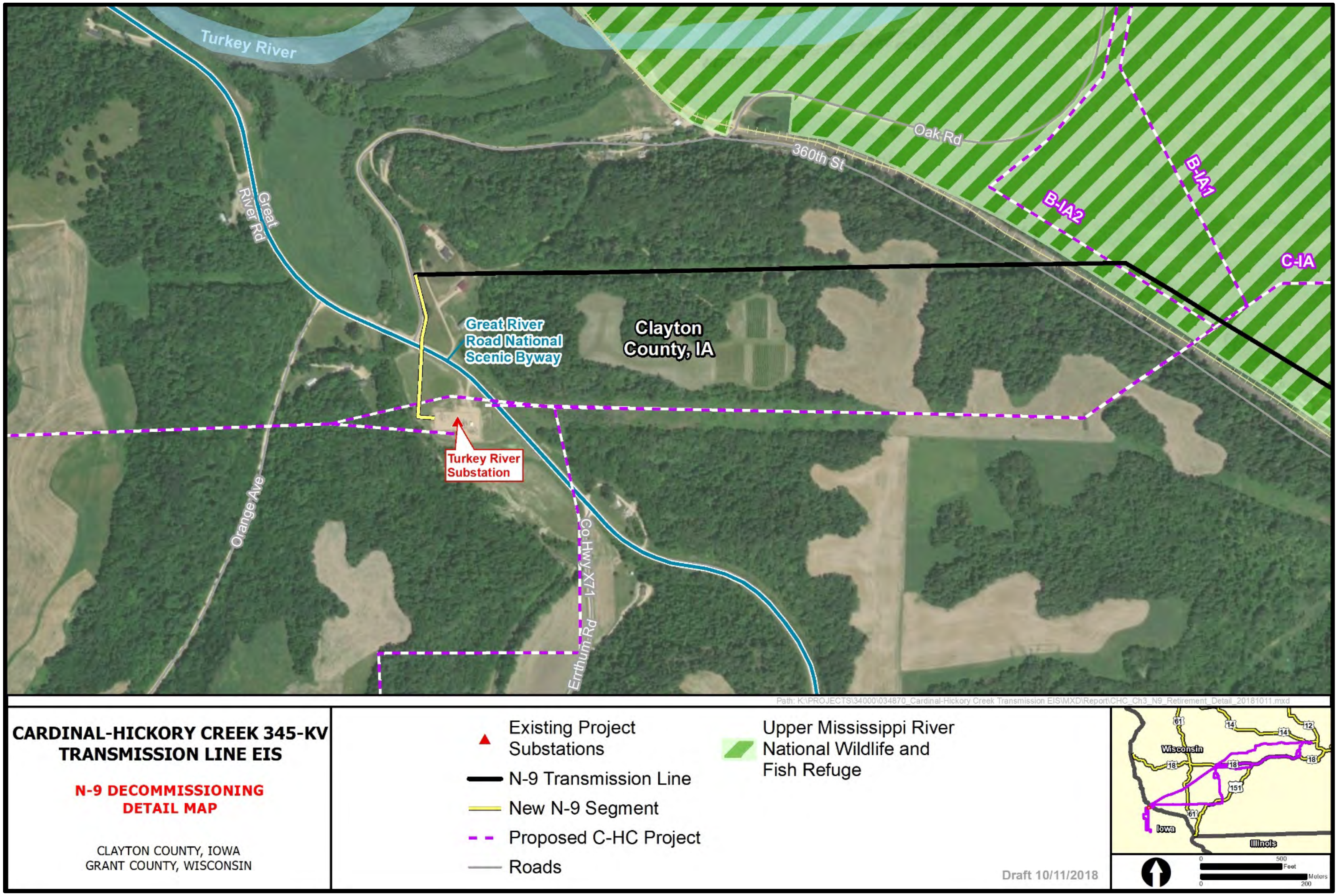

Figure F.2. N-9 decommissioning detail map.

Prior to decommissioning activities, an erosion control plan would be developed to identify methods for preventing and mitigating soil erosion. The decommissioning of the N-9 transmission line would require the removal of 27 structures: one in Wisconsin, 21 structures within the Refuge, and five structures on private property in Iowa. The structures to be removed are primarily wooden, single- and H-frame structures. Within the Refuge, there are four steel lattice structures at the Mississippi River crossing location. Conductors and shield wire would be collected on wire reels. Once the conductor and shield wires are removed, the structures would be removed and hauled off-site for reuse or disposal. Then, the holes where the structures were installed would be filled. Smaller structures would be removed by trucks and ground equipment. In wetlands, all of the structures may be cut at ground level to minimize impacts to the wetlands. For structures located on privately owned lands, Dairyland, the American Transmission Company LLC (ATC), and ITC Midwest LLC (ITC Midwest), together referred to as “the Utilities,” would work with the landowners to determine if the structures can be cut at ground level or pulled out of the ground, and the remaining holes would be filled with topsoil.

Within the Refuge, there are four river crossing lattice structures requiring a large crane for removal. The existing lattice structure foundations would be removed to 4 feet below the ground surface and the remaining foundation would be covered with clean fill. Two temporary pads would be built adjacent to the steel structures on which the cranes and trucks would be placed. The pads would be 25 × 25 feet and be built with wooden timber construction mats.

Typical equipment used for this type of action includes cranes, bucket trucks, reel trailers, wirepullers, and related stringing equipment. Ground access is proposed with the use of tracked equipment in areas of stable soil or with the use of construction mats for areas with unstable soil. The use of temporary small construction bridges with construction mats is anticipated for crossing small channels. Dairyland would use ice bridges to cross any wetlands along the existing N-9 transmission line ROW. If the wetland soils are not frozen, construction would be performed in these areas using construction mats and air bridge matting. Air bridges are used in construction zones to support the weight of heavy equipment while protecting underlying pipeline, culvert, or other subterranean material that needs to be bridged. Operators do not permit heavy equipment to be driven over utilities. In this instance, cranes and loaders would be used as crews set out mats singly, so no piece of construction equipment ever touches the wetland. The support mats would be placed perpendicular to the main road decking, allowing the weight of the machinery to be dispersed across a large area. The road deck mats rest on those foundation mats, allowing the road deck to actually float on the wetland's vegetative layer, providing virtually no adverse impact to the wetland ecosystem.

The majority of the access routes would follow the existing ROW and existing access routes used by operation and maintenance crews. No new roads would constructed or decommissioned as part of the connected action. Construction access methods through wetlands would be planned to minimize ground disturbance and may include but are not limited to construction mats and bridging, low-ground-pressure equipment, and restricting the length and width of the access route. Temporary fill, gravel, or rock is not anticipated for access to any of the sites along the N-9 transmission line.

Upon completion of the decommissioning of the N-9 transmission line, all temporary construction matting used for access routes and temporary work areas would be removed either by conventional equipment or low-ground-pressure equipment. Estimated temporary access route and structure pad impacts would be calculated for each structure option when permit applications are prepared. Dairyland would use the same laydown sites identified for the construction of the C-HC Project.

A vegetation restoration plan would be developed in coordination with the U.S Fish and Wildlife Service (USFWS) and the U.S. Army Corps of Engineers (USACE) at the time of filing the special use permit application. The restoration plan would follow Dairyland’s best management practices (BMPs), environmental commitments enumerated in the DEIS (see Section 3.1, Table 3.1-4), BMPs described in Appendix D, and agency input. Dairyland would also obtain an erosion control permit from the Iowa Department of Natural Resources (IDNR). Restoration on private property would be negotiated with each of the landowners at the time of removal.

Dairyland's Iowa Utilities Board (IUB) franchise E-21927 would stay intact until the decommissioning of the N-9 transmission line is complete. After that time, Dairyland would file a request to the IUB to amend the franchise. Dairyland would petition the IUB for a new 69-kV electrical transmission franchise from the termini of the N-9 transmission line to the existing Turkey River Substation (see Figure E.2). Funding for the C-HC Project would be used to complete this connected action.

Minor Equipment Installation at One Wisconsin Substation

The Utilities expect to install equipment at the Lancaster 138-kV Substation (located on Segment D) or at the Hillman Substation (located on Segment E), depending on the alternative selected for the C-HC Project (Figure F.3). The equipment would be needed to use the optical ground wire that would be part of the C-HC Project. No ground disturbance would occur outside either of the existing substation footprints for the connected action. The cost of the equipment installation is not included in the C-HC Project.

ANALYSIS METHODS

The analysis contained within this appendix is informed by the N-9 transmission line retirement plan developed by the Utilities, desktop-collected resource data, and ongoing coordination with agencies. The reader is referred to Chapter 3 of the DEIS for a description of the existing environmental and human resource conditions that could be impacted by connected actions, also known as the affected environment.

For the two connected actions the following resources are analyzed:

- Geology and Soils
- Vegetation, including Wetlands and Special Status Plants
- Wildlife, including Special Status Species
- Water Resources and Quality
- Air Quality
- Noise
- Transportation
- Cultural and Historic Resources
- Land Use, including Agriculture and Recreation
- Visual Quality and Aesthetics
- Socioeconomics and Environmental Justice
- Public Health and Safety

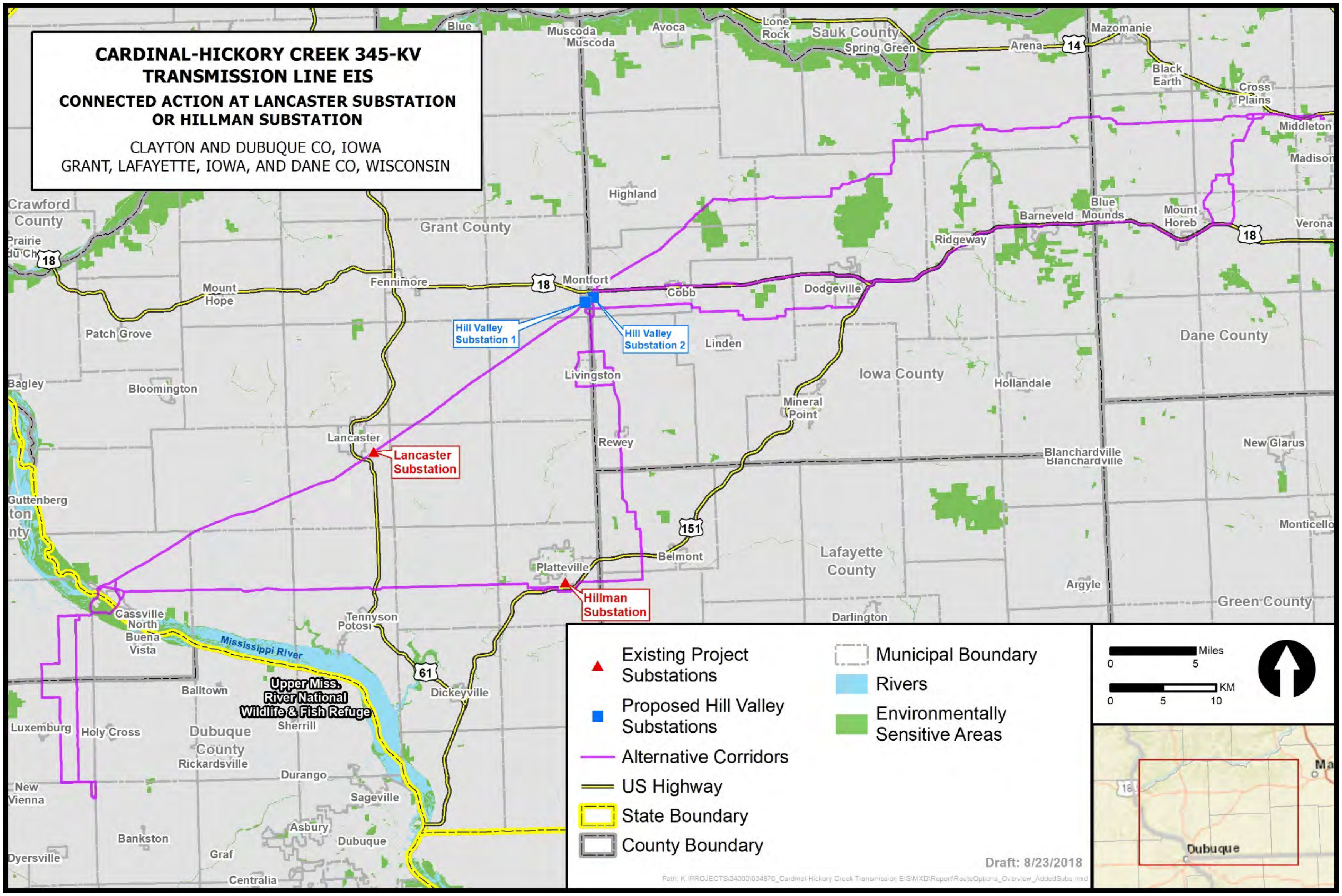

Figure F.3. Connected action at Lancaster Substation or Hillman Substation.

To determine whether an action has the potential to result in significant impacts, the context and intensity of the action must be considered. Context refers to area of impacts, timing, and the duration. Table F-2 defines the impact durations used to explain how long impacts described in *Environmental Consequences* would last. Short-term (or temporary) disturbance is classified as disturbance during the construction/decommissioning period only, whereas long-term (or permanent) disturbance is for the lifetime of the project.

Table F-2. Impact Duration Definitions

Duration	Description
Short-term	During the construction/decommissioning period through two growing seasons after construction is completed, 1 to 3 years
Long-term	Operational life of the tap line, 3 to 50 years

Intensity refers to the severity of the impact. Intensity definitions have been developed to assess the magnitude of effects for all of the affected resource categories resulting from implementing the connected action. The definitions of intensity are provided in Table F-3.

Table F-3. Impact Intensity Thresholds

Minor Impact	Moderate Impact	Major Impact
Impacts would occur, but resources would retain existing characteristics and overall baseline conditions.	Impacts would occur, but resources would partially retain existing characteristics. Some baseline conditions would remain unchanged.	Impacts would occur that would create a high degree of change within the existing resource characteristics and overall conditions of the resources.

Analysis Area

Retirement of Dairyland's N-9 Transmission Line in Iowa

For the connected action analysis, the impact analysis area would include the 80-foot-wide N-9 ROW, new tap line, and access roads. Where relevant, impacts are broken out by Refuge, private lands, and transportation ROW. Portions of the N-9 transmission line would be within the ROW associated with 360th Street and the Great River Road (CY9). Table F-4 summarizes the acres of surface disturbance (also referred to as the analysis area) associated with each element of the connected action, by land ownership.

Table F-4. Connected Action Analysis Area by Land Ownership

	Length (miles)	Within Refuge (acres)	Private Land (acres)	Transportation ROW* (acres)	Total (acres)
Decommissioned N-9 line ROW	2.7	18.6	7.1	0.6	26.3
New tap line ROW	0.2	0.0	1.0	0.9	1.9
Access roads**	3.31	2.9	4.2	0	7.1
Total Analysis Area	**6.21**	**21.5**	**12.3**	**1.5**	**35.3**

* Portions of the N-9 transmission line would be within ROW associated with 360th Street and Great River Road (CY9).

**Access roads refer to the roads utilized to reach the project area in order to decommission the N-9 line and build the new tap line. No new roads would constructed or decommissioned as part of the connected action.

Minor Equipment Installation at One Wisconsin Substation

The impact analysis area for the minor equipment installation at one of the Wisconsin substations, either the Lancaster 138-kV Substation or at the Hillman Substation, is limited to the existing footprint of either substation.

Data Used for Impacts Analysis

The Utilities provided Rural Utilities Service (RUS) with desktop-collected resource data for wetlands, land ownership, and cultural resources to support the analysis contained within this appendix. SWCA Environmental Consultants supplemented the data provided by the Utilities by using publicly available data sets for soils, floodplains, land cover, transportation, farmland, and critical habitat. No fieldwork was completed to collect resource data for the N-9 transmission line.

Dairyland rebuilt the N-9 transmission line in 2000, which required the preparation and approval of a National Environmental Policy Act (NEPA) Borrower's Environmental Report by the RUS. Dairyland corresponded with the IDNR, Iowa State Historic Preservation Officer (SHPO), USACE, and USFWS prior to the rebuild. No endangered species or other environmental concerns were identified prior to the 2000 rebuild. No fieldwork was completed to collect resource data for the rebuild of the N-9 transmission line.

ENVIRONMENTAL CONSEQUENCES

This section provides an overview of environmental consequences for the two connected actions. The affected environment for the connected actions is the same as discussed in the DEIS Chapter 3 for these resources. Therefore, this section focuses on describing and analyzing the impacts from the connected actions by resource topic.

Geology and Soils

Retirement of Dairyland's N-9 Transmission Line in Iowa

The decommissioning the N-9 transmission line and construction of the 0.2-mile tap line could impact soils in the analysis area. The decommissioning of the N-9 line would involve the removal of 27 structures, 21 of which are in the Refuge. Table F-5 shows the acreage of impacts to the sensitive soils from the connected action. For the decommissioning of the N-9 line, approximately 30 acres of sensitive soils would be impacted. Approximately half of the impacted soils are wet soils. Impacts to soils from the decommissioning action would include temporary soil destabilization due to the removal of vegetative cover, and soil compaction can occur from the use of heavy construction vehicles on poorly drained soils. In order to minimize soil compaction, the retirement of Dairyland's N-9 transmission line and construction of the tap line would be completed in winter months so that trucks and equipment driving on frozen soils would reduce compaction. Construction mats would also be used in areas of unstable soils. The use of matting and temporary bridges over wet areas and streams would be used to help minimize impacts to wet soils. Direct, short-term minor impacts are expected for the 35.3 acres of soils during the removal of the N-9 transmission line and new tap line.

The construction of the tap line would impact 2 acres of sensitive soils. The predominant soil type impacted is prime farmland and a small portion of the soils along the tap line are wet soils. The prime farmland–classified soils are not currently used for agricultural production and will not be in the future, so there are no impacts to prime farmlands. Impacts to soils from the construction of the tap line would include soil erosion, loss of soil productivity, and the establishment of noxious weeds on the soil surface. Construction activities may also increase erosion potential by destabilizing the soil surface. Environmental commitments and BMPs listed in Chapter 3, Table 3.1-4, would be utilized to minimize impacts to soils. These impacts would be short-term in nature and minimized through adherence to the erosion control plan. Long-term impacts to soils would be limited to the three to four transmission structures necessary to construct the 0.2-mile tap line.

Table F-5. Temporary Sensitive Soil Impacts from the N-9 Decommissioning and Tap Line

	Refuge (acres)	Private Land (acres)	Transportation ROW (acres)	Total (acres)
Total Analysis Area	**21.5**	**12.3**	**1.5**	**35.3**
Sensitive Soil Type*				
Prime farmland	6.6	1.2	1.2	9.0
Farmland of statewide importance	0.0	3.9	0.0	3.9
Steep slopes	0.0	0.4	0.0	0.4
Severe erosion potential	0.0	8.0	0.0	8.0
Shallow soils	0.2	3.0	0.2	3.4
Wet soils	17.2	0.2	0.4	17.8

* Sensitive soil types may add up to more than the total analysis area because there may be overlap among different types of sensitive soils.

As shown in Table F-5, there would be approximately 17.2 acres of impacts to wet soils from the decommissioning of the N-9 line in the Refuge. Construction mats and temporary bridges would also be used in areas in which soils are classified as unstable soils and wet soils to help mitigate impacts. There are approximately 7 acres of soils with a prime farmland classification within the Refuge. However, since this land in the Refuge is not used for farming and would not be used as such in the future, there would be no impacts to prime farmlands. This soil classification and impact analysis would limit soil impacts to minor, short-term impacts.

Minor Equipment Installation at One Wisconsin Substation

There would be no new impacts to soils resulting from the minor equipment installation at the Hillman or Lancaster Substations in Wisconsin. The installation of the equipment would occur within the existing substation footprint where soils have already been impacted by the substation construction.

Vegetation, including Wetlands and Special Status Plants

Retirement of Dairyland's N-9 Transmission Line in Iowa

Table F-6 summarizes the impacts to vegetation from the N-9 transmission line decommissioning and new tap line construction. The primary impacts to vegetation from the decommissioning of the N-9 line would be short-term, minor impacts from the use of large equipment to remove the structures. Within the Refuge, approximately 19 acres would be disturbed, of which approximately 17 acres are classified as wetlands. On private lands and within the transportation ROW, most of the vegetation cover is classified as grasslands. Once the structures are removed and the ROW easements are retired, there would be long-term beneficial impacts to vegetation because the retired ROW within the Refuge would be revegetated according to a revegetation plan approved by USFWS and USACE. Areas outside of the Refuge would be allowed to naturally revegetate. Over the long term, the vegetation communities would be consistent with surrounding land uses.

Impacts to vegetation from the construction of the new tap line connecting the remaining portion of the N-9 transmission line with the Turkey River Substation would include:

- Removal and/or crushing of natural, native species–dominated vegetation communities or associations;
- Decreased plant productivity as a result of fugitive dust;
- Potential introduction of non-native plant species; and
- Plant community fragmentation.

The majority of the new tap line would be either within transportation ROW associated with the local roads or within actively managed pastureland. Therefore, impacts (both short and long term) to native vegetation communities from the construction of the new tap line would be minimal. Environmental commitments and BMPs listed in Chapter 3, Table 3.1-4, would be utilized to minimize impacts to vegetation.

Table F-6. Acreages of Impacts to Vegetation from the N-9 Decommissioning and Tap Line

Land Cover Class	Refuge (acres)	Private Land (acres)	Transportation ROW (acres)	Total (acres)
Total Analysis Area	**21.5**	**12.3**	**1.5**	**35.3**
Grassland	1.6	5.2	0.6	**7.4**
Forest	0.0*	0.4	0.0	**0.4**
Shrubland	0.1	3.4	0.3	**3.8**
Wetland	17.2	0	0.0	**17.2**

* The lack of forested landcover presented in this table is indicative of the maintained transmission line ROW. Within the Refuge, the area surrounding the ROW is primarily forested.

Wetlands

The connected action is expected to result in minor, short-term impacts to wetlands. There are approximately 17 acres of wetlands along the decommissioned N-9 line, all within the Refuge. Temporary direct disturbance to wetlands is expected during decommissioning to provide access to the 21 structures within the Refuge. Nineteen of the 21 structures within the Refuge would be removed at the ground level to avoid permanent impacts to wetlands. Two structures within the Refuge are steel lattice with cement foundations. The foundations for the two lattice structures would be removed to 4 feet below the ground surface. It is estimated the removal of the structure foundations would require no more than 450 square feet (0.01 acre) of surface area and 1,800 cubic feet of permanent fill within wetlands.

Wetland impacts may result from temporary wetland crossings for construction equipment and/or materials along the proposed ROW and adjacent areas. The decommissioning activities would occur in the winter months so that ice bridges would be used to cross any wetlands along the construction area. If the wetland soils are not frozen, decommissioning activities would be performed in these areas using construction mats to prevent soil compaction and earth disturbance at temporary crossings. All of the wooden structures within the Refuge would be cut at ground level to minimize impacts to the wetlands.

Two construction pads would be temporarily installed within the Refuge to minimize impacts to wetlands during the removal of the steel lattice structures at the Mississippi River crossing.

Decommissioning activities have the potential to increase sediment deposition in nearby wetlands and fragment wetland habitats that span the ROW and adjacent areas. These indirect impacts may decrease overall wetland habitat quality. Noxious weeds and other invasive species would also potentially be introduced and spread through ground disturbances and transfer by equipment. Adherence to BMPs and environmental commitments from Table 3.1-4 would be utilized to reduce erosion, sediment deposition, and the spread of noxious and invasive species along the decommissioned line and new tap line. Upon completion of construction and decommissioning, disturbed areas within the Refuge would be revegetated according to a revegetation plan developed by the Utilities in coordination with the USACE and USFWS.

No wetlands have been identified along the new 0.2-mile tap line.

Minor Equipment Installation at One Wisconsin Substation

There would be no impact to vegetation, including wetlands and special status plants, resulting from the minor equipment installation at the Hillman or Lancaster Substations in Wisconsin. The installation of the equipment would occur within the existing substation footprint where vegetation was previously removed for substation construction.

Wildlife, including Special Status Species

Retirement of Dairyland's N-9 Transmission Line in Iowa

The following discussion of potential impacts to wildlife and special status species applies to both the Refuge portion and private land portion of the N-9 transmission line.

The connected action is not anticipated to impact or alter any protected species or their critical habitats or result in short- or long-term impacts. The impact analysis area does not contain any high- or low-priority zones for the federally endangered rusty patched bumble bee.

Potential impacts from the retirement of Dairyland's N-9 transmission line include the loss, degradation, and/or fragmentation of breeding, rearing, foraging, and dispersal habitats; collisions with and crushing by construction vehicles; loss of burrowing animals and burrows in areas where grading would occur; increased invasive species establishment and spread; and increased noise/vibration levels. These decommissioning and construction-related impacts would be moderate and short-term.

Noise and vibration associated with construction activities would change habitat use patterns for some species. Some individuals would move away from the source(s) of the noise/vibration to adjacent or nearby habitats, which may increase competition for resources within these areas. Noise/vibration and other disturbances may also lead to increased stress on individuals, which could decrease their overall fitness due to increased metabolic expenditures. These effects would be temporary and moderate, and the impacts would cease with the completion of construction activities.

The connected action is not anticipated to result in any long-term adverse impacts to wildlife species. Decommissioning and construction activities would require disturbance of suitable habitat for wildlife species, such as birds, mammals, reptiles, and amphibians. These species are described in detail in Section 3.4 and 3.14. Minor, temporary impacts to wildlife habitat and individuals would occur due to noise and human activity during decommissioning and construction. This would result in short-term temporary displacement of species and would temporarily deter wildlife species from using habitats within the vicinity of construction; however, once construction of the tap line is complete, wildlife species would return.

The retirement of the N-9 transmission line would result in a permanent beneficial impact to wildlife. After the removal of the structures and transmission line, the ROW would be abandoned, and no transmission line infrastructure would remain. All maintenance activities associated with the transmission line would end, and habitat would be restored and/or return to a more natural state with fewer occurrences of human disturbance. The ongoing maintenance of the existing ROW fragments forested and wetland habitats within the Refuge. Abandonment and restoration of the ROW would reduce habitat fragmentation over the long term (50+ years) as the ROW is gradually revegetated through active habitat restoration efforts and/or natural succession. In the short term, the effects of habitat fragmentation on wildlife uses would remain.

Minor Equipment Installation at One Wisconsin Substation

There would be no impact to wildlife, including special status species, resulting from the minor equipment installation at the Hillman or Lancaster Substations in Wisconsin. The installation of the equipment would occur within the existing substation footprint where wildlife species and habitat do not occur.

Water Resources and Quality

Retirement of Dairyland's N-9 Transmission Line in Iowa

Decommissioning of the N-9 transmission line would result in removal of the N-9 line within approximately 18.8 acres of 100-year floodplain in the Refuge. Disturbance in the floodplain would be limited to the decommissioning period within the ROW. During decommissioning, ground cover and soils would be temporarily disturbed. This would result in a temporary minor impact. Upon completion of decommissioning, existing transmission structures would be removed from the 100-year floodplain. This would result in a long-term beneficial impact as the floodplain acreage would be restored to a more natural state, benefitting the floodplain function and regaining a small amount of floodplain storage.

The construction of the tap line would occur in 0.3 acre of floodplain outside of the Refuge. Temporary construction impacts would be similar to those discussed for the decommissioning of the N-9 line. During construction, ground cover and soils would be temporarily disturbed. Impacts in the floodplains would be temporary in nature and the area not occupied by the transmission structures would be reclaimed and revegetated to pre-construction conditions. Permanent disturbance in the floodplain would be limited to the area needed for the new transmission line structures. There would be a minor, long-term impact to the 0.3 acre of floodplain where the new tap line would be constructed.

Impacts to groundwater and surface waters are not anticipated. Construction-related liquids (e.g., equipment lubricants) would be managed to avoid spills and vehicle fueling would occur off-site. Ground-disturbing construction activities including the operation of construction vehicles adjacent to waterways involves some risk to water quality; ground disturbance resulting from excavation, grading, and construction traffic may lead to sediments reaching surface waters. The most common contaminant from construction activity is the movement of sediment by stormwater into nearby surface waters, due to ground disturbance. When implemented properly, as required under Section 402 of the Clean Water Act, these activities minimize the risk for erosion and movement of sediment in stormwater. Once the areas disturbed by construction activities are revegetated, runoff from the ROW and the substation areas would contain minimal sediment and would not be likely to impact surface water quality. Any adverse impact from sedimentation is expected to be short term for the connected action. There would be no long-term impacts.

Minor Equipment Installation at One Wisconsin Substation

There would be no impacts to water resources and quality from the minor equipment installation at the Hillman or Lancaster Substations in Wisconsin because the activities would occur within the existing substation footprint.

Air Quality

Retirement of Dairyland's N-9 Transmission Line in Iowa

The following discussion of air quality impacts applies to both the Refuge portion and private land portion of the N-9 transmission line.

During decommissioning of the N-9 transmission line and construction of the tap line, small amounts of air pollutants would be temporarily generated by exhaust from construction equipment and vehicles as well as fugitive dust from ground-disturbing activities. These emissions would be greatest during the initial site preparation activities and would vary from day to day depending on the construction phase, level of activity, and prevailing weather conditions. All of these emissions would be temporary in nature, fall off rapidly with distance from the construction zone, and would not result in any long-term impacts. Once these activities are completed, emissions would subside, and ambient air quality would return to pre-decommissioning levels.

Greenhouses gas emissions would also be generated from the use of trucks and construction equipment but would not result in any long-term climate change impacts.

Minor Equipment Installation at One Wisconsin Substation

Installation of minor equipment within the Hillman or Lancaster Substation would result in short-term and minor air emissions from construction equipment. The air quality impacts would be very localized to the area surrounding the substation and the impacts would be short-term, lasting the duration of the equipment installation activity.

Noise

Retirement of Dairyland's N-9 Transmission Line in Iowa

The following discussion of noise impacts applies to both the Refuge portion and private land portion of the N-9 transmission line.

The closest receptor to the N-9 transmission line is a house approximately 100 feet to the north of the portion of the N-9 transmission line that would be decommissioned. In addition, approximately 170 feet from the N-9 transmission line is a winery tasting room, which is open to the public. Noise-sensitive receptors generally are defined as locations where people reside or where the presence of unwanted sound may adversely affect the existing land use. Noise-sensitive land uses include residences, hospitals, places of worship, libraries, performance spaces, offices, and schools, as well as nature and wildlife preserves, recreational areas, and parks. According to this definition, the house would be considered a sensitive receptor, whereas the winery tasting room is not considered a sensitive receptor for this analysis.

Estimates of noise from the retirement of Dairyland's N-9 transmission line are based on a roster of the maximum amount of construction equipment used at the station on a given day analyzed from the transmission line to the nearest residence (for ease of calculation, all equipment is assumed to be operating at this single point). The Federal Highway Administration Roadway Construction Noise Model has noise levels for various types of equipment pre-programmed into the software; therefore, the noise level associated with the equipment is typical for the equipment type and not based on any specific make or model. The equipment used in the analysis is given in Table F-7.

Table F-7. Retirement of Dairyland's N-9 Transmission Line Construction Equipment Roster

Equipment Type	Quantity	Typical Maximum Noise Levels at 50 feet, Each (dBA)
Crane	1	81
Bucket truck	2	75
Reel trailer	1	74
Wirepuller	1	77
Stringing equipment	2	75

Note: dBA = A-weighted decibels

The nearest sensitive receptor to the N-9 transmission line is a residence 100 feet away. The estimated noise level at the closest sensitive receptor is 73.2 A-weighted decibels (dBA), which is a major increase from the ambient noise level of 43.0 dBA (Table F-8). However, these impacts due to the noise generated by the retirement of Dairyland's N-9 line would be intermittent and only last during the decommissioning of the N-9 line close to the house. During decommissioning, the noise level at the nearest sensitive receptor along the transmission line would be very loud, approximately equivalent to a pneumatic drill or heavy truck from 50 feet away. The noise level would be loud and intrusive. This noise level would result in a temporary adverse impact during the decommissioning of the N-9 line in close proximity to the sensitive receptor. As decommissioning moves along the N-9 line, the volume of the decommissioning activities would fluctuate at this receptor, resulting in a more moderate and minor temporary impact. Dairyland would coordinate with landowners prior to decommissioning activities.

Table F-8. Estimated Construction Noise Levels at the Nearest Sensitive Noise Receptor

	Ambient Noise Level (dBA)	Calculated L_{max} (dBA)	Calculated L_{eq} Total (dBA)	Noise Level, Ambient + Construction (dBA)
				L_{day}
N-9 line	43.0	74.5	73.2	73.2

Note: dBA = A-weighted decibels; Lmax = maximum noise level; Leq = energy average noise level; Lday = Day equivalent level

Minor Equipment Installation at One Wisconsin Substation

Noise impacts during minor equipment installation are expected to be negligible. These noise impacts would be temporary and would have less of an impact than construction of the transmission line, as discussed in the Noise section of the DEIS.

Transportation

Retirement of Dairyland's N-9 Transmission Line in Iowa

Transportation impacts are not expected to be significant and would be temporary in nature. It is not anticipated that construction equipment or labor transportation would have a significant impact on traffic volumes or flow on local roadways or state highways. Existing roads would be used for construction access to the site. Any increases in traffic would be short-term in nature and would be limited to the decommissioning period of 2 months near the connected action analysis area. Decommissioning would occur during winter months, which is traditionally a time of lower road usage in the Refuge. In winter, the level of traffic on Oak Road in the Refuge significantly drops in conjunction with the end of waterfowl hunting season and the icing of the river.

The decommissioning of the N-9 line would intersect 360th Street and the new tap line would intersect 360th Street and Great River Road (CY9). Major roads that would likely be used to get the equipment to the project site would be Wisconsin State Highways 81 and 133 near Cassville Substation in Wisconsin, and CY9 and U.S. Route 52 in Iowa.

The project may generate a temporary increase in daily trips on the regional and local roadways. Worker-generated traffic would occur primarily in the early morning and late afternoon, while general deliveries likely would occur throughout the day. At any single location, this increase in traffic would be short-term, as crews move over any individual construction spread along the transmission line. Workers may be commuting to the project site from as far as 2 hours away, from outside the analysis area. However, the effects from the comparatively small number of workers using the high-standard, high-volume highways surrounding and within the analysis area are expected to be minor. Because of the dispersed nature of the construction, there would be a minor impact on traffic congestion on any one road segment and, if there were, it would be a temporary situation. On an individual or cumulative basis, the proposed project would not cause long-term traffic delays.

Standard permit application procedures for the N-9 decommissioning within Canadian Pacific Railway ROW would be required. Decommissioning of the N-9 transmission line is not anticipated to impede railroad operations, so no impacts to railroads are anticipated.

Construction timing would be coordinated for river crossings with the U.S. Coast Guard to avoid potential impacts to Private Aids to Navigation in this portion of the Mississippi River. Closures of the Mississippi River channel may be required during project construction activities. These closures would need to be coordinated by the Utilities, the USFWS, the USACE, and the U.S. Coast Guard in terms of the planned duration and extent of the navigation constraints on the river. However, this is unlikely as commercial navigation on the Mississippi River typically ends in early December. If deconstruction activities are carried out during winter months (December through early February) as planned, then they are unlikely to have an effect on commercial navigation.

Minor Equipment Installation at One Wisconsin Substation

The installation of minor equipment at the Hillman or Lancaster Substations would generate a temporary increase in daily trips on the regional and local roadways. Worker-generated traffic would occur primarily in the early morning and late afternoon, while general deliveries likely would occur throughout the day. However, the impacts from the comparatively small number of workers using the local roadways would be negligible.

Cultural and Historic Resources

Retirement of Dairyland's N-9 Transmission Line in Iowa

Ground disturbance during decommissioning of a portion of the N-9 transmission line and construction of the tap line may result in damage to or loss of integrity of cultural resources within the direct area of potential effects (APE), which would be a moderate impact to a cultural resource if the property partially retains the characteristic(s) that make it eligible for the National Register of Historic Places (NRHP), or a major impact if the ground disturbance results in a substantial alteration of the characteristic(s) which make the cultural resource eligible for the NRHP. Furthermore, indirect minor to moderate and long-term adverse impacts may occur from the presences of transmission line structures/towers in sight of NRHP-listed historic properties or properties eligible under Criterion A, B, or C, by potentially altering the setting and/or feeling of the properties.

No cultural resources that have been determined eligible have been previously identified within the N-9 transmission line decommissioning area or new tap line. However, the area has not been surveyed for cultural resources. Approximately 85 shovel test pits have been investigated for archaeological resources within the Refuge for the C-HC Project, which would be in close proximity to the N-9 transmission line ROW. All of the pits for the C-HC Project were found to be negative for archaeological resources, meaning no sites have been found.

Approximately 3.3 acres of the N-9 transmission line proposed for decommissioning and portions of one access road cross privately owned lands, just west of the Refuge, and this land may contain prehistoric mound groups. The sites have not been formally determined eligible for the NRHP. However, they may be eligible for the NRHP under the Multiple Property Submission (MPS), *Prehistoric Mounds of the Quad State Region of the Upper Mississippi Valley* (Stanley and Stanley 1988).

As formal determinations of eligibility are not provided, all properties are assumed eligible for listing in the NRHP. RUS, in coordination with the Iowa SHPO and other interested parties, would formally determine NRHP eligibility of these potential historic properties prior to construction.

The N-9 decommissioning and tap line construction project could result in minor to moderate impacts to the cultural resources within the APE, if they are determined eligible for listing in the NRHP. The Federal agencies, in coordination with SHPO and other consulting parties, would identify steps to avoid, minimize, or mitigate the adverse effects to these sites, thereby diminishing the severity of impacts.

Minor Equipment Installation at One Wisconsin Substation

There would be no impact to cultural resources from the minor equipment installation at the Hillman or Lancaster Substations in Wisconsin. The installation of the equipment would occur within the existing substation footprint where cultural resources do not occur.

Land Use, including Agriculture and Recreation

Retirement of Dairyland's N-9 Transmission Line in Iowa

Landcover

Temporary impacts would occur to land cover types within the ROW during decommissioning and construction of the tap line. Impacts would result from vegetation clearing, transporting materials to and from decommissioning/construction sites, and deconstruction of transmission line structures, and building on the tap line. Impacts would be localized within the ROW and access roads. Table F-9 shows land coverage acreage for the N-9 line and tap line by land ownership. The land cover designated as urban/developed along the Refuge is associated where the existing access road overlaps with Oak Road.

Table F-9. Primary Land Cover Classes within the N-9 Decommissioning and Tap Line Area

	Refuge (acres)	Private Land (acres)	Transportation ROW (acres)	Total (acres)
Total Analysis Area	**21.5**	**12.3**	**1.5**	**35.3**
Agriculture	2.0	2.8	0.1	4.9
Forest	0.0	0.4	0.0	0.4
Grassland	1.6	5.2	0.6	7.4
Urban/Developed	0.6	0.3	0.4	1.3
Shrubland	0.1	3.4	0.3	3.8
Wetlands	17.2	0.0	0.0	17.2

Grassland and shrubland cover types would be temporarily and permanently impacted as a result of the connected actions. Temporary minor impacts as described above would occur during construction and decommissioning, but once these activities are complete most of the ROW in this land cover type would return to shrubland and forested conditions over time, unless the landowners continued to maintain vegetation within the decommissioned ROW as grassland. In the case of the Refuge, the ROW would be revegetated with the goal of returning to a forested landscape, consistent with the adjacent landcover.

Wetlands and open water would also be impacted during construction and decommissioning, although the Utilities would work to avoid construction activities in these areas where possible. Construction mats and temporary bridges would be used in wetlands to help mitigate impacts.

All current land uses along the decommissioned transmission line would return to their original land uses after the structures and conductors are removed. Once the structures are removed and the ROW easements are retired, there would be long-term beneficial impacts to vegetation because the retired ROW would be allowed to naturally revegetate outside of the Refuge and would be revegetated within the Refuge through a coordinated planning effort with the USFWS and USACE. Over the long term, the vegetation communities would be consistent with surrounding land uses.

Minor, long-term impacts to land use and land cover would occur as a result of construction of the 0.2-mile tap line, most of which is classified as grassland and/or is managed as transportation ROW. Long-term minor impacts from the tap line would include less than 1 acre that would be permanently removed from grassland cover for the new transmission line structures.

Agricultural Lands

While there are soils classified as prime farmland and farmland of statewide importance within the analysis area, the current land use where these soils are is not managed as agricultural. These soils are within the Refuge and within the transportation ROW; therefore the land is not expected to be used for agricultural purposes in the future. Therefore, no impacts to prime farmland or farmland of statewide importance would result from the connected action.

Recreation Areas

Decommissioning and removing the existing utility line would limit user access and recreational opportunities within this portion of the Refuge during the 2-month decommissioning period. Recreational uses typically decline in the winter months to a few trappers and upland game and deer hunters in this area. However, reclamation of this area to pre-existing conditions would enhance user experiences in this area by providing an undeveloped landscape over the long term.

Minor Equipment Installation at One Wisconsin Substation

There would be no changes in land use from the minor equipment installation at the Hillman or Lancaster Substations in Wisconsin. The footprint of the substation would not change and the land use would be maintained for utility purposes.

Visual Quality and Aesthetics

Retirement of Dairyland's N-9 Transmission Line in Iowa

The following discussion of impacts to visual quality and aesthetics applies to both the Refuge portion and private land portion of the N-9 transmission line.

Retirement of Dairyland's N-9 transmission line would create direct short-term effects to visual resources by introducing vehicles, equipment, materials, and a workforce during the construction period. Viewers would temporarily witness the decommissioning activities resulting in moderate temporary visual impacts to the natural landscape. Visual effects from construction activities and decommissioning would be short-term, anticipated to last 2 months, and these effects would be minor.

The removal of the N-9 transmission line would result in a long-term beneficial impact to visual quality and aesthetics due to the removal of transmission line structures and the natural revegetation of the previously maintained ROW, which is consistent with the natural rural character of the area.

Construction of the approximately 0.2-mile tap line connecting the existing portion of the N-9 transmission line with the Turkey River Substation would result in permanent, moderate adverse visual impacts to one residence in close proximity to the N-9 transmission line and to users of the Great River Road in Iowa. The new tap line would cross the Great River Road in Iowa, which is considered a scenic driving route. However, the new tap line would be within the viewshed of the remaining segment of the N-9 transmission line and the Turkey River Substation, which is an existing industrial land use. Given the presence of existing human-made features, the landscape has a higher visual absorption capacity for the new elements compared with landscapes that are less modified by human-made structures, because similar vertical elements have previously been introduced into the landscape setting.

Minor Equipment Installation at One Wisconsin Substation

There would be no changes in the visual quality of the area from the minor equipment installation at the Hillman or Lancaster Substations in Wisconsin. The footprint of the substation would not change, and the land use would be maintained for utility purposes.

Socioeconomics and Environmental Justice

Retirement of Dairyland's N-9 Transmission Line in Iowa

The following discussion of impacts to socioeconomics and environmental justice applies to both the Refuge portion and private land portion of the N-9 transmission line.

There would be no impacts to socioeconomics from the decommissioning of the N-9 transmission line and construction of the tap line. The existing businesses and social services would be adequate to support the proposed connected action because of the small size of the construction crew and short-term nature of activities. Given the small size of crew needed for the projects, no impacts to emergency health care facilities or law enforcement services are anticipated.

As discussed in the DEIS, there are no environmental justice populations present in this area.
The connected action activities would not have disproportionate impacts on minority and low-income populations.

Minor Equipment Installation at One Wisconsin Substation

There would be no impacts to socioeconomics from the minor equipment installation at one Wisconsin substation. No impacts to existing business, social socials, emergency health care facilities, or law enforcement services are anticipated.

The connected action activities would not have disproportionate impacts on minority and low-income populations.

Public Health and Safety

Retirement of Dairyland's N-9 Transmission Line in Iowa

The following discussion of impacts to public health and safety applies to both the Refuge portion and private land portion of the N-9 transmission line.

Potential health and safety hazards associated with the retirement of a portion of the N-9 transmission line and short connection to the Turkey River substation exist for construction personnel as related to heavy equipment operation, overhead materials and cranes, and use of construction tools. Construction-related hazards can be effectively mitigated by complying with all applicable Federal and state occupational safety and health standards. Adherence to these standards, and applicable National Electrical Safety Code regulations and utility design and safety standards, would protect construction workers from unacceptable risks.

During decommissioning and construction of the new tap line, all employees, contractors, and subcontractors would be required to conform to Occupational Safety and Health Administration (OSHA) safety procedures. Adequate training would be mandatory for all construction workers on-site. Heavy equipment would be in compliance with OSHA requirements for safety devices, such as back-up warnings, seat belts, and rollover protection. Personal safety equipment such as hard hats, ear and eye protection, and safety boots would be required for all workers on-site. Accidents and injuries would be reported to the designated safety officer at each site.

There would be risk of accidental fire during construction from human activities such as refueling, cigarette smoking, and use of vehicles and construction equipment in dry, grassy areas. The health and safety plan would address these risks, and the risks would be reduced to acceptable levels by restrictions or procedures regarding these activities. Caution would be taken during decommissioning and deconstruction to minimize the risk of unplanned fires. Furthermore, decommissioning during the winter months, when there is snow cover on the ground, would greatly reduce the wildlife risk.

All construction sites would be managed to prevent harm to the general public. The general public would not be allowed to enter any construction areas associated with the connected action. The major risk to the general public would be from increased traffic volume on the roadways near or adjacent to the construction area as a result of commuting construction workers and transportation of equipment and materials.

There would be no new health impacts introduced from the connected action through electric and magnetic fields (EMF). Sources of EMF in the proximity to the connected action include the existing N-9 transmission line, Turkey River Substation, and other transmission infrastructure in the area. While the decommissioning of approximately 2 miles of the N-9 transmission line would remove EMF from the area, the new proposed 0.2-mile tap line would introduce EMF in the vicinity of the Turkey River Substation. The decommissioning and construction of the new tap line would result in a slight relocation of EMF sources and no change in EMF levels.

Minor Equipment Installation at One Wisconsin Substation

Public health and safety impacts for minor equipment installation at one Wisconsin substation would be similar to the impacts discussed above. No new EMF would be introduced to the area as a result of the minor equipment installation.

SUMMARY OF IMPACTS

Table F-10 presents a summary of potential impacts to resources analyzed for the connected actions.

Table F-10. Summary of Impacts from the C-HC Project Connected Actions

Resource	N-9 Transmission Line Decommissioning within the Refuge	N-9 Transmission Line Decommissioning and Tap Line on Private Land	Substation Improvements
Geology and Soils	Short-term adverse impacts to 21.5 acres of soils. Long-term beneficial impacts to soils after decommissioning.	Short-term impacts to 12.3 acres of soils. Long-term beneficial impacts to soils after decommissioning. Long-term adverse impacts to soils at three to four structures for the new tap line.	None
Vegetation, including Wetlands and Special Status Plants	Short-term adverse impacts to 17.2 acres of wetlands. Long-term beneficial impacts to vegetation communities after decommissioning.	Short-term adverse impacts to 5.2 acres of grassland, 3.4 acres of grassland, and 0.4 acre of forest land. Long-term adverse impacts to vegetation at three to four structures for the new tap line. Long-term beneficial impacts to vegetation communities after decommissioning.	None
Wildlife, including Special Status Species	Temporary and moderate impacts to wildlife during decommissioning. Long-term beneficial impact to wildlife after decommissioning.	Temporary and moderate impacts to wildlife during decommissioning. Long-term beneficial impact to wildlife after decommissioning.	None

Resource	**N-9 Transmission Line Decommissioning within the Refuge**	**N-9 Transmission Line Decommissioning and Tap Line on Private Land**	**Substation Improvements**
Water Resources and Quality	Temporary minor impact to floodplains during decommissioning. Long-term beneficial impact to 18.8 acres of floodplains. No impacts to surface waters or groundwater.	Minor long-term impacts to 0.3-acre floodplains. No impacts to surface waters or groundwater.	None
Air Quality	Temporary minor increase in emissions during decommissioning.	Temporary minor increase in emissions during decommissioning.	Short-term minor increase in emissions during construction.
Noise	None	Temporary adverse impact during decommissioning at one sensitive receptor.	Short-term minor impacts during construction.
Transportation	Temporary minor impacts during decommissioning.	Temporary minor impacts during decommissioning.	Short-term minor impacts to roadways during construction.
Cultural and Historic Resources	None identified at this time, although surveys may be necessary.	Potential minor to moderate impacts to the cultural resources within the APE, if they are determined eligible for listing in the NRHP. Cultural resource surveys have not been conducted.	None
Land Use, including Agriculture and Recreation	Short-term minor impacts to land use during decommissioning on 21.5 acres within the Refuge. Long-term beneficial impacts within the Refuge after decommissioning.	Short-term minor impacts to 12.3 acres during decommissioning of the N-9 line and construction of the tap line. Long-term beneficial impacts after decommissioning.	None
Visual Quality and Aesthetics	Short-term minor impacts during decommissioning. Long-term beneficial impacts after decommissioning.	Short-term minor impacts during decommissioning. Long-term beneficial impacts after decommissioning.	None
Socioeconomics and Environmental Justice	None	None	None
Public Health and Safety	None, as Federal and state occupational safety and health standards as well as adherence to applicable National Electrical Safety Code would occur.	None, as Federal and state occupational safety and health standards as well as adherence to applicable National Electrical Safety Code would occur.	None, as Federal and state occupational safety and health standards as well as adherence to applicable National Electrical Safety Code would occur.

LITERATURE CITED

Stanley, D., and L. Stanley. 1988. *Multiple Property Listing: Prehistoric Mounds of the Quad-State Region of the Upper Mississippi River Valley*. No. 64500179. Washington, D.C.: National Park Service.