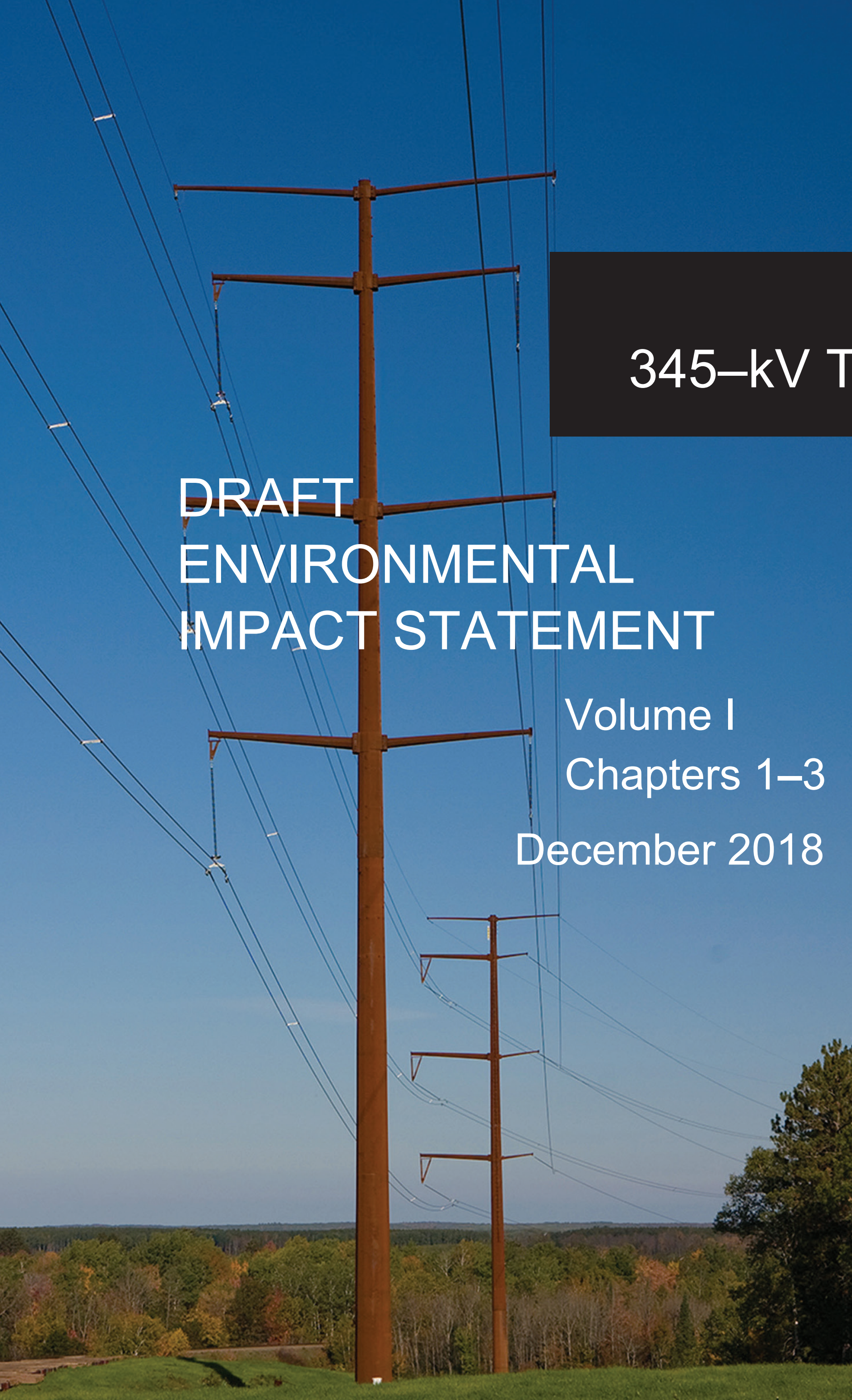

Cardinal– Hickory Creek 345–kV Transmission Line Project

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Volume I

Chapters 1–3

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Cooperating Agencies:

U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
U.S. Environmental Protection Agency

Cardinal-Hickory Creek 345-kV Transmission Line Project

Responsible Federal Agency (Lead): U.S. Department of Agriculture, Rural Utilities Service

Cooperating Agencies: U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, U.S. Environmental Protection Agency

Title: Cardinal-Hickory Creek 345-kV Transmission Line Project Draft Environmental Impact Statement

Location: Eastern Iowa, southwestern and south-central Wisconsin

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EXECUTIVE SUMMARY

Introduction

Dairyland Power Cooperative (Dairyland), American Transmission Company LLC (ATC), and ITC Midwest LLC (ITC Midwest), together referred to as "the Utilities," propose to construct and own a new 345-kilovolt (kV) transmission line between Dane County, Wisconsin, and Dubuque County, Iowa.

The approximately 100- to 125-mile 345-kV transmission line is proposed between Dane County, Wisconsin, and Dubuque County, Iowa. The proposed project includes the following facilities:

- **At the existing Cardinal Substation in Dane County, Wisconsin:** a new 345-kV terminal within the substation;
- **At the proposed Hill Valley Substation near the village of Montfort, Wisconsin:** an approximately 22-acre facility with four 345-kV circuit breakers, one 345-kV shunt reactor, one 345-/138-kV autotransformer, and three 138-kV circuit breakers;
- **At the existing Eden Substation near the village of Montfort, Wisconsin:** transmission line protective relaying upgrades to be compatible with the new protective relays installed at the new Hill Valley Substation and replacement of conductors and switches to meet Utilities' operating limits;
- **Between the existing Eden Substation and the proposed Hill Valley Substation near the village of Montfort, Wisconsin:** a rebuild of the approximately 1 mile of Hill Valley to Eden 138-kV transmission line;
- **At the existing Wyoming Valley Substation near Wyoming, Wisconsin:** installation of nine 16-foot ground rods to mitigate potential fault current contributions from the proposed project;
- **Between the existing Cardinal Substation and the proposed Hill Valley Substation:** a new 50- to 53-mile (depending on the final route) 345-kV transmission line;
- **Between the proposed Hill Valley Substation and existing Hickory Creek Substation:** a new 50- to 70-mile (depending on the final route) 345-kV transmission line;
- **At the Mississippi River in Cassville, Wisconsin:** a rebuild and possible relocation of the existing Mississippi River transmission line crossing to accommodate the new 345-kV transmission line and Dairyland's 161-kV transmission line, which would be capable of operating at 345-/345-kV but would initially be operated at 345-/161-kV;
    - depending on the final route and the Mississippi River crossing locations:
        - a new 161-kV terminal and transmission line protective relaying upgrades within the existing Nelson Dewey Substation in Cassville, Wisconsin;
        - a replaced or reinforced structure within the Stoneman Substation in Cassville, Wisconsin;
        - multiple, partial, or complete rebuilds of existing 69-kV and 138-kV transmission lines in Wisconsin that would be collocated with the new 345-kV line;
- **At the existing Turkey River Substation in Dubuque County, Iowa:** two 161-/69-kV transformers, four 161-kV circuit breakers, and five 69-kV circuit breakers; and
- **At the existing Hickory Creek Substation in Dubuque County, Iowa:** a new 345-kV terminal within the existing Hickory Creek Substation.

These upgrades and new construction projects are all together referred to as the "Cardinal-Hickory Creek Project" (or the "C-HC Project"). Due to the scope and potential impact of the C-HC Project and the involvement and actions of certain Federal agencies, an environmental impact statement (EIS) is being prepared to fulfill obligations specified under the National Environmental Policy Act (NEPA).

Dairyland intends to request financial assistance from the U.S. Department of Agriculture Rural Utilities Service (RUS) to fund its anticipated 9% ownership interest in the C-HC Project. RUS administers programs that provide much-needed infrastructure or infrastructure improvements to rural communities. RUS's determination to potentially finance the Dairyland portion of the C-HC Project constitutes a Federal action, requiring it to perform an environmental review within the context of NEPA. To comply with NEPA, RUS has prepared this draft EIS (DEIS) prior to the determination of whether RUS funds should be obligated to finance Dairyland's ownership portion of the project and prior to initiation of construction.

RUS is serving as the lead Federal agency for the NEPA environmental review of the C-HC Project. The U.S. Fish and Wildlife Service (USFWS), U.S. Army Corps of Engineers (USACE), and U.S. Environmental Protection Agency are cooperating agencies for the DEIS. The National Park Service is serving as a participating agency. Regardless of the potential financial assistance from RUS to fund Dairyland's ownership interest in the C-HC Project, a NEPA environmental review would still be required as part of the permitting actions by USACE, USFWS, and potentially other Federal agencies.

Project Purpose and Need

In many areas of the Midwest, the electricity transmission backbone system primarily consists of 345-kV lines. There are limited connection points to the existing regional grid and 345-kV transmission lines in the area from northeast Iowa and southwestern and south-central Wisconsin. The Utilities propose to construct and own the C-HC Project 345-kV transmission line, and interconnecting 345-kV network facilities in northwest Iowa and south-central Wisconsin. The C-HC Project is the southern portion of Midcontinent Independent System Operator, Inc.'s (MISO's) multi-value project (MVP) #5 project. The proposal includes a new intermediate substation near Montfort, Wisconsin, which would provide connectivity to the regional 345-kV network.

The C-HC Project would increase the capacity of the regional transmission system to meet the following needs:

Address reliability issues on the regional bulk transmission system and ensure a stable and continuous supply of electricity is available to be delivered where it is needed even when facilities (e.g., transmission lines or generation resources) are out of service;

Alleviate congestion that occurs in certain parts of the transmission system and thereby remove constraints that limit the delivery of power from where it is generated to where it is needed to satisfy end-user demand;

Expand the access of the transmission system to additional resources, including 1) lower-cost generation from a larger and more competitive market that would reduce the overall cost of delivering electricity, and 2) renewable energy generation needed to meet state renewable portfolio standards and support the nation's changing electricity mix;

Increase the transfer capability of the electrical system between Iowa and Wisconsin;

Reduce the losses in transferring power and increase the efficiency of the transmission system and thereby allow electricity to be moved across the grid and delivered to end-users more cost-effectively; and

Respond to public policy objectives aimed at enhancing the nation's transmission system and to support the changing generation mix by gaining access to additional resources such as renewable energy or natural gas-fired generation facilities.

Federal Purpose and Need

Several agencies will use this DEIS to inform decisions about funding, authorizing, or permitting various components of the proposed C-HC Project:

- RUS, the lead Federal agency, will determine whether or not to provide financial assistance for Dairyland's portion of the project.
- USFWS will evaluate the Utilities' request for a right-of-way (ROW) easement and a Special Use Permit to cross the Upper Mississippi River National Wildlife and Fish Refuge (Refuge).
- 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 Clean Water Act.

Certificate of Public Convenience and Necessity in Wisconsin and Electric Transmission Franchise in Iowa

In addition to compliance with all applicable Federal regulations, a certificate of public convenience and necessity (CPCN) must be granted by the State of Wisconsin and an electric transmission franchise granted by the State of Iowa. The Public Service Commission of Wisconsin (PSCW) is responsible for reviewing and approving applications for a transmission project that is either 1) 345 kV or greater, or 2) less than 345 kV but greater than or equal to 100 kV, over 1 mile in length, and needing a new ROW (PSCW 2017). The Iowa Utilities Board (IUB) is responsible for reviewing and processing all petitions for electric transmission line franchises under Iowa Code Chapter 478 – Electric Transmission Lines, Chapter 11 of 199 Iowa Administrative Code – Electric Lines, and Chapter 25 of 199 Iowa Administrative Code – Iowa Electrical Safety Code. A franchise is the authorization of the IUB for the construction, erection, maintenance, and operation of an electric transmission line. The granting of a franchise requires a finding by the IUB that the project is necessary to serve a public use, represents a reasonable relationship to an overall plan of transmitting electricity in the public interest, and meets all other legal requirements (IUB 2017).

Connected Action

Connected actions are those that are closely related to the proposed project and should therefore be discussed in the same impact statement (40 Code of Federal Regulations [CFR] 1508.25). There are two connected actions associated with the C-HC Project:

1. The retirement of Dairyland's 69-kV transmission line (referred to as the N-9 transmission line in this DEIS) that crosses the Refuge in Iowa.
2. The installation of minor equipment at one of two substations in Wisconsin, depending on the selected alternative.

Public Involvement

Throughout the NEPA process, the public and various government agencies have had the opportunity to provide input and comment on the C-HC Project. The Notice of Intent published on October 18, 2016, initiated the 30-day public scoping period, which ultimately was extended to 81 days ending on January 6, 2017. The announcement included a brief overview about the Proposed Action and alternatives, potential resource concerns, opportunities to provide input and attend meetings, and RUS project contacts. Letters, radio public service announcements, and newspaper advertisements announcing the proposed project, and the scoping meeting locations and times were distributed prior to the public scoping meetings. RUS held six public scoping meetings to present the RUS NEPA process and timelines, and to answer questions and receive comments regarding the C-HC Project.

RUS also sent letters to Federal and state agencies and federally recognized tribes with interest in the C-HC project area inviting them to participate in public and agency scoping meetings concurrently with the public scoping meetings in October and November 2016. Tribes were invited to participate in the National Historic Preservation Act (NHPA) Section 106 review process, attend public scoping meetings, and provide relevant information for inclusion in the DEIS.

Scoping

During scoping, RUS received 379 comment letters from 352 commenters for a total of 1,736 individual comments. The key issues identified during the comment process were primarily related to socioeconomics, NEPA process, wildlife, land use, and visual resources. A summary of the public comments received and organized by concern, issue, or resource topic is presented in Table ES-1, in order of the greatest number of comments received to the fewest number of comments received.

Table ES-1. Scoping Comment Summary by Topic

Topic	Number of Comments	Topic	Number of Comments
Socioeconomics	552	Impact Analyses	51
NEPA Process	481	Cultural Resources	39
Wildlife	262	Air Quality	30
Land Use	169	Public Involvement	29
Visual Resources	162	Geology	28
Recreation and Natural Areas	116	Soils	19
Water Resources	112	Transportation	16
Vegetation	112	Noise	14
Public Health and Safety	71	Communications Infrastructure	5
Decision Process	61	Paleontology	1

Public Comment Period

RUS is holding six public meetings on the DEIS during which interested parties may make oral comments in a formal setting and/or submit written comments (Table ES-2). A court reporter will be present to record these oral comments. Meeting transcripts will be available on the project website after the meetings.

Table ES-2. DEIS Public Meeting Dates, Times, and Locations

Date	Location	Meeting Time	Venue
Tuesday January 22, 2019	Peosta, Iowa	1–3 p.m.	Peosta Community Center 7896 Burds Road Peosta, IA
Tuesday January 22, 2019	Guttenberg, Iowa	6–8 p.m.	Guttenberg Municipal Building 502 S. First Street Guttenberg, IA
Wednesday January 23, 2019	Cassville, Wisconsin	5–7 p.m.	Cassville Middle School Cafeteria 715 E. Amelia Street Cassville, WI
Thursday January 24, 2019	Dodgeville, Wisconsin	5–7 p.m.	Dodger Bowl Banquet Hall 318 King Street Dodgeville, WI
Monday January 28, 2019	Barneveld, Wisconsin	5–7 p.m.	Deer Valley Lodge 401 West Industrial Drive Barneveld, WI
Tuesday January 29, 2019	Middleton, Wisconsin	5–7 p.m.	Madison Marriott West 1313 John Q Hammons Drive Middleton, WI

Following the close of the comment period, RUS will issue a Final EIS (FEIS) that considers and responds to all substantive comments received on the DEIS. RUS will then issue a final decision based on the DEIS and FEIS and all public and agency comments in the public record for this proceeding.

Proposed Project and Alternatives

RUS regulations (7 CFR 1970.5 (b)(3)(iii)) require the Utilities to "develop and document reasonable alternatives that meet their purpose and need while improving environmental outcomes." As part of the initial investigation of the proposed C-HC Project, the Utilities prepared three corridor-siting documents: the Alternatives Evaluation Study (AES) (Dairyland et al. 2016a), the Alternative Crossings Analysis (ACA) (Burns and McDonnell Engineering Company [Burns and McDonnell] 2016), and the Macro-Corridor Study (MCS) (Dairyland et al. 2016b). The AES describes the transmission planning process and modeling scenarios used by MISO to evaluate electrical alternatives and to identify the project endpoints: the Hickory Creek Substation in Iowa, and the Cardinal Substation in Wisconsin. The Utilities then developed the C-HC Study Area to develop a range of reasonable route alternatives connecting the two endpoints. Once the boundaries of the C-HC Study Area were defined, the Utilities identified potential macro-corridors within the C-HC Study Area by completing an opportunities-and-constraints analysis using the results from field reconnaissance and geographic information system (GIS) databases.

Alternatives Considered but Not Evaluated in Detail

Alternative transmission line corridors in Wisconsin were identified and investigated by the Utilities during the initial routing studies. In addition, Mississippi River crossing alternatives were investigated and determined to be not feasible. The alternative corridors discussed in this section were not carried forward for detailed analysis in this DEIS for a variety of reasons. The following alternatives in the Cardinal Substation to Hill Valley Substation Area, Hill Valley Substation to Mississippi River Study Area, and Alternative Mississippi River Crossings were eliminated from detailed analysis: Alternative Corridors 1–12, Lock and Dam No. 10, Lock and Dam No. 11, Highway 61/151 crossing in Dubuque, Iowa (Highway 151 Bridge), Julien Dubuque Bridge/Highway 20 crossing in Dubuque, Iowa (Julien

Dubuque Bridge), and Dubuque to Galena 161-kV Transmission Line crossing in Dubuque, Iowa (Galena 161-kV Transmission Line).

In addition, the Utilities examined alternative routes for crossing the Refuge. The Utilities have met with the USFWS since April 2012 to discuss potential Mississippi River crossings, including crossings of the Refuge. The Utilities provided an ACA report to demonstrate that non-Refuge alternatives were not economically or technically feasible and would have greater overall environmental and human impacts compared to the feasible Refuge crossing locations (Burns and McDonnell 2016).

Non-transmission alternatives reviewed for this DEIS include regional or local renewable electricity generation (i.e., solar), energy storage, energy efficiency, and demand response. In addition, RUS also considered two transmission line alternatives, a lower-voltage alternative and underground burial of the transmission line. The non-transmission, lower-voltage and underground alternatives were evaluated on the six-point need for the Proposed Action, but were not carried forward for detailed analysis.

The No Action Alternative

The No Action Alternative "provides a benchmark, enabling decision makers to compare the magnitude of environmental effects of the action alternatives" (CEQ 1981: Question 3) (40 CFR 1502.14). The No Action Alternative provides the environmental baseline against which the other alternatives are compared (RUS regulation 7 CFR 1970.6 (a)).

Under the No Action Alternative, RUS would not provide funding for Dairyland's portion of the C-HC Project, and the USFWS and USACE would not grant the ROWs necessary for the C-HC Project to cross the Refuge. The project would not be built, and existing land uses and present activities in the analysis area would continue.

Action Alternatives

RUS has identified six alternatives for the C-HC Project. These alternatives consist of individual route segments that, when combined, form complete route alternatives connecting the Cardinal Substation in Wisconsin with the Hickory Creek Substation in Iowa. Figure ES-1 shows the segments used to develop the six action alternatives for the C-HC Project.

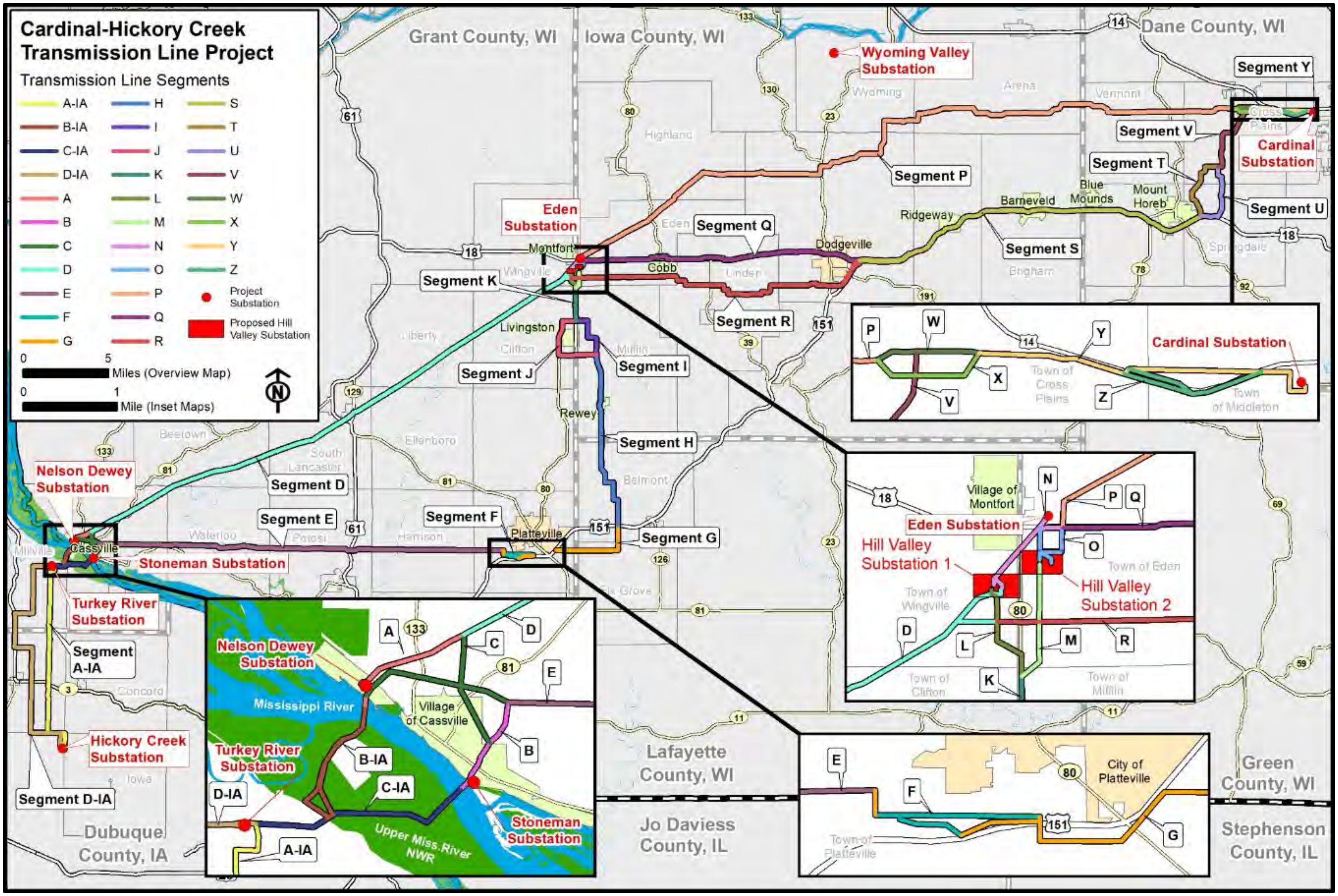

Figure ES-1. Transmission line alternative corridor segments map.

The estimated total cost for the proposed C-HC Project is $500 million (in 2023 dollars). Dairyland intends to request financial assistance from RUS to fund its anticipated 9% ownership interest in the C-HC Project. If approved, the in-service date would be scheduled for 2023.

Overall, for all the alternatives, in places where the proposed transmission line is collocated with existing transmission lines, the lines would be installed with a double-circuit configuration on new transmission line structures, and the existing transmission line ROW would be used to accommodate the new structures. The typical ROW would be 150 feet wide in Wisconsin and 200 feet wide in Iowa. However, in exceptional circumstances, the ROW would differ from the typical widths.

Alternative 1: North Corridor Baseline

Alternative 1 would include 99 miles of transmission with approximately 65 miles collocated with existing ROWs for transmission lines, railroads, and roadways and 34 miles of transmission line in new ROW.

The east end of this alternative starts at the Cardinal Substation. Segments Y and W would follow the existing 69-kV transmission line to Segment P. Segment P would be a section of new transmission line ROW located along the northern half of the C-HC Study Area. Segment P would then connect with Segment N before connecting to the new Hill Valley Substation near Montfort, Wisconsin. Although either 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 property containing the Nelson Dewey Substation, just northwest of Cassville, Wisconsin. The line would not connect into, but would bypass, the Nelson Dewey Substation.

Once the C-HC Project transmission line exits southward from the Nelson Dewey Substation property, 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 Dubuque County, Iowa. Under this alternative, the existing 161-/69-kV double-circuit configuration at the existing Stoneman Substation Mississippi River crossing would be removed and would require a modification of the physical structure of the Stoneman Substation. Under this alternative, the existing ROW for the 161-kV line within the Refuge would be revegetated following the requirements of USFWS and USACE.

Alternative 2: North Corridor with Southern Variation

Alternative 2 would include 105 miles of transmission with approximately 68 miles collocated with existing ROWs for transmission lines, railroads, and roadways and 37 miles of transmission line in new ROW.

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. The alternative would then follow Segment D before reaching the Mississippi River, where it would cross southeast on Segment C; and then follow part of Segment B and enter the property containing the Stoneman Substation but would not connect to that substation. Alternative 2 would then exit south of the Stoneman Substation property 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 would include 117 miles of transmission with approximately 79 miles collocated with existing ROWs for transmission lines, railroads, and roadways and 38 miles of transmission line in new ROW.

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 enter the property containing the Stoneman Substation in Cassville, Wisconsin, but would not connect to that substation. 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 include 119 miles of transmission with approximately 109 miles collocated with existing ROWs for transmission lines, railroads, and roadways and 10 miles of transmission line in new ROW.

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. Route 18 along Segment S, until it reaches and then passes on the north side of Dodgeville and traverses west on Segments Q and N; then follows Segment O south into 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 include 128 miles of transmission with approximately 117 miles collocated with existing ROWs for transmission lines, railroads, and roadways and 10 miles of transmission line in new ROW.

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 until it passed just west of Klevenville. The alternative would then pass just south of Mount Horeb, heading southwest along U.S. Route 18 and along Segment S, then would 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 go 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 would traverse west on Segments G, F, E, and C; then would turn south to the Nelson Dewey Substation. After leaving the Nelson Dewey Substation, the alternative would turn south on Segment A, and then would follow 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 and would require a modification of the physical structure of the Stoneman Substation. Under this alternative, the existing ROW for the 161-kV line within the Refuge would be revegetated following the requirements of USFWS and USACE.

Alternative 6: South-North Crossover Corridor

Alternative 6 would include 101 miles of transmission with approximately 97 miles collocated with existing ROWs for transmission lines, railroads, and roadways and 4 miles of transmission line in new ROW.

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. Route 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 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, 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. Under this alternative, the existing ROW for the 161-kV line within the Refuge would be revegetated following the requirements of USFWS and USACE.

Project Components

The major components of the C-HC Project include transmission line facilities, substations, and communication systems. Typical design characteristics for the major project components are listed in Table ES-3. Final design characteristics would be determined in the detailed design phase of the project.

Table ES-3. Typical Transmission Line Components

Transmission Line Facility	Description
Transmission line structures	Monopole steel structures Low-profile H-frame tubular steel (Refuge)
Typical structure height	90–175 feet for monopole structures 75 feet for low-profile H-frame structures (Refuge)
Typical span length	500–1,200 feet for monopole structures 500–600 feet for low-profile H-frame (Refuge)
Number of structures per mile	4–11 per mile
Directly embedded structures *Temporary ground disturbance* *Permanent ground disturbance*	See Section 2.4.1.3.1 for details. 100 × 100–foot workspace (0.23 acre); 20 to 30 feet deep 6 feet in diameter per structure (0.001 acre)
Reinforced concrete caissons *Temporary ground disturbance* *Permanent ground disturbance*	See Section 2.4.1.3.1 for details. 100 × 100–foot workspace (0.23 acre); 20 to 60 feet deep Up to 12 feet in diameter per structure (0.003 acre)

Transmission Line Facility	Description
Voltage	345,000 volts or 345 kV
Circuit configuration	Varies depending on location. Options include: 345-kV single circuit 345/69-kV double circuit 345/138-kV double circuit 345/161-kV double circuit 345/345-kV double circuit across Mississippi River but operated at 345/161-kV
Conductor size and type	Outside of Mississippi River crossing: Diameter: 1.404 inches Type: Bundled T2 477 Hawk Mississippi River crossing: Diameter: 1.814 inches Type: Bundled T2-795 Drake
Design ground clearance of conductor	27 feet

Multiple existing substations along the proposed C-HC Project routes would be improved under any of the six action alternatives. In addition, one new substation, named the Hill Valley Substation, would be constructed near Montfort, Wisconsin.

Two types of structure foundations would be primarily used for the C-HC Project: directly embedded structures and reinforced concrete caissons. Directly embedded structures tend to be more economical than concrete foundations and are typically used for tangent and small-angle structures. Soil conditions would determine the appropriate foundation type and the required dimensions of the drilled holes. Where poor soils conditions exist, deeper and wider excavations would be necessary. In some places, access would be limited or protection of natural resources would be paramount (or both), making alternative construction methods prudent for consideration. Alternative foundations that might be needed to construct the C-HC Project include micro-piles, helical piers, vibratory piles, and vibratory caissons.

Wherever possible, the C-HC Project ROW would be accessed from existing public roads that intersect the ROW. Where public roads do not intersect the ROW, existing farm lanes, driveways, and cleared forest roads or trails would be used for access, along with existing waterway crossings such as bridges or culverts. Before construction begins on the C-HC Project transmission line, some of these existing access roads might need modifications and improvements to allow for safe equipment movement to and from the C-HC Project ROW.

Affected Environment and Environmental Consequences

NEPA requires agencies to assess the direct, indirect, and cumulative impacts of the alternatives carried forward for detailed analysis. Potential impacts were identified and evaluated for each aspect of the natural and built environments potentially affected by the C-HC Project, including the following resources: 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; and the Upper Mississippi River National Wildlife and Fish Refuge. Direct and indirect impacts are discussed for each resource immediately following the characterization of each resource’s affected environment in Chapter 3 of the DEIS. Impact analysis for each resource also assumes successful implementation of the environmental commitments and best management practices (BMPs) that the Utilities would follow (Table ES-4). Table ES-5 presents a summary comparison of potential impacts to resources analyzed in the DEIS for each action alternative.

Table ES-4. Environmental Commitments Common to All Action Alternatives

Resource	Environmental Commitment
General	• Regulatory agencies may require independent third-party environmental monitors related to permitted aspects of the C-HC Project. The Utilities use trained staff members or contractors as monitors for special resource conditions as a standard practice
Geology and Soils	• An erosion control plan, coordinated with the Iowa Department of Natural Resources (IDNR) and Wisconsin Department of Natural Resources (WDNR), would be prepared once a route is approved, and BMPs would be employed near aquatic features (wetlands, streams, waterbodies) to minimize the potential for erosion and to prevent any sediments from entering the aquatic features. • Erosion controls would be regularly inspected and maintained throughout the construction phase of a project until exposed soil has been adequately stabilized.
Vegetation, including Wetlands and Special Status Plants	**General Vegetation** • During restoration, erosion and sediment control measures, including measures for stabilization of disturbed areas during and at the completion of construction, would be implemented as defined in the Stormwater Pollution Prevention Plan (SWPPP) developed for the C-HC Project. Areas where ground disturbance occurs would be monitored until 70% revegetation has been established. • In non-agricultural areas where ground disturbance occurs, the area would be monitored until ground cover is reestablished to at least 70% of the vegetation type, density, and distribution that was documented in the area prior to construction. • In areas that were previously forested, disturbed areas would be revegetated consistent with non-invasive herbaceous vegetation that occurs in the area. **Algific Talus Slopes** • Upon final route selection and after landowner permission is obtained, additional habitat assessments and algific talus slope surveys will be completed along the final route selected in Iowa. • Geotechnical surveys at the proposed pole locations will be completed along the final route selected in Iowa to determine whether caves or cavities exist in bedrock that could be connected to algific talus slopes within or adjacent to the action area. • Should any algific talus slopes be identified during habitat assessments, or any caves or cavities be detected in the bedrock during geotechnical surveys, they will be avoided by construction. • Pole locations and construction access roads will be adjusted to avoid algific talus slopes, if present. • If algific talus slopes are identified, vegetation removal on steep slopes would be minimized to only the amount necessary to maintain conductor clearances. • Broadcast spraying of herbicides will be avoided and careful spot spraying will be used in suitable algific talus slope habitat areas. **Woodlands** • To minimize the spread of oak wilt, the cutting or pruning of oak trees between April 15 and July 1 for maintenance would be conducted in accordance with Wisconsin Administrative Code (WAC) Public Service Commission (PSC) 113.051. • 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 would be employed, which 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 Agriculture, Trade, and Consumer Protection [ATCP] 21.17). Where ash wood products cannot be left on-site, alternative plans would be developed to meet the requirements. • Standard practices used in the quarantine area to avoid the spread of gypsy moth damage include inspections by trained staff 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. **Wetlands** • Impacts to wetlands would be minimized by one or more of the following measures: o Conducting construction activities when wetland soils and water are frozen or stable and vegetation is dormant. o Use of equipment with low ground-pressure tires or tracks. o Placement of construction matting to help minimize soil and vegetation disturbances and distribute axle loads over a larger surface area, thereby reducing the bearing pressure on wetland soils. • Access roads through wetlands will not require permanent fill. • Erosion control BMPs will be installed where needed to prevent soil erosion into and within wetlands.

Resource	Environmental Commitment
	• Any spoils will be removed from wetlands to non-sensitive upland areas or other approved location. Cleaning of construction equipment and mats, per the Wisconsin Council on Forestry's "Invasive Species Best Management Practices: Rights-of-Way" guidance to mitigate the spread of invasive species (Appendix D). Where necessary to ameliorate minor impacts, such as rutting and vegetation disturbance due to equipment operation and mat placement in wetlands, site restoration activities will be implemented, monitored, and remedial measures applied until established restoration goals are achieved, as required by regulatory permits obtained for the C-HC Project. **Invasive Species** • The Utilities would follow the Wisconsin Council on Forestry's "Invasive Species Best Management Practices: Rights-of-Way" guidance to mitigate the spread of invasive species (see Appendix D). • Work below the ordinary high-water mark (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 WAC NR 329.04(5)). • Uninfested natural areas, such as high-quality wetlands, forests, and prairies, will 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. o The WDNR or IDNR, as applicable, would be consulted to determine the best methods for control of encountered invasive species. • The Utilities will employ a Certified Pesticide Applicator for all herbicide applications within the C-HC Project. The Certified Pesticide Applicators will only use herbicides registered and labeled by the U.S. Environmental Protection Agency (USEPA) and will follow all herbicide product label requirements. Herbicides approved for use in wetland and aquatic environments will be used in accordance with label requirements, as conditions warrant.
Wildlife, including Special Status Species	• In accordance with WDNR avoidance and minimization measures, reptile exclusion fencing would be installed in areas during the appropriate season where habitat is likely to support rare turtles, snakes, or salamanders. • The Utilities will develop a project-specific Avian Protection Plan for the C-HC Project. An eagle management plan will be included as part of the Avian Protection Plan. • Bird flight diverters 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. • Design standards for this project will meet avian-safe guidelines as outlined by the Avian Powerline Interaction Committee for minimizing potential avian electrocution risk. • The Utilities will identify locations, in coordination with USFWS, IDNR, and WDNR, where the installation of bird flight diverters will be recommended to minimize the potential for avian collisions. If an eagle nest occurs near the ROW, the Utilities will coordinate with the USFWS to determine if and where bird flight diverters are needed to minimize collision risk. • The Utilities will coordinate with the USFWS, IDNR, and WDNR on eagle nest surveys to occur before construction activities to identify eagle nests within 0.5 mile on either side of the ROW. The surveys would occur preferably in the winter or spring before leaf-on when nests are the most visible. • The Utilities will coordinate with the USFWS if an eagle nest occurs within 660 feet of the edge of the ROW to determine if and which permits are recommended or if mitigation measures are appropriate to minimize impacts. • The Utilities will work with the IDNR and the 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. • Prior to tree clearing during migratory bird nesting season, the Utilities will complete a field review of the final ROW to identify existing stick nests. Tree-clearing crews will also be trained to stop work and notify Environmental staff if they encounter an unanticipated nest. • Vegetation clearing within threatened and endangered avian species habitat will be avoided during migratory bird nesting season. **Iowa Pleistocene Snail** • Upon final route selection and after landowner permission is obtained, additional habitat assessments and algific talus slope surveys will be completed along the final route selected in Iowa. • Geotechnical surveys at the proposed pole locations will be completed along the final route selected in Iowa to determine whether caves or cavities exist in bedrock that could be connected to algific talus slopes within or adjacent to the action area.

Resource	Environmental Commitment
	• Should any algific talus slopes be identified during habitat assessments, or any caves or cavities be detected in the bedrock during geotechnical surveys, they will be avoided by construction. • Pole locations and construction access roads will be adjusted to avoid algific talus slopes, if present. • Vegetation removal that occurs on steep slopes along the proposed ROW in Iowa will be the minimum amount necessary to maintain conductor clearances. • All seed mixes used for restoration and revegetation in areas of algific talus slope habitat will be free of neonictinoids. • The use of BMPs during construction and vegetation management activities to prevent the spread of invasive species will help to maintain greater plant diversity along the cleared transmission corridors. **<u>Northern Long-eared Bat</u>** • Tree removal activities will be avoided during the northern long-eared bat "pup season" (June 1 to July 31) to avoid potential direct impacts to pups at roosts. • Northern long-eared bat surveys will be performed between the two proposed corridors within the Upper Mississippi River National Wildlife and Fish Refuge per the USFWS's most recent Range-wide Indiana Bat/Northern Long-eared Bat Summer Survey Guidelines (USFWS 2018a). • Northern long-eared bat surveys may be performed along other portions of project segments per the most recent survey guidelines to determine northern long-eared bat presence or probable absence. Areas having survey results of probable absence would not be subject to tree removal restrictions during the pup season. **<u>Rusty Patched Bumble Bee</u>** • Prior to construction, areas within High Potential Zones preliminarily screened as low-quality habitat or questionable habitat will be evaluated and documented using the *Rusty Patched Bumble Bee Habitat: Assessment Form and Guide* (Xerces Society for Invertebrate Conservation 2017). • Areas determined to contain suitable habitat within High Potential Zones per the *Rusty Patched Bumble Bee Habitat: Assessment Form and Guide (*Xerces Society for Invertebrate Conservation 2017) will be surveyed for rusty patched bumble bee no more than 1 year prior to construction per the Survey Protocols for the Rusty Patched Bumble Bee (USFWS 2018b). Additional surveys may be performed more than 1 year prior to construction to guide project planning. • Where the rusty patched bumble bee is confirmed to be present, disturbance and vegetation clearing conducted between March 15 and October 14 will be minimized to the extent possible along edges of woodlots and in open areas with abundant floral resources where nesting habitat is more likely to be found. • Seed mixes containing a diversity of native flowering plants will be used to reseed existing suitable habitat areas that require revegetation/restoration within High Potential Zones, as well as opportunity areas for expanding suitable habitat within known High Potential Zones. • All seed mixes used for restoration and revegetation will be free of neonicotinoids. • The use of BMPs during construction and vegetation management activities to prevent the spread of invasive species will help to maintain greater plant diversity along the cleared transmission corridors. • Herbicide application where used for vegetation management purposes in suitable habitat within High Potential Zones will be targeted to limit the effects of the herbicide beyond the targeted species. • To avoid or minimize impacts in areas documented by surveys to be occupied by rusty patched bumble bee, activities within occupied habitat will be sequenced with seasonal time frames as much as is feasible (i.e., late spring/summer work in woodlands to avoid overwintering queens, late fall/winter work in open areas to avoid foraging and nesting sites).
Water Resources and Water Quality	• An erosion control plan, coordinated with the IDNR and WDNR, will be prepared once a route is ordered/approved, and BMPs would be employed near aquatic features (wetlands, streams, waterbodies) to minimize the potential for erosion and to prevent any sediments from entering the aquatic features. • Erosion controls would be regularly inspected and maintained throughout the construction phase of a project until exposed soil has been adequately stabilized. • Waterway crossings would require a temporary clear span bridge (TCSB) to avoid the necessity of driving construction equipment through streams. 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 stream bank. If there are waterways that are too wide to clear span, a temporary bridge with in-stream support would be designed and constructed. • 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.

Resource	Environmental Commitment
	• 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. • No structures would be located below the OHWM. • Any dewatering within the project area during construction would be discharged to a non-sensitive upland site to facilitate re-infiltration to the aquifer. • Nearby waterways could be used as a water source during project construction. The Utilities would attempt to avoid water withdrawals during spawning seasons. The Utilities would coordinate water withdrawals with the IDNR and WDNR.
Air Quality	• Contractors will clean up any dirt or mud that may be tracked onto the road by equipment daily. • Tracking pads may be constructed at frequently used access points to minimize mud being tracked onto public roads. Road sweeping will be used as needed to minimize dust. • A water truck will be available on-site to spray areas of the laydown yards and ROW that are creating excessive dust.
Noise	• When undertaking construction activities around residences, the Utilities and their contractors will be cognizant of the residents and will limit work hours in that area, specifically during the early morning hours. • If helicopters are used on the project, the Utilities will use various forms of outreach to notify the affected communities and landowners of when the helicopters will be in operation. • The Utilities and their contractors plan to generally work during daylight hours Monday through Friday, with an average workday to be approximately 11 hours.
Transportation	• Traffic control plans will be developed and implemented during construction to minimize traffic impacts and comply with permit requirements. • The Utilities will minimize the number of vehicles and the amount of time they are parked on the roads. • If a driveway is needed to access the ROW, the driveways may be protected using composite mats or other low-profile protection systems. Commercial or industrial driveways will be evaluated prior to use as surface protection may not be required. • Any damage caused by construction access will be repaired as needed. • The Utilities and their contractors will not block any residence driveways with equipment unless agreed upon with the landowner or resident.
Cultural and Historic Resources	• Consultation between the Iowa and/or Wisconsin State Historic Preservation Offices (SHPOs), RUS, the Utilities, and affected Tribal groups, among others would be required under Section 106 of the NHPA. This consultation must be completed prior to the start of construction activities. • The Utilities would develop an Unanticipated Discoveries Plan detailing the process for addressing the identification of previously unidentified potential historic properties such as archaeological sites, historic features, or unidentified human remains during the course of construction. Such a plan would include steps for preventing further harm to previously unidentified sites and notifying consulting parties in order to address impacts to potential historic properties. • If unanticipated archaeological resources or human remains are encountered 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 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.

Resource	Environmental Commitment
Land Use, including Agriculture and Recreation	• Where possible, siting in agricultural areas would be along fence lines or between fields or along public road 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. • 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. • Where appropriate, minimization techniques, such as topsoil replacement and deep tilling, may be used. • Construction vehicles may be cleaned before entering the organic farm parcels, in accordance with input from the landowner. • During the easement negotiation, landowners can decline the use of herbicides for vegetation management activities once the line is in operation. Therefore, no herbicide would be applied within portions of the ROW on which the landowner wishes not to introduce it. • If construction activity occurs during wet conditions and soils are rutted, the ruts will be repaired as soon as conditions allow, to reduce the potential for impacts. • 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. • Prior to and during construction, the Utilities will coordinate with land managers regarding public notification about construction activities and temporary closures of public areas. • See more detailed BMPs for agricultural lands in Appendix D.
Visual Quality and Aesthetics	• Steel monopoles with a weathered finish will be used at visually sensitive locations to minimize the visual impacts to the landscape.
Socioeconomics and Environmental Justice	• Short-term impacts to agricultural lands would be mitigated by providing compensation to producers and by restoring agricultural lands to the extent practicable.
Public Health and Safety	• If the proposed transmission lines parallel or cross distribution lines, appropriate measures can be taken to address any induced voltages.
Upper Mississippi River National Wildlife and Fish Refuge	• For the portion of the C-HC Project within the Refuge, preliminary low-profile structures are proposed with a design height to match the existing tree cover within the Refuge (approximately 75 feet) to reduce the potential 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. • Construction on the Refuge would need to occur outside the eagle nesting season (typically January 15 to June 15) or outside a 660-foot exclusion zone to avoid disturbance to nesting adult, chick, and fledgling eagles. • For the alternatives that cross the Mississippi River at the Nelson Dewey Substation (alternatives 1, 5, and 6), additional minimization steps are proposed: o The Utilities propose to mitigate adverse impacts to forest resources in the Refuge through restoration and enhancement of forest resources both within and off Refuge lands. A restoration plan would be developed in consultation with the USFWS and USACE. The restoration plan would supplement existing USFWS efforts to restore bottomland hardwood forest within the Refuge, specifically on the floodplain of the Turkey River. Mitigation may also include the reestablishment and/or expansion of mature woodlands near the Nelson Dewey Substation and/or other non-Refuge locations adjacent to Refuge lands. These restoration efforts would mitigate adverse impacts on public lands. • Revegetation within the Refuge would be conducted in concert with USFWS and USACE 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 USACE and 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 environmental commitments outlined above and other mitigation to be developed with the USFWS and USACE, as part of the USACE and USFWS permit application processes, the Utilities would develop a project-specific mitigation plan. This plan would need to be deemed acceptable by USACE and USFWS prior to the issuance of permits.

Table ES-5. Comparison Summary for Action Alternatives
(MiT = minor temporary; MoT = moderate temporary; MiP = minor permanent; MoP = moderate permanent; MaP = major permanent)

Resource Group	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Geology and Soils	MoT impacts to 149 acres of shallow soils; 93 acres of wet soils; 173 acres of steep slope soils; and severe erosion potential for 1,265 acres; MiP impacts to 63,000 cubic yards of displaced subsurface soils and ≤24 acres of sensitive soils	MoT impacts to 141 acres of shallow soils; 104 acres of wet soils; 171 acres of steep slope soils; and severe erosion potential for 1,352 acres; MiP impacts to 66,000 cubic yards of displaced subsurface soils and ≤24 acres of sensitive soils	MoT impacts to 159 acres of shallow soils; 106 acres of wet soils; 171 acres of steep slope soils; and severe erosion potential for 1,284 acres; MiP impacts to 73,000 cubic yards of displaced subsurface soils and ≤24 acres of sensitive soils	MoT impacts to 155 acres of shallow soils; 81 acres of wet soils; 96 acres of steep slope soils; and severe erosion potential for 1,111 acres; MiP impacts to 80,000 cubic yards of displaced subsurface soils and ≤24 acres of sensitive soils	MoT impacts to 165 acres of shallow soils; 91 acres of wet soils; 92 acres of steep slope soils; and severe erosion potential for 1,238 acres; MiP impacts to 85,000 cubic yards of displaced subsurface soils and ≤24 acres of sensitive soils	MoT impacts to 144 acres of shallow soils; 73 acres of wet soils; 82 acres of steep slope soils; and severe erosion potential for 1,092 acres; MiP impacts to 70,000 cubic yards of displaced subsurface soils and ≤24 acres of sensitive soils
Vegetation	MoT and MoP impacts to 228 acres of grassland, 524 acres of forest, and 10 acres of shrubland	MoT and MoP impacts to 249 acres of grassland, 530 acres of forest, and 9 acres of shrubland	MoT and MoP impacts to 302 acres of grassland, 504 acres of forest, and 10 acres of shrubland	MoT and MoP impacts to 433 acres of grassland, 236 acres of forest, and 16 acres of shrubland	MoT and MoP impacts to 454 acres of grassland, 245 acres of forest, and 8 acres of shrubland	MoT and MoP impacts to 355 acres of grassland, 252 acres of forest, and 17 acres of shrubland
Wetlands	MoT impacts to 72 acres; MoP impacts to 38 acres	MoT impacts to 69 acres; MoP impacts to 52 acres	MoT impacts to 58 acres; MoP impacts to 49 acres	MoT impacts to 54 acres; MoP impacts 16 acres	MoT impacts to 61 acres; MoP impacts 5 acres	MoT impacts to 63 acres; MoP impacts 7 acres
Special Status Plants	Minor impacts	Same impact as Alternative 1	Same impact as Alternative 1	Same impact as Alternative 1	Same impact as Alternative 1	Same impact as Alternative 1
Wildlife	MiT impacts to 228 acres of grassland habitat, 110 acres of wetlands, and 15 acres of open water; MoP impacts to 524 acres of forest habitat	MiT impacts to 249 acres of grassland habitat, 121 acres of wetlands, and 13 acres of open water; MoP impacts to 530 acres of forest habitat	MiT impacts to 302 acres of grassland habitat, 107 acres of wetlands, and 11 acres of open water; MoP impacts to 504 acres of forest habitat	MiT impacts to 433 acres of grassland habitat, 69 acres of wetlands, and 11 acres of open water; MoP impacts to 236 acres of forest habitat	MiT impacts to 454 acres of grassland habitat, 66 acres of wetlands, and 10 acres of open water; MoP impacts to 245 acres of forest habitat	MiT impacts to 203 acres of grassland habitat, 72 acres of wetlands, and 14 acres of open water; MoP impacts to 252 acres of forest habitat
Special Status Species	May affect, not likely to adversely affect the Iowa Pleistocene snail; MoT impacts to 76 acres of high-potential and 954 acres low-potential rusty patched bumble bee habitat	Same impact as Alternative 1 to Iowa Pleistocene snail; MoT impacts to 86 acres of high-potential and 958 acres low-potential rusty patched bumble bee habitat	Same impact as Alternative 1 to Iowa Pleistocene snail; MoT impacts to 77 acres of high-potential and 1,003 acres low-potential rusty patched bumble bee habitat	Same impact as Alternative 1 to Iowa Pleistocene snail; MoT impacts to 51 acres of high-potential and 995 acres low-potential rusty patched bumble bee habitat	Same impact as Alternative 1 to Iowa Pleistocene snail; MoT impacts to 45 acres of high-potential and 937 acres low-potential rusty patched bumble bee habitat	Same impact as Alternative 1 to Iowa Pleistocene snail; MoT impacts to 55 acres of high-potential and 948 acres low-potential rusty patched bumble bee habitat
Water Resources	MiT impacts to 8 impaired waterways, 3 outstanding and exceptional waters, and 12 trout streams	MiT impacts to 8 impaired waterways, 3 outstanding and exceptional waters, and 11 trout streams	MiT impacts to 5 impaired waterways, 10 outstanding and exceptional waters, and 9 trout streams	MiT impacts to 8 impaired waterways, 8 outstanding and exceptional waters, and 7 trout streams	MiT impacts to 9 impaired waterways, 8 outstanding and exceptional waters, and 7 trout streams	MiT impacts to 6 impaired waterways, 6 outstanding and exceptional waters, and 10 trout streams

Resource Group	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Floodplains	MiT impacts to 14 crossings > 1,000 feet, 43,661 linear feet of floodplains, and 9,901 linear feet of floodway	MiT impacts to 14 crossings > 1,000 feet, 40,100 linear feet of floodplains, and 8,620 linear feet of floodway	MiT impacts to 10 crossings > 1,000 feet, 28,310 linear feet of floodplains, and 8,620 linear feet of floodway	MiT impacts to 8 crossings > 1,000 feet, 21,150 linear feet of floodplains, and 8,620 linear feet of floodway	MiT impacts to 7 crossings > 1,000 feet, 21,051 linear feet of floodplains, and 8,9,091 linear feet of floodway	MiT impacts to 11 crossings > 1,000 feet, 35,091 linear feet of floodplains, and 9,091 linear feet of floodway
Air Quality	MiT impacts	Same impact as Alternative 1	Same impact as Alternative 1	Same impact as Alternative 1	Same impact as Alternative 1	Same impact as Alternative 1
Noise	MiT impacts to 2 sensitive noise receptors	MiT impacts to 3 sensitive noise receptors	MiT impacts to 4 sensitive noise receptors	MiT impacts to 10 sensitive noise receptors	MiT impacts to 2 sensitive noise receptors	MiT impacts to 8 sensitive noise receptors
Transportation	MiT impacts to 2,381 roadway segments; MoT impacts to 1 major river and 24 railroad segments; MoP impacts to 5 airport/heliport facilities	MiT impacts to 2,408 roadway segments; MoT impacts to 1 major river and 24 railroad segments; MoP impacts to 5 airport/heliport facilities	MiT impacts to 2,658 roadway segments; MoT impacts to 1 major river and 30 railroad segments; MoP impacts to 6 airport/heliport facilities	MiT impacts to 3,024 roadway segments; MoT impacts to 1 major river and 26 railroad segments; MoP impacts to 9 airport/heliport facilities	MiT impacts to 3,070 roadway segments; MoT impacts to 1 major river and 26 railroad segments; MoP impacts to 10 airport/heliport facilities	MiT impacts to 2,765 roadway segments; MoT impacts to 1 major river and 20 railroad segments; MoP impacts to 8 airport/heliport facilities
Cultural and Historic Resources	9 NRHP-listed, determined eligible, or assumed eligible resources could be impacted	8 NRHP-listed, determined eligible, or assumed eligible resources could be impacted	15 NRHP-listed, determined eligible, or assumed eligible resources could be impacted	21 NRHP-listed, determined eligible, or assumed eligible resources could be impacted	25 NRHP-listed, determined eligible, or assumed eligible resources could be impacted	11 NRHP-listed, determined eligible, or assumed eligible resources could be impacted
Land Use	See impacts to land cover classes under Vegetation	See impacts to land cover classes under Vegetation	See impacts to land cover classes under Vegetation	See impacts to land cover classes under Vegetation	See impacts to land cover classes under Vegetation	See impacts to land cover classes under Vegetation
Agriculture	MiT impacts to 1,096 acres of agriculture land cover type, 399 acres of prime farmland, and 553 acres of farmland of statewide importance; MaP impacts to 11 acres of prime farmland and 11 acres of farmland of statewide importance	MiT impacts to 1,146 acres of agriculture land cover type, 375 acres of prime farmland, and 630 acres of farmland of statewide importance; MaP impacts to 22 acres of prime farmland	MiT impacts to 1,299 acres of agriculture land cover type, 636 acres of prime farmland, and 661 acres of farmland of statewide importance; MaP impacts to 22 acres of prime farmland	MiT impacts to 1,361 acres of agriculture land cover type, 872 acres of prime farmland, and 725 acres of farmland of statewide importance; MaP impacts to 22 acres of prime farmland	MiT impacts to 1,534 acres of agriculture land cover type, 935 acres of prime farmland, and 815 acres of farmland of statewide importance; MaP impacts to 11 acres of prime farmland and 11 acres of farmland of statewide importance	MiT impacts to 1,167 acres of agriculture land cover type, 649 acres of prime farmland, and 612 acres of farmland of statewide importance; MaP impacts to 11 acres of prime farmland and 11 acres of farmland of statewide importance
Recreation	MiT impacts to 4 recreational areas and MoT impacts to 1 recreational area; MiP impacts to 1 recreational area and MoP impacts to 2 recreational areas	MiT impacts to 4 recreational areas and MoT impacts to 1 recreational area; MiP impacts to 2 recreational area and MoP impacts to 1 recreational areas	MiT impacts to 5 recreational areas and MoT impacts to 1 recreational area; MiP impacts to 1 recreational area and MoP impacts to 2 recreational areas	MiT impacts to 4 recreational areas and MoT impacts to 1 recreational area; MoP impacts to 3 recreational areas	MiT impacts to 3 recreational areas and MoT impacts to 2 recreational area; MoP impacts to 4 recreational areas	MiT impacts to 2 recreational areas and MoT impacts to 2 recreational area; MiP impacts to 1 recreational area and MoP impacts to 3 recreational areas

Resource Group	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Visual Quality and Aesthetics	MiP impacts at the overall project level; MaP impacts to 2 residences; MaP impacts, as well as beneficial impacts to the Refuge; MiP impacts to the Great River Road National Scenic Byway	MiP impacts at the overall project level; MaP impacts to 2 residences; MiP impacts to the Refuge; MaP to the Great River Road National Scenic Byway	MiP impacts at the overall project level; MaP impacts to 3 residences; MiP impacts to the Refuge; MaP impacts to the Great River Road National Scenic Byway	MiP impacts at the overall project level; MaP impacts to 9 residences; MiP impacts to the Refuge; MaP impacts to the Great River Road National Scenic Byway	MiP impacts at the overall project level; MaP impacts to 2 residences; MaP impacts, as well as beneficial impacts to the Refuge; MiP impacts to the Great River Road National Scenic Byway	MiP impacts at the overall project level; MaP impacts to 8 residences; MaP impacts, as well as beneficial impacts to the Refuge; MiP impacts to the Great River Road National Scenic Byway
Socioeconomics	MiT positive impacts to employment and income with $480,937,254 of temporary spending and $948,105 annual spending; MoT and MiP impacts to property values for 2 residences	MiT positive impacts to employment and income with $494,675,522 of temporary spending and $954,541 annual spending; MoT and MiP impacts to property values for 2 residences	MiT positive impacts to employment and income with $544,948,945 of temporary spending and $1,119,447 annual spending; MoT and MiP impacts to property values for 3 residences	MiT positive impacts to employment and income with $557,603,250 of temporary spending and $1,154,985 annual spending; MoT and MiP impacts to property values for 9 residences	MiT positive impacts to employment and income with $568,612,262 of temporary spending and $1,210,366 annual spending; MoT and MiP impacts to property values for 2 residences	MiT positive impacts to employment and income with $490,301,721 of temporary spending and $844,933 annual spending; MoT and MiP impacts to property values for 8 residences
Public Health and Safety	MiP exposure to EMF for 2 residences	MiP exposure to EMF for 1 school and 2 residences	MiP exposure to EMF for 1 school and 3 residences	MiP exposure to EMF for 1 school and 9 residences	MiP exposure to EMF for 2 residences	MiP exposure to EMF for 8 residences
The Refuge	*Segment B-IA1* Permanent impacts to a total of 23 acres in the ROW of the restoration area within the Refuge, 0.1 acre of wetlands, and 0 acres of forest removal within ROW; Temporary impacts to 39 acres of sensitive soils, 38 acres of wetlands *Segment B-IA2* Permanent impacts to a total of 27 acres in the ROW of the restoration area within the Refuge, 1 acre of wetlands, and 1 acre of forest removal within ROW; Temporary impacts to 44 acres of sensitive soils, 35 acres of wetlands	Permanent impacts to a total of 0 acres in the ROW of the restoration area within the Refuge, 12 acres of wetlands and 0 acres of forest removal within ROW; Temporary impacts to 44 acres of sensitive soils, 35 acres of wetlands	Same impact as Alternative 2	Same impact as Alternative 2	Same impact as Alternative 1	Same impact as Alternative 1

Cumulative Impacts

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).

The cumulative impact analysis describes the types of present and reasonably future actions that are included in the cumulative impact analysis area for each affected resource identified and evaluated in the DEIS. 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. Table ES-6 provides a summary of impacts, including short- and long-term adverse and beneficial impacts by resource from the cumulative impact scenario.

Table ES-6. Impact Summary 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

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ACRONYMS AND ABBREVIATIONS

°F	degree(s) Fahrenheit
ACA	Alternative Crossings Analysis
ACGIH	American Conference of Governmental Industrial Hygienists
ADT	average daily traffic
AES	Alternatives Evaluation Study
ANSI	American National Standards Institute
APE	area of potential effects
APLIC	Avian Powerline Interaction Committee
ATC	American Transmission Company LLC
ATCP	Agriculture, Trade, and Consumer Protection
BA	Biological Assessment
BFD	bird flight diverter
BLS	Bureau of Labor Statistics
BMP	best management practice
BNSF	Burlington Northern-Santa Fe
bpd	barrels per day
Burns and McDonnell	Burns and McDonnell Engineering Company
CapX2020 report	*CapX2020 345 kV Underground Report* (Power Engineers, Inc. 2010)
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CH_4	methane
C-HC Project	Cardinal-Hickory Creek Project
CO	carbon monoxide
CO_2	carbon dioxide
Complex	Ice Age Complex at Cross Plains
CPCN	certificate of public convenience and necessity
CPRS	Canadian Pacific Railway
CWA	Clean Water Act
Dairyland	Dairyland Power Cooperative
DATCP	Wisconsin Department of Agriculture, Trade, and Consumer Protection
dB	decibels
dBA	A-weighted decibels
DEIS	draft environmental impact statement

DEM	digital elevation model
DG	distributed generation
DOT	Department of Transportation
DR	demand response
DSM	Demand-Side Management
EA	environmental assessment
EC	Engineering Circular
EE	Energy efficiency
EFHRAN	European Health Risk Assessment Network on Electromagnetic Fields Exposure
EIS	environmental impact statement
EO	executive order
EMF	electromagnetic fields
EPR	ethylenepropylene rubber
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Act
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FPPA	Farmland Protection Policy Act
GHG	greenhouse gas
GIS	geographic information system
GWh	gigawatt hours
HAP	hazardous air pollutant
HPFF	high-pressure, fluid-filled pipe
HPGF	high-pressure, gas-filled pipe
HUC	Hydrologic Unit Code
I-	Interstate
IA	Iowa
IAC	Iowa Administrative Code
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IDNR	Iowa Department of Natural Resources
IEEE	Institute of Electrical and Electronics Engineers
IEM	independent environmental monitor
ILF	in-lieu fee
Iowa DOT	Iowa Department of Transportation
IPaC	Information for Planning and Consultation

ITC Midwest	ITC Midwest LLC
IUB	Iowa Utilities Board
KOP	key observation point
kV	kilovolt
kV/m	kilovolts per meter
kWh	kilowatt-hours
Ldn	day-night average noise level
Leq	energy average noise level
L_{max}	the maximum sound level for the loudest piece of equipment
LRZ	local resource zone
MCS	Macro-Corridor Study
mG	milliGauss
MISO	Midcontinent Independent System Operator, Inc.
MPS	Multiple Property Submission
MRO	Midwest Reliability Organization
MTEP	MISO Transmission Expansion Plan
MVA	mega volt ampere
MVAR	mega volt ampere reactive
MVP	multi-value project
MW	megawatt(s)
MWh	megawatt hours
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NASS	National Agricultural Statistics Service
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NLCD	National Land Cover Dataset
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NO_X	nitrogen oxides
NPS	National Park Service
NR	Natural Resources
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NST	National Scenic Trail

NWI	National Wetlands Inventory
NWRS	National Wildlife Refuge System
OHWM	ordinary high-water mark
OSHA	Occupational Safety and Health Administration
PAB	Palustrine Aquatic Bed
PEM	Palustrine Emergent
PFO	Palustrine Forested
$PM_{2.5}$	particulate matter 2.5
PM_{10}	particulate matter 10
project	Cardinal-Hickory Creek Project
PSC	Public Service Commission
PSCW	Public Service Commission of Wisconsin
PSS	Palustrine Scrub-Shrub
PUB	Palustrine Unconsolidated Bottom
RCNM	Roadway Construction Noise Model
RCRA	Resource Conservation and Recovery Act of 1976, as amended
Refuge	Upper Mississippi River National Wildlife and Fish Refuge
REM	Remnant Fishery Habitat
REPS	Wisconsin Rural Electric Power Services
RGOS	Regional Generation Outlet Study
ROW	right-of-way
RPBB	rusty patched bumble bee
RPS	Renewable Portfolio Standard
RTO	regional transmission organization
RUS	Rural Utilities Service
SCADA	supervisory control and data acquisition
SCAQMD	South Coast Air Quality Management District
SCFF	self-contained fluid-filled
SF_6	sulfur hexafluoride
SHPO	State Historic Preservation Office
SO_2	sulfur dioxide
SPCC	Spill Prevention, Control and Countermeasure Plan
SSI	Swedish Radiation Protection Authority
SSM	Swedish Radiation Safety Authority
SSURGO	Soil Survey Geographic Database
SUFG	State Utility Forecasting Group
SWCA	SWCA Environmental Consultants

SWPPP	Stormwater Pollution Prevention Plan
TCP	Traditional Cultural Property
TCSB	temporary clear span bridge
TMDL	Total Maximum Daily Load
TOSCA	Toxic Substances Control Act
UMRR	Upper Mississippi River Restoration
U.S.	United States
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
the Utilities	Dairyland Power Cooperative, American Transmission Company LLC, and ITC Midwest LLC
VOC	volatile organic compound
WAC	Wisconsin Administrative Code
WCEP	Whooping Crane Eastern Partnership
WDNR	Wisconsin Department of Natural Resources
WDNR NHI	WDNR Natural Heritage Inventory
WI	Wisconsin
WIS	Wisconsin Highway
WisDOT	Wisconsin Department of Transportation
WSOR	Wisconsin and Southern Railroad
WUS	waters of the U.S.
WWI	Wisconsin Wetland Inventory
WWCT	Wisconsin Wetland Conservation Trust
XLPE	solid cable, cross-linked polyethylene

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CHAPTER 1. PROJECT PURPOSE AND NEED

1.1 Introduction

Dairyland Power Cooperative (Dairyland), American Transmission Company LLC (ATC), and ITC Midwest LLC (ITC Midwest), together referred to as "the Utilities," propose to construct and own a new 345-kilovolt (kV) transmission line between Dane County, Wisconsin, and Dubuque County, Iowa. The proposed project would include approximately 100 to 125 miles of new transmission line; an upgrade and possibly relocation of an existing Mississippi River crossing to a 345-/345-kV double-circuit line; building a new substation near Montfort, Wisconsin; upgrades to the Cardinal, Stoneman, and the Hickory Creek Substations; constructing a new less than 1-mile-long 69-kV transmission line near the Mississippi River; and rebuilding the Turkey River Substation. These upgrades and new construction projects are all together referred to as the "Cardinal-Hickory Creek Project" (or the "C-HC Project") (Figure 1.1-1). Due to the scope and potential impact of the C-HC Project and the involvement and actions of certain Federal agencies, an environmental impact statement (EIS) is being prepared to fulfill obligations specified under the National Environmental Policy Act (NEPA).

This EIS is organized as follows:

- Chapter 1 (Project Purpose and Need): Identifies the purpose of and need for the project, purpose of and need for the Federal agencies' decisions, and information about public participation.
- Chapter 2 (Proposed Project and Alternatives): Presents a detail description of the alternatives analyzed in detail in this EIS, summarizes the alternatives dismissed from detailed analysis, and presents the connected actions associated with the C-HC Project.
- Chapter 3 (Affected Environment and Environmental Consequences): Includes a resource-by-resource discussion of the affected environment, or existing conditions, for the resources present in the study area and the analysis of impacts to those resources from the C-HC Project.
- Chapter 4 (Cumulative Impacts and Other Required Considerations): Includes a resource-by-resource discussion of impacts from past, present, and reasonably foreseeable future projects that could contribute cumulatively to impacts from the C-HC Project.
- Chapter 5 (Coordination and Consultation): Presents a list of coordination and consultation activities conducted under NEPA and related laws for the C-HC Project to date.
- Chapter 6 (List of Preparers): Identification of individuals who substantively contributed to the development of this EIS.
- Chapter 7 (Literature Cited): A list of references used to write and support the analysis in this EIS.
- Chapter 8 (Distribution List): A list of repositories where this EIS was made available to the public.
- Chapter 9 (Glossary): The glossary of terms to provide the reader with additional information and background on terms and concepts discussed in this document.
- Appendix A (Detailed Electricity Characteristics): Provides a summary of regional load forecasts and Wisconsin and Iowa state population projections.
- Appendix B (List of Tribes): A list of tribes contacted by RUS for the C-HC Project and this EIS to date.

- Appendix C (Alternatives Development Process): Defines the transmission line subsegments that comprise each action alternative summarizes the alternative evaluation process followed to ensure the action alternatives were reasonable and technically feasible.
- Appendix D (Best Management Practices): Presents an overview of the best management practices (BMPs) for the C-HC Project.
- Appendix E (Special Status Plants List): A list of special status plants in the C-HC Project study area.
- Appendix F (Connected Actions Analysis): Presents the description of the proposed connected actions for the C-HC Project and the analysis of impacts for the connected actions.

This chapter discusses the purpose of and need for the C-HC Project and the objectives of the Draft EIS (DEIS). A further description of the project and its participants is included. The Utilities, which will be responsible for the construction and have ownership of the project, and the Federal agencies, state agencies, and regional transmission organization (RTO) responsible for regulating, providing planning oversight, and/or ensuring the efficient operation, stability, and reliability of the high-voltage transmission system affected by the project, are all described. The Federal agencies that will participate in preparing the DEIS, along with their regulatory framework and authorizing actions pertinent to the project, are described. Furthermore, this chapter provides a description of public participation activities held for the C-HC Project to date, and a summary of issues analyzed in this DEIS.

Dairyland intends to request financial assistance from the U.S. Department of Agriculture (USDA) Rural Utilities Service (RUS) to fund its anticipated 9% ownership interest in the C-HC Project. Appendix A provides information regarding Dairyland's system and load growth that are pertinent to its application for financial assistance. RUS administers programs that provide much-needed infrastructure or infrastructure improvements to rural communities. This includes the RUS Electric Program, which provides funding via loans or guaranteed loans to finance the construction or improvement of electric distribution, transmission, and generation facilities in rural areas of the United States. RUS's determination to potentially finance the Dairyland portion of the C-HC Project constitutes a Federal action, requiring it to perform an environmental review within the context of NEPA. To comply with NEPA, RUS has prepared this DEIS prior to the determination of whether RUS funds should be obligated to finance Dairyland's ownership portion of the project and prior to initiation of construction.

RUS is serving as the lead Federal agency for the NEPA environmental review of the C-HC Project. The U.S. Fish and Wildlife Service (USFWS), U.S. Army Corps of Engineers (USACE), and U.S. Environmental Protection Agency (USEPA) are cooperating agencies for the DEIS. The National Park Service (NPS) is serving as a participating agency. Regardless of the potential financial assistance from RUS to fund Dairyland's ownership interest in the C-HC Project, a NEPA environmental review would still be required as part of the permitting actions by USACE, USFWS, and potentially other Federal agencies. This DEIS was prepared to meet the following objectives:

- Describe and evaluate the C-HC Project, and other reasonable alternatives, including a No Action Alternative, to the C-HC Project that would avoid or minimize adverse effects to the natural and human environment;
- Identify and assess potential impacts on the natural and human environment that would result from the C-HC Project; and
- Identify specific environmental commitments and mitigation measures to minimize natural and human environmental impacts.

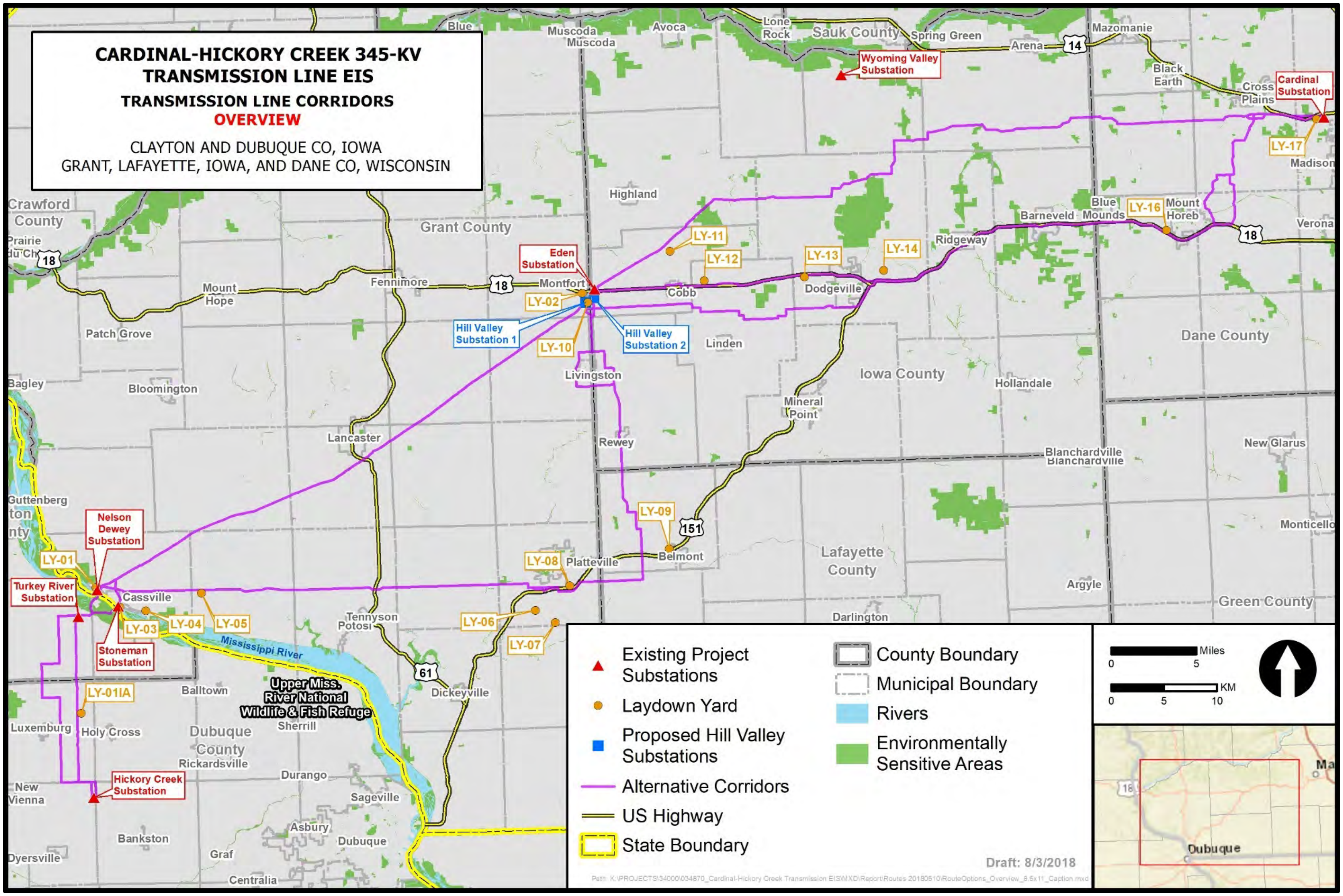

Figure 1.1-1. Proposed Cardinal-Hickory Creek 345-kV Transmission Line Project.

1.2 Project Background

1.2.1 *Description of Proposed Project*

The Utilities propose to construct a new approximately 100- to 125-mile 345-kV transmission line between Dane County, Wisconsin, and Dubuque County, Iowa (see Figure 1.1-1). The Proposed Action includes the following facilities:

- At the existing Cardinal Substation in Dane County, Wisconsin: a new 345-kV terminal within the substation;
- At the new proposed Hill Valley Substation near the Village of Montfort, Wisconsin: a 10-acre facility with four 345-kV circuit breakers, one 345-kV shunt reactor, one 345-kV/138-kV autotransformer, and three 138-kV circuit breakers;
- At the existing Eden Substation near the village of Montfort, Wisconsin: transmission line protective relaying upgrades, ground grid improvements, and replacement of equipment within the Eden Substation;
- Between the existing Eden Substation and the proposed Hill Valley Substation near the village of Montfort, Wisconsin: a rebuild of the approximately 1-mile Hill Valley to Eden 138-kV transmission line;
- At the existing Wyoming Valley Substation near Wyoming, Wisconsin: ground grid improvements;
- Between the existing Cardinal Substation and the proposed Hill Valley Substation: a new 50- to 53-mile (depending on the final route) 345-kV transmission line;
- Between the proposed Hill Valley Substation and existing Hickory Creek Substation: a new 50- to 70-mile (depending on the final route) 345-kV transmission line;
- **At the Mississippi River in Cassville, Wisconsin:** a rebuild and possible relocation of the existing Mississippi River transmission line crossing to accommodate the new 345-kV transmission line and Dairyland's 161-kV transmission line, and which would be capable of operating at 345-kV/345-kV but will initially be operated at 345-kV/161-kV;
    - o depending on the final route and the Mississippi River crossing locations:
    - a new 161-kV terminal and transmission line protective relaying upgrades within the existing Nelson Dewey Substation in Cassville, Wisconsin;
    - a replaced or reinforced structure within the Stoneman Substation in Cassville, Wisconsin;
    - multiple, partial, or complete rebuilds of existing 69-kV and 138-kV transmission lines in Wisconsin that would be collocated with the new 345-kV line;
- **At the existing Turkey River Substation in Dubuque County, Iowa:** two 161-/69-kV transformers, four 161-kV circuit breakers, and five 69-kV circuit breakers; and
- **At the existing Hickory Creek Substation in Dubuque County, Iowa:** a new 345-kV terminal within the existing Hickory Creek Substation.

The estimated cost for the proposed C-HC Project is $500 million (in 2023 dollars). If approved, construction of the project would begin in early 2020, and the in-service date would be scheduled for 2023.

1.2.2 *Description of Utilities*

The Utilities that would construct and own the proposed C-HC Project are described below. Ownership of the various components of the C-HC Project would include the following:

- Dairyland would own 9% of the C-HC Project 345-kV transmission line,
- be the sole owner of the 161-kV transmission line from the Turkey River Substation to either the Stoneman Substation or the Nelson Dewey Substation, depending on the final route, that will be rebuilt with the 345-kV Mississippi River crossing,
- be the sole owner of any equipment replaced in the Stoneman Substation, and
- be the partial owner of the Turkey River Substation.
- ATC already owns the Cardinal Substation, would own the new Hill Valley Substation, and would own 45.5% of the C-HC Project 345-kV transmission line.
- ITC Midwest already owns the Hickory Creek Substation and would own 45.5% of the C-HC Project 345-kV transmission line.

1.2.2.1 DAIRYLAND POWER COOPERATIVE

Dairyland is a not-for-profit generation and transmission cooperative headquartered in La Crosse, Wisconsin. Dairyland is owned by and provides the wholesale power requirements for 24 separate distribution cooperative members in southern Minnesota, western Wisconsin, northern Iowa, and northern Illinois, and 17 municipal utilities in Wisconsin, Minnesota, and Iowa. Dairyland serves a population of approximately 600,000 and owns approximately 3,200 miles of electric transmission lines. Dairyland receives power to meet the needs of its members through self-owned generation facilities and power it purchases from other entities.

Dairyland and its member cooperative system have ownership in and receive power from four conventional fossil-fueled and 23 renewable electric generation facilities, currently operating or soon to be operating. These facilities provide Dairyland with a total rated generating capacity of over 1,280 megawatts (MW). Of that total, 1,007 MW are generated by conventional fossil-fueled facilities and about 275 MW are generated by renewable facilities. Dairyland owns renewable energy resources including four wind energy generation facilities with a capacity of 216 MW. To meet all of its load needs, Dairyland also purchases wholesale electricity from other power suppliers, including major solar installations located in Westby, Wisconsin; Oronoco, Minnesota; and Galena, Illinois (Dairyland 2016a).

Dairyland continues to add renewable generation and to support other renewable programs. They recently signed power purchase agreements for 15 solar generation projects in southwestern Wisconsin and northeastern Iowa, ranging from 0.5 to 2.5 MW each and totaling 20.3 MW of installed generating capacity. In addition to these commercial facilities, there are over 850 consumer-owned distributed generation solar installations in the Dairyland service area (Dairyland 2016a).

Dairyland promotes the education of its members and consumers regarding renewable energy. Dairyland 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 the Western Technical College – Independence Campus and three schools in Wisconsin (Alma Area School, Cochrane-Fountain City School, and De Soto Area Middle and High School) (Dairyland 2016a).

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 kilowatt hours (kWh) (i.e., 1.5 cents/kWh). These additional funds are then used to support development of new renewable electricity facilities and programs (Dairyland 2017).

1.2.2.2 AMERICAN TRANSMISSION COMPANY, LLC, AND ITC MIDWEST, LLC

ATC, through its corporate manager ATC Management, Inc. (collectively ATC), began operations in 2001 as the nation's first multistate, transmission-only utility. ATC owns and operates more than 9,500 miles of high-voltage transmission lines and 530 substations in portions of Wisconsin, Michigan, Minnesota, and Illinois. Since its formation, ATC has upgraded or built more than 2,300 miles of transmission lines and 175 substations. ATC is headquartered in Pewaukee, Wisconsin.

ITC Midwest is a wholly-owned subsidiary of ITC Holdings Corp., the nation’s largest independent electric transmission company. ITC Midwest is headquartered in Cedar Rapids, Iowa, and maintains operating facilities in Dubuque, Iowa City, and Perry, Iowa, as well as Albert Lea and Lakefield, Minnesota. ITC Midwest connects more than 700 communities with approximately 6,600 circuit miles of transmission lines in Iowa, southern Minnesota, northeastern Missouri, and northwestern Illinois. ITC Midwest has also received a Certificate of Authority to operate as a public utility in Wisconsin.

1.3 Electric System Reliability and Planning

The availability and reliability of electricity is a critical component to the economy, social system, and security of the United States. Creating and maintaining jobs in manufacturing and in the service industry depends on reliable electricity every day; and it provides essential power to the health care system, schools, military installations, homes, law enforcement agencies, and other emergency response agencies. Electricity is a highly perishable commodity and, except for the use of batteries on a small scale, it cannot be stored like water or gas; electricity must be generated as needed, and supply must be kept in balance with demand. Additionally, unlike water or gas, electricity follows the path of least resistance and cannot be easily routed in a specific direction. Therefore, given the scope, distances, and millions of people it serves, the generation and transmission of electricity requires enormous planning, cooperation, coordination, and continuous real-time monitoring and control on a 24-hour daily basis.

Responsibility for electrical system planning, reliability, and transmission operational oversight within much of the United States, including Wisconsin and Iowa, is primarily dependent upon large regional transmission organizations (Figure 1.3-1). The oversight and actions of these RTOs result in the more efficient use of electrical energy resources and in a transmission system capable of delivering electricity with improved availability and reliability. Utilities, state governments, and other planning entities work with the RTOs, whose authority is mainly derived through national energy policy legislation.

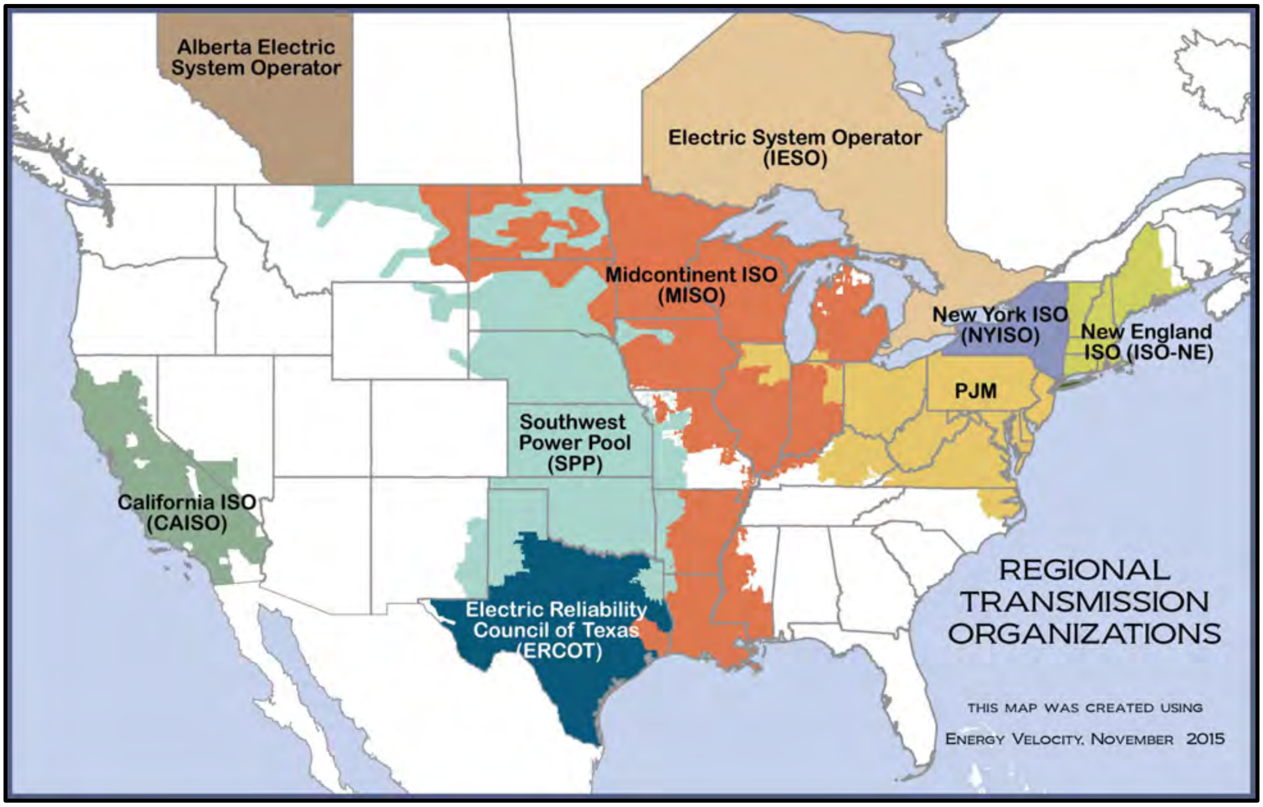

Figure 1.3-1. FERC regional transmission organizations.

The roles of these two organizations are shaped by the rules and policies of two agencies: Federal Energy Regulatory Commission (FERC) and the North American Electric Reliability Corporation (NERC). The roles and responsibilities of these organizations and the RTOs are briefly summarized below.

1.3.1 *Federal Energy Regulatory Commission*

The FERC is an independent Federal commission within the U.S. Department of Energy that regulates the interstate transmission of electricity as well as natural gas and oil. FERC has the responsibility to protect the reliability of the high-voltage interstate transmission system, and it has the authority to develop and enforce reliability standards. These standards are in place to ensure system reliability, which is defined by the U.S. Department of Energy's Energy Infrastructure Administration as "a measure of the ability of the system to continue operation while some lines or generators are out of service. Reliability deals with the performance of the system under stress" (U.S. Energy Information Administration 2017).

FERC established RTOs for the purposes of "promoting efficiency and reliability in the operation and planning of the electric transmission grid and ensuring non-discrimination in the provision of electric transmission services" (18 Code of Federal Regulations [CFR] 35.34(a)). RTOs are essentially responsible for the transmission systems within their areas. RTO responsibilities include pricing, reliability assurance, and determining when and how new generators can have access to the system. RTOs are also responsible for designing and administering a FERC-approved tariff, which is a published volume of rate schedules and general terms and conditions under which a product or service will be supplied (National Renewable Energy Laboratory 2017).

1.3.2 *North American Electric Reliability Corporation*

In 2006, the NERC was given authority, under FERC regulations, to enforce the standards established in the Energy Policy Act of 2005.

NERC Reliability Standards (NERC 2017a) apply to all owners, users, and operators of the bulk power system, which includes the electric generation and transmission system in North America. Any state may take action to ensure the "safety, adequacy and reliability of electric service within that state, as long as such action is not inconsistent with any Reliability Standard" (16 United States Code [U.S.C.] 824o(i)(3)). Among the many reliability standards NERC has developed are sets of standards for transmission operations and transmission planning.

NERC works with eight regional entities to improve the reliability of the bulk power system. The members of the regional entities come from all segments of the electric industry: investor-owned utilities; Federal power agencies; rural electric cooperatives; state, municipal, and provincial utilities; independent power producers; power marketers; and end-use customers. These entities account for virtually all the electricity supplied in the United States, Canada, and a portion of Baja California Norte, Mexico. The Midwest Reliability Organization (MRO) is one of the eight regional entities (NERC 2017b).

The MRO's primary function is to monitor and enforce the NERC Reliability Standards. The MRO has delegated much of its transmission reliability responsibility to two Reliability Coordinators: the MISO for the United States and SaskPower for Canada. The C-HC Project falls within the regions overseen by MRO and MISO.

1.3.2.1 MIDCONTINENT INDEPENDENT SYSTEM OPERATOR

MISO is responsible for developing the procedures, processes, and practices for electric reliability within the MRO's U.S. jurisdiction (MISO 2014). MISO is responsible for producing and maintaining an updated reliability plan—a document that describes how MISO meets the requirements of NERC Transmission Operating Standards (MISO 2014). Each year, MISO develops its annual MISO Transmission Expansion Planning (MTEP). For its planning process, MISO uses a "bottom-up, top-down approach," which means MISO obtains data and plans from all of its transmission owners (bottom-up) and conducts its own transmission planning (top-down).

From 2008 to 2011, in conjunction with state utility regulators and industry stakeholders including the Utilities, MISO evaluated how to build transmission facilities that would meet the significant renewable energy requirements within MISO at the lowest delivered megawatt-hour (MWh) cost. While MISO considered stakeholder comments, ultimately the MISO Board of Directors approved the final projects. In 2011, as part of the 2011 MISO MTEP, MISO adopted a portfolio of 17 multi-value projects (MVPs) to provide economic, reliability, and public policy benefits across what was then the entire MISO footprint: all or portions of 13 states and one Canadian province. MISO ultimately designated the C-HC Project as part of the MVP portfolio to be developed, identified as MVP #5 in Figure 1.3-2 and Table 1.3-1. MISO confirmed the MVP's benefits in the 2014 MTEP14 MVP Trie*nnial Review* (MISO 2014) and again in the 2017 *MTEP17 MVP Triennial Review* (MISO 2017a).

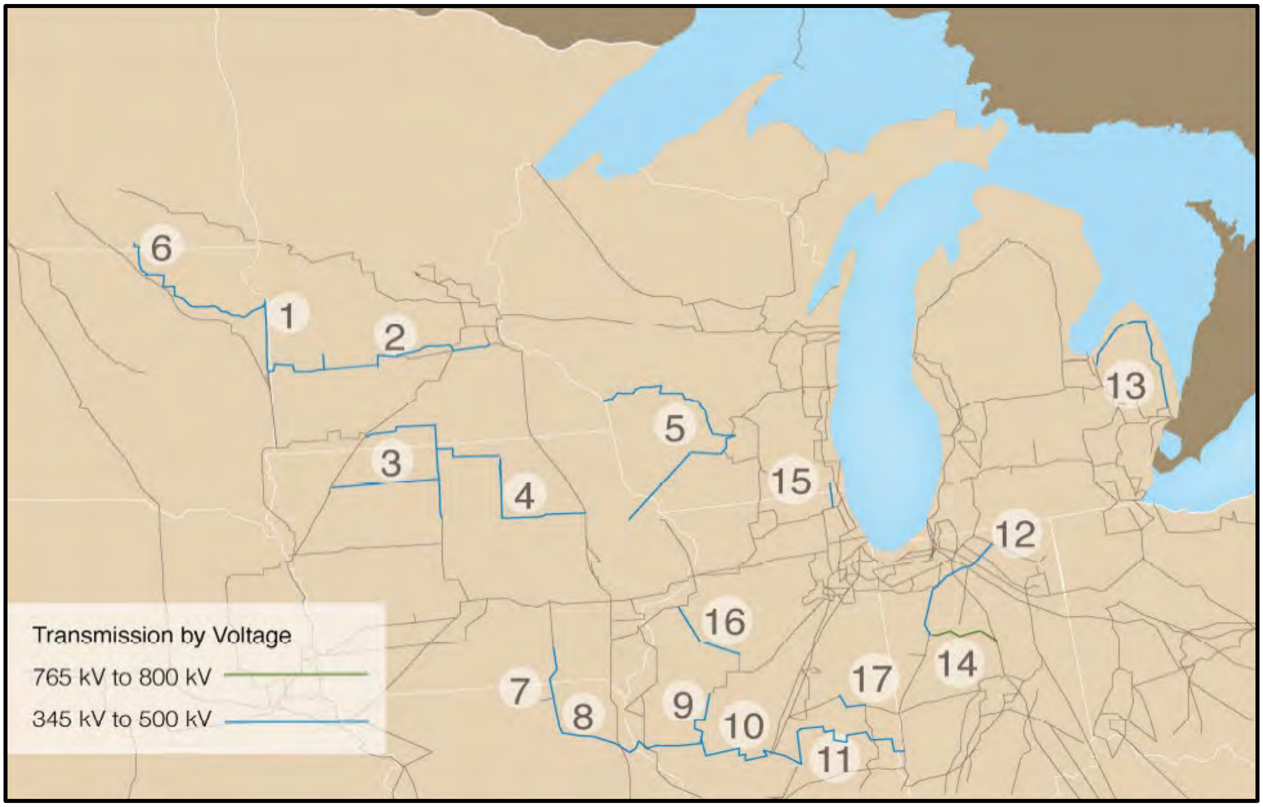

Figure 1.3-2. MVP portfolio map.

Table 1.3-1. MVP Portfolio Summary

ID	Project, Location	Voltage (kV)	ID	Project, Location	Voltage (kV)
1	Big Stone-Brookings (SD)	345	10	Pawnee-Pana (IL)	345
2	Brookings, SD-SE Twin Cities (MN/SD)	345	11	Pana-Mt. Zion-Kansas-Sugar Creek (IL/IN)	345
3	Lakefield Jct.-Winnebago-Winco-Burt Area & Sheldon-Burt Area-Webster (MN/IA)	345	12	Reynolds-Burr Oak-Hiple (IN)	345
4	Winco-Lime Creek-Emery-Black Hawk-Hazleton (IA)	345	13	Michigan Thumb Loop Expansion (MI)	345
5*	LaCrosse-N. Madison-Cardinal & Dubuque Co-Spring Green-Cardinal (WI)	345	14	Reynolds-Greentown (IN)	765
6	Ellendale-Big Stone (ND/SD)	345	15	Pleasant Prairie-Zion Energy Center (WI/IL)	345
7	Adair-Ottumwa (IA/MO)	345	16	Fargo-Galesburg-Oak Grove (IL)	345
8	Adair-Palmyra Tap (MO/IL)	345	17	Sidney-Rising (IL)	345
9	Palmyra Tap-Quincy-Meredosia-Ipava & Meredosia-Pawnee (IL)	345			

Source: MISO (2014)

*The C-HC Project is the southern portion of MVP #5. The northern portion of MVP #5 is the Badger-Coulee Transmission Line.

1.3.3 *The Utilities' Participation in the Planning and Implementation of the MVPs*

The Utilities are transmission-owning members of MISO. All three entities were active participants in the MISO planning processes that resulted in the development of the MVP Portfolio.

When the MISO Board of Directors approved the MVPs, it directed "transmission owners to use due diligence to construct the facilities approved in the plan" (MISO 2012a). The MISO Transmission Owners Agreement (2016) and the MISO tariff (MISO 2017b) specify which transmission owners are entitled to build projects that are approved through the MISO MTEP. FERC found that MISO correctly designated ATC and ITC Midwest as joint owners of the C-HC Project (FERC 2013, 2015). Because the C-HC Project traverses Dairyland's service territory and because Dairyland has an existing transmission line crossing at Cassville, ATC and ITC Midwest invited Dairyland to participate as a partial owner of the C-HC Project.

To comply with FERC Order 890 requirements, ATC developed a process with a timeline of actions to ensure that its economic planning was coordinated, open, and transparent to customers and stakeholders. ATC has analyzed an electrically equivalent project to the C-HC Project as a part of its Order 890 ten-year planning process for many years, as early as 2008.

ATC's planning department also coordinated with MISO and numerous other regional stakeholders as MISO conducted its regional evaluation of the C-HC Project. ATC participated in the MISO open-stakeholder planning processes from 2008 to 2011 that resulted in the development of the MVP Portfolio. As part of this coordination with MISO, ATC evaluated the C-HC Project's economic, reliability, and qualitative effects pursuant to the ATC planning provisions of the MISO tariff (ATC 2017). ATC also participated in the MISO cost-allocation process for the MVPs (called the Regional Expansion Criteria and Benefits Task Force) and in the associated FERC tariff proceeding.

Dairyland provided local input and review during the development of the MVP Portfolio and the MVPs in Dairyland's service territory. Dairyland also participated in the MISO cost-allocation process for the MVPs.

All of ITC Midwest's transmission facilities are under FERC jurisdiction and subject to FERC Order 890 transmission planning principle requiring a planning process that includes coordination, openness, transparency, information exchange, comparability, dispute resolution, regional participation, economic planning studies, and cost allocation. To meet these requirements, ITC Midwest not only carries out its own system planning functions, but additionally has elected to put its transmission facilities under MISO's Attachment FF-4, "Transmission Owners Integrating Local Planning Processes Into Transmission Provider Planning Processes For FERC Order 890 Compliance." As such, ITC Midwest's transmission system planning for all facilities are integrated with and included in the regional planning processes of MISO, including using MISO planning stakeholder forums to demonstrate the need for, identify the alternatives to, and report the status of planned transmission projects. This requires active ITC Midwest support to the MISO planning process including model development, generator interconnection planning, transmission service planning, regional expansion planning, generator decommission planning, load interconnections, interregional coordination, and focus studies.

1.4 Project Purpose and Need

In many areas of the Midwest, the electricity transmission backbone system primarily consists of 345-kV lines (Figure 1.4-1). There are limited connection points to the existing regional grid and 345-kV transmission lines in the area from northeast Iowa and southwestern and south-central Wisconsin. The Utilities propose to construct and own the C-HC Project 345-kV transmission line, interconnecting 345-kV network facilities in northwest Iowa and south-central Wisconsin. The C-HC Project is the southern portion of MISO's MVP #5 project. The proposal includes a new intermediate substation near Montfort, Wisconsin, which would provide connectivity to the regional 345-kV network.

The C-HC Project would increase the capacity of the regional transmission system to meet the following needs:

- Address reliability issues on the regional bulk transmission system and ensure a stable and continuous supply of electricity is available to be delivered where it is needed even when facilities (e.g., transmission lines or generation resources) are out of service;
- Alleviate congestion that occurs in certain parts of the transmission system and thereby remove constraints that limit the delivery of power from where it is generated to where it is needed to satisfy end-user demand;
- Expand the access of the transmission system to additional resources, including 1) lower-cost generation from a larger and more competitive market that would reduce the overall cost of delivering electricity, and 2) renewable energy generation needed to meet state renewable portfolio standards and support the nation's changing electricity mix;
- Increase the transfer capability of the electrical system between Iowa and Wisconsin;
- Reduce the losses in transferring power and increase the efficiency of the transmission system and thereby allow electricity to be moved across the grid and delivered to end-users more cost-effectively; and
- Respond to public policy objectives aimed at enhancing the nation's transmission system and to support the changing generation mix by gaining access to additional resources such as renewable energy or natural gas-fired generation facilities.

The remainder of this section provides a more detailed explanation of the purpose of and need for the C-HC Project.

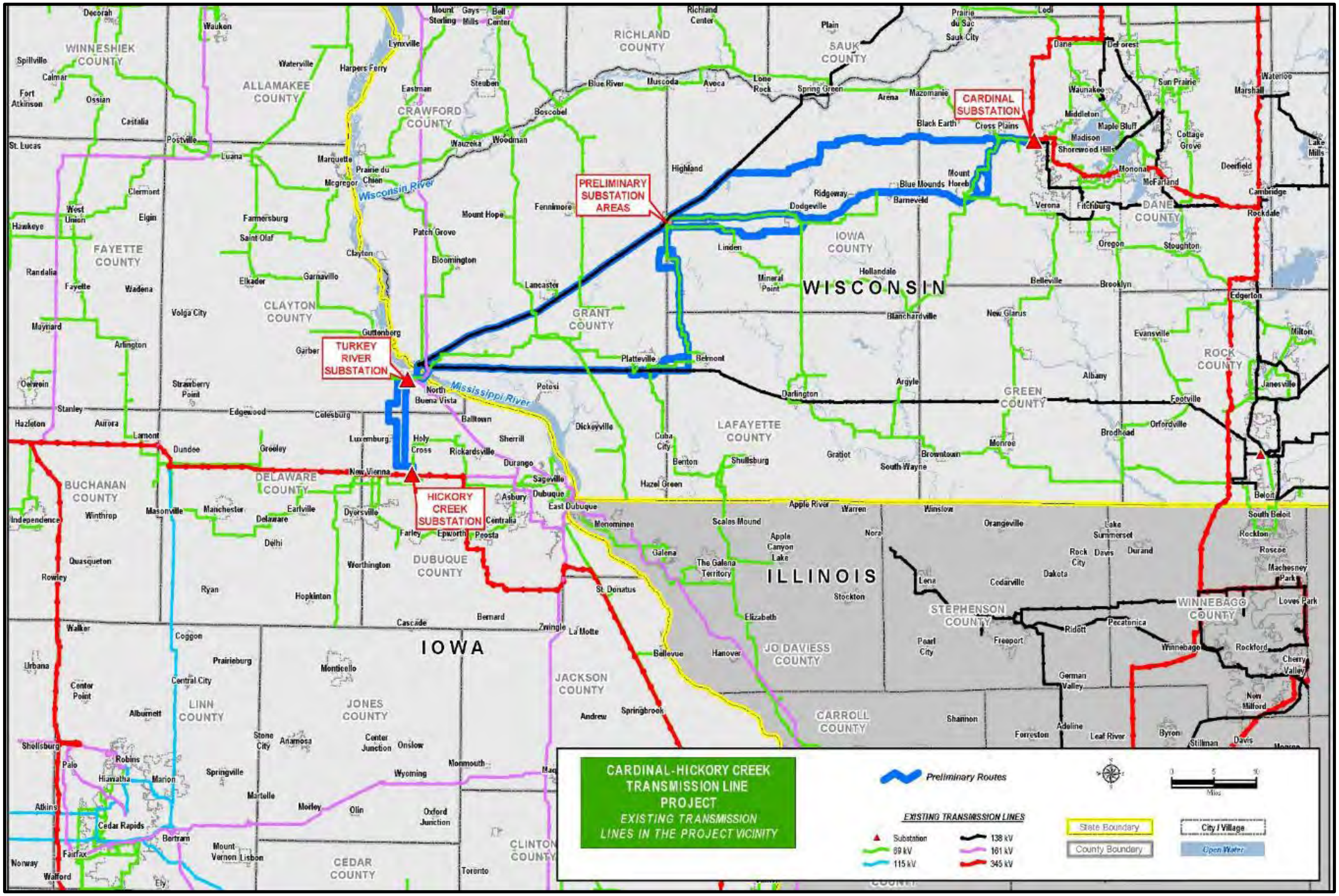

Figure 1.4-1. Transmission backbone system in the vicinity of the C-HC Project.

1.4.1 *Increase Transfer Capability Enabling Additional Generation*

The C-HC Project would create an outlet for additional wind power that would bring electricity from the wind-rich areas of the upper Great Plains to load centers like Madison and Milwaukee, and to the remainder of the MISO footprint. The Utilities estimate that the incremental increase in transfer capability created by the C-HC Project would be approximately 1,300 MW throughout much of the year.

1.4.1.1 INCREASE TRANSFER CAPABILITY BETWEEN IOWA AND WISCONSIN ENABLING ADDITIONAL GENERATION

As transmission providers, the Utilities are required to allow generators to interconnect with the transmission grid under a well-defined process. Because of the existing constraints in the transmission system that limit the transfer capability of power from Iowa to Wisconsin, the development of additional wind generation in Iowa is dependent on increasing transmission capacity and enhancing the capability to transfer additional power to the east. There are a number of wind generation projects in MISO that are explicitly dependent upon completion of the C-HC Project. MISO has informed at least 12 wind generators in Iowa and Minnesota that they are only eligible for conditional generation interconnect agreements until the C-HC Project is built and operational (Table 1.4-1). As shown below, at least 10 of these 13 generators are already in service. The Utilities estimate that the C-HC Project would increase the transfer capability by 1,382 MW during the summer peak (approximately June through August) and 1,231 MW during the spring, fall, and summer months, which would also enable a number of new generators to interconnect as well.

Table 1.4-1. MISO Generation Interconnection Agreements Conditional on the C-HC Project Being in Service

Interconnection Request Identifier	Transmission Owner	State	Nameplate Capacity (MW)	Fuel Type	Status
G735	ITC Midwest	Iowa	200	Wind	In-service
H008	ITC Midwest	Iowa	36	Wind	In-service
H096	ITC Midwest	Iowa	50	Wind	In-service
J091	MidAmerican Energy Company	Iowa	66	Wind	In-service
R39	Great River Energy	Iowa	500	Wind	In-service
G667	Great River Energy	Minnesota	13	Wind	In-service
J278	ITC Midwest	Minnesota	200	Wind	In-service
G870	Northern States Power	Minnesota	201	Wind	In-service
G826	Northern States Power	Minnesota	200	Wind	In-service
G858	Northern States Power	Minnesota	38	Wind	In-service
H071	Northern States Power	Minnesota	40	Wind	In-service
H081	Northern States Power	Minnesota	201	Wind	Under construction
J395	ATC	Wisconsin	98	Wind	Under construction

Source: Dairyland et al. (2016a)

Much renewable generation located west of the C-HC Project is in a “conditional” transmission status. This status means the generators are currently using the regional electrical grid system to deliver power to their off-takers, but have limitations with how much power can be delivered and under what conditions within the current regional system. Construction of the C-HC Project would allow greater transfer capability and the removal of those "conditional" operational restrictions for these existing generators. For those generators, MISO uses quarterly studies of construction or generator outages and projected in-service dates for new transmission lines to notify those generators about the percentage of full output they would be allowed to generate during the upcoming quarter.

ITC Midwest interconnection customers would also benefit because a substantial portion of these generation interconnection requests are in the state of Iowa where ITC Midwest is a transmission provider.

1.4.1.2 ENABLE GENERATION IN SOUTHWESTERN AND SOUTH-CENTRAL WISCONSIN

Renewable generators are requesting to interconnect with or near the C-HC Project in Wisconsin. A 200-MW windfarm (J712) is presently under study at MISO for a potential connection to the new Hill Valley Substation that is part of the C-HC Project. Additionally, three other renewable projects (J855, J870, and J871) have requested interconnection to ATC's existing Eden Substation near the new Hill Valley Substation. If these projects become operational, it is highly likely that they would be connected at Hill Valley. Because developers sometimes withdraw their requests for interconnection, it is unknown whether any of these renewable generators would interconnect with the new Hill Valley Substation.

Table 1.4-2 shows that there are almost 1,800 MW of generation interconnection requests in southwestern and south-central Wisconsin. Many of these requests, though not directly connecting to the C-HC Project, would likely benefit from C-HC in the form of lower costs to interconnect. The Quilt Block Wind Farm (J395), the output of which is purchased by Dairyland, is conditional on the C-HC Project (MISO 2017c).

Table 1.4-2. Generation Interconnection Requests in Southwestern and South-Central Wisconsin

Project Number	Group Name	Point of Interconnection	County	MW	Generating Facility Type	In-Service Date
J390	ATC	Paddock-Rockdale 345-kV Line	Rock	702	Natural Gas Combustion Turbine (Combined Cycle)	4/25/2018
J395	ATC	Hillman-Darlington 138-kV Line	Lafayette	98	Wind	12/31/2017
J584	ATC	Blacksmith Tap-Spring Grove 69-kV Line	Green	60	Wind	9/15/2018
J712*	**ATC**	**Hill Valley 138-kV Substation**	**Iowa**	**200**	**Wind**	
J760	ATC	New Kitty Hawk 345-kV Substation	Rock	30	Natural Gas Combustion Turbine (Simple Cycle)	4/1/2019
J798	ATC	Whitewater 138-kV Substation	Walworth	124	Photovoltaic Solar	9/1/2019
J807	ATC	Darlington-Hillman 138-kV Line (Falcon Substation J395)	Lafayette	41.4	Wind	9/15/2020
J819	ATC	Darlington 138-kV Substation	Lafayette	99.9	Wind	9/15/2020
J825	ATC	North Monroe-Albany 138-kV Line	Green	99.9	Wind	9/15/2020
J850	ATC	RCEC La Prairie-RCEC Bradford 138-kV Line	Rock	250	Photovoltaic Solar	9/30/2021
J855	ATC	Eden 138-kV Substation	Grant, Iowa	100	Wind	8/1/2019
J864	ATC	Lone Rock 69-kV Substation	Richland	49.98	Photovoltaic Solar	9/1/2019
J870	ATC	Eden 138-kV Substation	Grant, Iowa	200	Photovoltaic Solar	9/10/2021

Project Number	Group Name	Point of Interconnection	County	MW	Generating Facility Type	In-Service Date
J871	ATC	Eden 138-kV Substation	Grant, Iowa	100	Photovoltaic Solar	9/10/2021
J947	ATC	Potosi-Hillman 138-kV Line	Grant	200	Photovoltaic Solar	9/15/2019

Source: MISO (2017d)

*Note: Project J712 is bolded to draw attention to the fact that it would directly tie into the proposed C-HC Project.

1.4.2 *Reduce the Overall Cost of Delivered Electricity*

The C-HC Project would significantly help to resolve constraints and allow Dairyland's and ATC's customers to access more lower-cost energy in Iowa, while also allowing ITC Midwest's load-serving transmission customers more access to the energy market to sell lower-cost energy.

Adding a new regional transmission line should also reduce the costs of delivering electricity.
The following are metrics for calculating the amount of those savings along with how those metrics apply to the customers of Dairyland, ATC, and ITC Midwest.

1.4.2.1 ENERGY COST SAVINGS

When a new transmission line or non-transmission alternative is added to the electric system, prices in certain locations of the energy market can be lowered. For example, when a 345-kV alternative like the C-HC Project is added to the transmission system, the energy market becomes more robust as energy from different generators can now be transmitted to different load points more efficiently and without constraint, thereby increasing competition and driving down market prices.

Dairyland and ATC's customers benefit economically in the MISO energy markets in part due to reduced constraints on transmission lines. According to the Utilities' planning analysis submitted as part of the application to the Wisconsin Public Service Commission, the C-HC Project would provide net benefits to Wisconsin customers of between $23.5 million and $350.1 million (American Transmission Company et al. 2018). These benefits would include energy cost savings, insurance value, avoided reliability upgrades, avoided asset renewal upgrades, and capacity cost savings. Customers of Dairyland, ATC, and other utilities in Wisconsin would share in these benefits.

Dairyland would directly benefit because the C-HC Project would eliminate the Stoneman-Turkey River 161-kV transmission line as a potential market constraint and capacity import limit, thereby increasing the competitiveness of an area that FERC has deemed a "Narrow Constrained Area" in the Wisconsin Upper Michigan System. The C-HC Project would reduce constraints by allowing a more efficient dispatch of generation, and would improve Dairyland's service to its member cooperatives' load in northeast Iowa, southwestern Wisconsin, and northwest Illinois. In combination with other MVPs, the C-HC Project would enable additional transfer capability while offloading heavily congested paths near the Quad Cities on the Iowa–Illinois border (see Figure 1.3-2).

In Iowa, the C-HC Project would support existing and future wind generation development that would benefit the state and the region through the production of additional low-cost energy.

1.4.2.2 REDUCE CAPACITY AND ENERGY LOSSES

There is a need to reduce capacity and energy losses for electricity delivered for Dairyland's members and ATC's customers. All transmission lines have losses because as electricity travels across the conductors from point A to point B some energy is lost as heat. When a transmission project is built, the electric system becomes more robust, and often decreases the capacity and energy losses in the lines since the electricity that travels through the system now has more conductors and capacity.[1] By lowering the line losses during peak demand, the amount of capacity and energy that the local utilities are required to generate and deliver is reduced. This reduction of capacity and energy losses results in electricity being delivered more efficiently and at reduced costs, a direct economic benefit to customers.

MISO has found that the addition of the MVP Portfolio, of which the C-HC Project is one element, to the existing transmission network would reduce overall system losses (MISO 2014). The MVP Portfolio would also reduce the generation needed to serve the combined load and transmission line losses. According to MISO, "the energy value of these loss reductions is considered in the congestion and fuel savings benefits, but the loss reduction also helps to reduce future generation capacity needs." Fuel savings refers to the offset of natural gas, coals, and other fuel units by wind generation (MISO 2014:37).

1.4.2.3 IMPROVE COMPETITIVENESS

A new transmission facility can improve the market structure and competitiveness if the facility enables external suppliers to offer additional generation into a specifically defined market. The increased generation alternatives would increase competition, causing a reduction in market prices. To the extent that suppliers who participate in the market are exposed to such market prices through short-term purchases and the turnover of longer-term contracts, these reductions in market prices would also reduce end-user costs.

1.4.3 *Address Reliability Issues on the Regional Bulk Transmission System*

The Nelson Dewey (nameplate 220 MW) and Stoneman (nameplate 40 MW) power plants in Cassville, Wisconsin, both ceased operations in 2015. These plant closures have changed the electricity flows on the regional grid in southwestern Wisconsin and have increased the reliance on the local transmission system due to the need to bring electricity from more remote generation sources to maintain local electric service. Because of these plant closings, Dairyland, ATC, and MISO have had to establish operating guides to control how much power flows through the transmission lines in southwestern Wisconsin under certain operating conditions.

An operating guide consists of pre-planned procedures that are initiated under pre-determined operating conditions of the transmission system to alleviate conditions such as line overloads. Operating guides are normally used as interim measures and are not normally long-term solutions. The C-HC Project would reduce or completely eliminate multiple operating guides, some of which exist due to the risk of cascading outages in southwestern and south-central Wisconsin for some contingencies. While operating guides may be an acceptable way to maintain a reliable transmission system, they do add complexity to real-time operations and, in some instances, require reliability to be maintained by interrupting service to load or generation. It is a clear benefit to limit the number of operating guides and/or the complexity within each operating guide.

[1] A conductor is a wire made up of multiple aluminum strands around a steel core that together carry electricity. Capacity is defined as the maximum allowable value of current that can flow through transmission lines without adversely affecting the mechanical and electrical properties of the conductor. Capacity size depends on the electrical and mechanical properties of the conductor, its ability to spread the heat generated, and the ambient conditions (Spes et al. 2017). Transmitting electricity at a higher voltage reduces the losses in the conductor. Generally speaking, the more energy that travels across the conductors, the hotter they become and the more energy is dissipated as lost heat. When a new transmission line is built, it generally reduces the amount of energy that travels over the existing transmission lines, thereby decreasing line losses.

There are several transmission line overloads in southwestern and south-central Wisconsin. The three most serious overloads that must be eliminated under NERC requirements occur on the:

- Turkey River–Stoneman 161-kV transmission line, connecting ITC Midwest to Dairyland;
- Stoneman-Nelson Dewey 161-kV transmission line; and
- Townline Road-Bass Creek 138-kV transmission line.

The Utilities have also identified 46 existing overloads that would be eliminated by the C-HC Project. Furthermore, MISO also documented overloads that would be eliminated by the MVP Portfolio (MISO 2014, 2017a).

1.4.4 *Avoided Infrastructure Costs and Other Grid Improvements*

There is a need to upgrade and/or replace existing, aging infrastructure within the study area. If the C-HC Project is not constructed, Dairyland would, at a minimum, have to rebuild the Stoneman-Nelson Dewey 161-kV transmission line to increase its capability and also would have to replace equipment at the Stoneman Substation to increase the capability of the Turkey River-Stoneman 161-kV line (Dairyland et al. 2016a).

Analysis completed as part of MISO's MVP Portfolio review indicates that the Turkey River-Stoneman 161-kV line may need to be rebuilt as a 345-kV line, which is currently considered part of the C-HC Project. This improvement may be needed in the future if the C-HC Project is not built.

Other transmission line improvement that are needed within the general study area are listed in Table 1.4-3.

Table 1.4-3. Transmission Projects Eliminated as a Result of the Cardinal-Hickory Creek Project

Transmission Project	Length (miles)	Transmission Owner
Turkey River – Stoneman 161-kV	2.71	ITC Midwest
North Monroe – Albany 138-kV	9.21	ATC
Albany – Bass Creek 138-kV	11.88	ATC
Total	**23.80**	

1.5 Purpose of and Need for Federal Action

Several agencies will use this DEIS to inform decisions about funding, authorizing, or permitting various components of the proposed C-HC Project. RUS, the lead Federal agency, will determine whether or not to provide financial assistance for Dairyland's portion of the project. As a cooperating agency, the USFWS will evaluate the Utilities' request for a right-of-way (ROW) easement and a Special Use Permit to cross the Upper Mississippi River National Wildlife and Fish Refuge (Refuge). The USACE, also a cooperating agency, 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 Clean Water Act (CWA). The following sections describe the authorities under which the three Federal agencies can make decisions and the type of decisions to be made.

1.5.1 *Rural Utilities Service*

The Rural Electrification Act of 1936, as amended (7 U.S.C. 901 et seq.) generally authorizes the Secretary of Agriculture to make rural electrification and telecommunication loans, and specifies eligible borrowers, references, purposes, terms and conditions, and security requirements. RUS is authorized to make loans and loan guarantees to finance the construction of electric distribution, transmission, and generation facilities including system improvements and replacements required to furnish and improve electric service in rural areas, as well as demand-side management, electricity conservation programs, and on- and off-grid renewable electricity systems.

Dairyland is requesting financing assistance from RUS for its participation as a partial owner of the C-HC Project. Dairyland would be the sole owner of the 161-kV transmission line that would be rebuilt as part of the 345-kV Mississippi River crossing and any equipment replaced in the Stoneman Substation. Dairyland also would be a partial owner of the Turkey River Substation. RUS's proposed Federal action is to decide whether to provide financial assistance for Dairyland's participation as a partial owner of the C-HC Project.

As part of its review process, RUS is required to complete the NEPA process, along with other technical and financial considerations, in processing Dairyland's application. Other RUS agency actions include the following:

- Provide engineering reviews of the purpose and need, engineering feasibility, and cost of the proposed project.
- Ensure that the proposed project meets the borrower's requirements and prudent utility practices.
- Evaluate the financial ability of the borrower to repay its potential financial obligations to RUS.
- Review the alternatives to improve transmission reliability issues.
- Ensure that adequate transmission service and capacity are available to meet the proposed project needs.
- Ensure that NEPA and other environmental laws and requirements and RUS environmental policies and procedures are satisfied prior to taking a Federal action.

1.5.2 *U.S. Fish and Wildlife Service*

The USFWS would need to issue a Special Use Permit for construction of project features on Refuge-managed/owned lands and may need to authorize additional or new ROW for crossing the Refuge. The USFWS is authorized to approve permits and issue easements for utilities under 16 U.S.C. 668dd(d)(1)(b). The Refuge is part of the National Wildlife Refuge System (NWRS). The mission of the NWRS is defined in the Refuge Improvement Act of 1997 as:

> *to administer a national network of lands and waters for the conservation, management and where appropriate, restoration of fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.*

The Upper Mississippi River Wildlife and Fish Refuge Act of 1924 sets forth the following purposes for the Refuge:

> *…as a refuge and breeding place for migratory birds included in the terms of the convention between the United States and Great Britain for the protection of migratory birds, concluded August 16, 1916, and*
>
> *to such extent as the Secretary of the Interior may by regulations prescribe, as a refuge and breeding place for other wild birds, game animals, fur-bearing animals, and for the conservation of wild flowers and aquatic plants, and*
>
> *to such extent as the Secretary of the Interior may by regulations prescribe as a refuge and breeding place for fish and other aquatic animal life.*

USFWS also has authority and trust responsibility under the Endangered Species Act (ESA), the Bald and Golden Eagle Protection Act, and the Migratory Bird Treaty Act.

USFWS would need to grant an easement across its lands within the Refuge for the C-HC Project. The easement application would be submitted after the Record of Decision identified the preferred route, and the required compatibility determination would proceed after the application was determined to be complete.

Given this, the Refuge Manager would need to complete a written compatibility determination for the proposed C-HC Project prior to issuance of a ROW. Compatible use is defined in 50 CFR 25.12(a) as, "a proposed or existing wildlife-dependent recreational use or any other use of national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purpose(s) of the national wildlife refuge."

A Special Use Permit would be needed from the Refuge prior to construction of the project on Refuge-managed/owned lands after a ROW is issued.

Under NEPA and the National Wildlife Refuge Improvement Act of 1997, major actions affecting the quality of the human environment require full consideration of potential impacts, public involvement, and an interdisciplinary approach to decision-making that considers a reasonable range or alternatives.

1.5.3 *U.S. Army Corps of Engineers*

The USACE may need to issue the following authorizations and permits to allow the C-HC Project to be constructed:

- A permit under Section 10 of the Rivers and Harbors Act, for the crossing of the Mississippi River.
- Permission under Section 14 of the Rivers and Harbors Act (commonly referred to as "Section 408"), for the crossing of the Mississippi River.
- A permit under Section 404 of the CWA, for activities that discharge fill into waters of the U.S. (WUS), including wetlands.
- A ROW authorization to issue an easement across USACE-owned lands.

Section 10 of the Rivers and Harbors Act of 1899 is administered by the USACE. Under Section 10, a permit is required to construct certain structures or to work in or affect "navigable waters of the U.S." Navigable WUS are defined by the USACE as:

> *those waters of the United States subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce. A determination of navigability, once made, applies laterally over the entire surface of the waterbody, and is not extinguished by later actions or events which impede or destroy navigable capacity* (33 CFR Part 329).

Section 10 requires a minimum clearance over the navigable channel for an aerial electric transmission line crossing navigable WUS. Within the C-HC Project area, the Mississippi River is considered to be navigable WUS.

Section 14 of the Rivers and Harbors Act of 1899, as amended, and codified in 33 U.S.C. 408 (Section 408) provides that the Secretary of the Army may, upon the recommendation of the Chief of Engineers, grant permission to other entities for the permanent or temporary alteration or use of any USACE Civil Works project. Permission under Section 14 of the River and Harbors Act applies to USACE real estate, such as USACE-owned lands, that are found within the Refuge. USACE Engineer Circular (EC) 1165-2-216, *Policy and Procedural Guidance for Processing Requests to Alter U.S. Army Corps of Engineers Civil Works Projects Pursuant to 33 USC 408*, provides the requirements and procedures for an overall review process that can be tailored to the scope, scale, and complexity of individual proposed alternations, and provides infrastructure-specific considerations for dams, levees, floodwalls, flood risk management channels, and navigation projects. Per EC 1165-2-216, the decision made by the USACE pursuant to a Rivers and Harbors Act Section 10 permit or CWA Section 404 permit cannot be issued prior to the decision on the Section 408 permit.

Section 404 of the CWA established a permit program for the discharge of dredged or fill material into WUS, including wetlands. This permit program is jointly administered by the USACE and the USEPA. The immediate regulatory decision regarding which activities fall under Section 404 of the CWA lies with the USACE Rock Island District in Illinois, and St. Paul District in Wisconsin. The USACE will need to determine which method for obtaining a Section 404 permit applies to the C-HC Project: authorization under a Nationwide Permit (NWP), authorization under a regional general permit, or issuance of an individual permit.

The USACE's evaluation of a Section 10 permit and Section 14 permission under the Rivers and Harbors Act and a Section 404 permit under the CWA involves multiple analyses, including: 1) evaluating the C-HC Project's impacts in accordance with NEPA, 2) determining whether the C-HC Project is contrary (Section 10 and possibly Section 14) to the public interest, and 3) in the case of the Section 404 permit, determining whether the C-HC Project complies with the requirements of the CWA.

The issuance of a ROW easement would require an application to the USACE Real Estate branch that demonstrates the project has no viable alternative to use of public lands and has a demonstrated need. The C-HC Project would be reviewed to determine if it is consistent with Mississippi River Project purposes, consistent with the Mississippi River Project Master Plan, and meets applicable laws/guidance. An approved mitigation plan for statutory and non-statutory mitigation may also be required before issuance.

1.6 Required Federal and State Agency Approvals

The Utilities will be required to obtain approvals from multiple Federal and state agencies prior to constructing the C-HC Project. For the Mississippi River crossing, the C-HC Project must obtain approvals from multiple Federal agencies, as described above under Section 1.5, Purpose of and Need for Federal Action. The C-HC Project must also obtain authorizations from the States of Iowa and Wisconsin. These requirements are briefly described below.

1.6.1 *Federal and State Permits and Approvals Summary*

Table 1.6-1 identifies the primary permits and other approvals that may be required by Federal and state agencies.

Table 1.6-1. Federal and State Permits or Approvals for the C-HC Project

Agency	Permits or Other Approvals
Federal Agencies	
U.S. Department of Agriculture Rural Utilities Service	NEPA compliance as lead agency, including National Historic Preservation Act, Section 106 tribal consultation.
U.S. Fish and Wildlife Service	• Use authorization if ROW required on National Wildlife Refuge or Wetland Management District lands. • Special Use Permit if crossing National Wildlife Refuge. • ESA Section 7 consultation would occur between RUS and USFWS. The C-HC Project may require Incidental Take or Non-Purposeful Take Permit under Section 7 of ESA if impacts to endangered/threatened species cannot be avoided. • Ensure compliance with the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act (MBTA).
U.S. Army Corps of Engineers	• Section 10 Permit of the Rivers and Harbors Act of 1899. • Nationwide Permit, Regional General Permit, or Individual Permit under Section 404 of the CWA. • If USACE land is crossed, an easement will be required and if a civil works project is impacted, a permit under Section 14 of the Rivers and Harbors Act of 1899, codified in 33 U.S.C. 408 ("Section 408") may also be required.
National Park Service	Land and Water Conservation Fund (LWCF) approval may be required if LWCF-funded lands are crossed.
U.S. Coast Guard	Authorization for Structures or Work in or Affecting Navigable Waters of the United States
Federal Aviation Administration	Form 7460-1 Objects Affecting Navigable Airspace
Federal Highway Administration	Permit required to cross Federal highways and interstate highways (usually coordinated through state department of transportation)
U.S. Environmental Protection Agency	A spill prevention, control, and countermeasure plan for the proposed Hill Valley Substation and the existing substations to be improved by the proposed project.
Natural Resources Conservation Service (NRCS)	Easement on property encumbered by NRCS obtained/managed conservation easement
State Agencies	
State of Wisconsin	
Public Service Commission of Wisconsin	Certificate of Public Convenience and Necessity
Wisconsin Department of Natural Resources	• Endangered Resource Review, which may result in Incidental Take Authorization if impacts to endangered/threatened species cannot be avoided • Construction Site Erosion Control and Stormwater Discharge Permit • CWA Section 401 Water Quality Certification (if CWA Section 404 permit is required by USACE) • Chapter 30 permit to place temporary bridges in or adjacent to navigable waters, pursuant to Wisconsin Statutes 30.123 and WAC Chapter 320 • Chapter 30 permit to place miscellaneous structures within navigable waterways, pursuant to Wisconsin Statutes 30.12 and WAC Chapter 329 (may be required) • Chapter 30 permit for grading on the bank of a navigable waterway, pursuant to Wisconsin Statutes 30.19 and WAC Chapter 341 (may be required) • Wetland Individual Permit, pursuant to Wisconsin Statutes 281.36 and WAC Chapters NR 103 and 299
Wisconsin Department of Transportation	• Application to Construct and Operate and Maintain Utility Facilities on Highways Rights-of-Way (Form DT1553) • Access Driveway Permit (may be required) • Drainage Permit (may be required) • Road Crossing Authorization • Oversize Loads or Excessive Weights on Highways

Agency	Permits or Other Approvals
Wisconsin Historical Society, Office of Preservation Planning	National Historic Preservation Act, Section 106 consultation
Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP)	Agricultural Impact Statement
State of Iowa	
Iowa Utility Board and Iowa municipality, if crossed	Electric Transmission Line Franchise
Iowa Department of Natural Resources	• CWA Section 401 Water Quality Certification (if CWA Section 404 permit is required by the U.S. Army Corps of Engineers) • National Pollutant Discharge Elimination System (NPDES) Permit • Floodplain Development Permit • Sovereign Land Construction Permit
Iowa Department of Transportation	Utility Accommodation Permit; Work within Right-of-Way Permit
Iowa State Historic Preservation Office	National Historic Preservation Act, Section 106 consultation

1.6.2 *Certificate of Public Convenience and Necessity in Wisconsin*

In addition to compliance with all applicable Federal regulations, a certificate of public convenience and necessity (CPCN) must be granted by the State of Wisconsin. The Public Service Commission of Wisconsin (PSCW) is responsible for reviewing and approving applications for a transmission project that is either 1) 345 kV or greater, or 2) less than 345 kV but greater than or equal to 100 kV, over 1 mile in length, and needing a new ROW (PSCW 2017).

The size and complexity of a proposed project determines the review process. When reviewing a transmission project, the PSCW considers alternative sources of supply and alternative locations or routes, as well as the need, engineering, economics, safety, reliability, individual hardships, and potential environmental effects. Applicants need to provide detailed information for two possible routes for projects that require a CPCN. Proposed routes are often subdivided into various route segments. For large projects that require a CPCN, easements for the project cannot be acquired by condemnation until the CPCN is granted (PSCW 2017).

After an CPCN application has been filed, the PSCW notifies the public that the review process is beginning. A public notification letter is sent to all property owners on or near the proposed ROW, as well as local government officials, libraries, and other interested persons. The notification describes the proposed project, includes a map, identifies the level of environmental review the project requires, lists locations where copies of the application are available for review, solicits public comments, and provides contact information. All transmission project applications are reviewed for environmental impacts, electrical performance, need, and cost/benefit (PSCW 2017).

The PSCW will prepare an EIS to assess how the project would affect the natural and human environment. The EIS includes all of the relevant knowledge and information about the expected environmental effects acquired by reviewing the project application and peer-reviewed literature, visiting the project area, interviewing regulatory staff with experience with similar projects, consulting other agencies, and collecting public comments. Projects for which an EIS is prepared always require a public hearing in the project area (PSCW 2017).

Members of the public are encouraged to testify about their views and concerns at public hearings. Public testimony may be provided in person at the hearing or through comments submitted to the PSCW by mail or on a dedicated project website at the PSCW after the hearing notice is issued. All testimony provided at public hearings is included in the record that the PSCW reviews in making a decision (PSCW 2017).

The PSCW is responsible for making the final decisions regarding proposed transmission lines in Wisconsin. The commissioners review the application, the case record, the environmental document prepared by staff, memos, and briefs. The PSCW discusses the issues raised in the hearing and makes its decision in an open meeting (PSCW 2017).

The PSCW decides whether a transmission line should be built, how it should be designed, and where it would be located. All proposed routes are analyzed during review by the PSCW. The selected route, chosen by the PSCW, may be the applicant's preferred route, an alternative route offered by the applicant, a combination of reasonable route segments, or a route variation suggested by the public. The PSCW's decisions are described in a detailed written order to the project applicant(s) (PSCW 2017).

For the C-HC Project, RUS has been coordinating closely with the PSCW to help ensure that if the C-HC Project is approved, the Federal and state processes result in the selection of a complete route that connects the Cardinal Substation in Wisconsin with the Hickory-Creek Substation in Iowa.

1.6.3 *Electric Transmission Franchise in Iowa*

In addition to complying with all applicable Federal regulations, the C-HC Project must have an electric transmission franchise granted by the State of Iowa. The Iowa Utilities Board (IUB) is responsible for reviewing and processing all petitions for electric transmission line franchises under Iowa Code Chapter 478 – Electric Transmission Lines, Chapter 11 of 199 Iowa Administrative Code – Electric Lines, and Chapter 25 of 199 Iowa Administrative Code – Iowa Electrical Safety Code. A franchise is the authorization of the IUB for the construction, erection, maintenance, and operation of an electric transmission line. The granting of a franchise requires a finding by the IUB that the project is necessary to serve a public use, represents a reasonable relationship to an overall plan of transmitting electricity in the public interest, and meets all other legal requirements (IUB 2017).

Any electric line which operates at 69 kV or more and is located outside the boundaries of a city requires a franchise from the IUB (Iowa Code Section 478.1). A company seeking a franchise can also request that the IUB grant the right of eminent domain, or condemnation, to obtain the ROW needed for the project (IUB 2017).

Iowa Code requires that an informational meeting must be held for any electric transmission line that would extend for 1 mile or more on privately owned land. The company proposing the electric line is required to notify all parties with an ownership interest in possibly affected property of the meeting. The company cannot begin ROW negotiations with landowners until this meeting is held, and cannot petition the IUB for a franchise until at least 30 days after this meeting (IUB 2017).

After a petition is filed, there is a period of staff review and company responses to public comment letters before the proceeding moves forward. Once staff determines the petition is satisfactory from a technical standpoint, there are two procedural paths toward an IUB decision. If no objections are on file and the petition does not request eminent domain, a notice is published for 2 consecutive weeks in a newspaper in the county (or counties) where construction would occur. If no objections are filed within 20 days of the second publication, a franchise may be granted without a hearing. If objections are on file, or if eminent domain is requested, a hearing typically is held. Notice of the hearing will be published, and objectors and/or owners of eminent domain parcels will receive notice by mail. Written testimony will be pre-filed, and a hearing held for cross examination. The hearing may be conducted by the IUB, or by an

Administrative Law Judge or Presiding Officer. If the hearing is not held before the full IUB, the result will be a proposed decision that can be appealed to the full IUB (IUB 2017).

Following the hearing, parties may file post-hearing briefs, and then the IUB issues its final decision. If the IUB approves the granting of the franchise, the company proposing the electric line may begin construction activities as defined by the final ruling of the IUB.

Once the IUB has decided the case, either initially or on appeal from a proposed decision, any party to the proceeding may file for rehearing within 20 calendar days under Iowa Code Sections 17A.16 and 478.32. Once a final decision has been made, any party may appeal to the District Court within 30 days under Iowa Code Sections 17A.19 and 478.32. A request for rehearing is not required prior to taking an appeal (IUB 2017).

1.7 Public Participation for Federal Decisions

The first Notice of Intent (NOI) for the C-HC Project was published in the Federal Register on October 18, 2016. The NOI serves as the official public announcement of the intent to prepare an EIS. The NOI published on October 18, 2016, initiated the 30-day public scoping period, which ultimately was extended to 81 days ending on January 6, 2017. The announcement included a brief overview about the Proposed Action and alternatives, potential resource concerns, opportunities to provide input and attend meetings, and RUS project contacts.

On November 22, 2016, RUS published a second NOI, which announced the second round of public scoping meetings held on December 6 and 7, 2016.

1.7.1 *Public Notification Efforts*

A combination of legal announcements, display ads, and press releases were provided to newspapers, television stations, and radio stations servicing the project area during the public scoping period to provide public scoping meeting details, the scoping period deadline, and basic details about the C-HC Project to individuals within the project vicinity. Details about the information provided to media outlets can be found in the C-HC Scoping Report (SWCA Environmental Consultants [SWCA] 2017).

On October 14, 2016, letters were sent to 38 Federal and state agencies inviting them to participate in public and agency scoping meetings concurrently with the public scoping meetings in October and November 2016. Agency scoping meetings were also scheduled to provide updates and answer questions. 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. On November 17, 2016, letters were mailed to a slightly expanded list of 46 Federal and state agencies notifying them of the second round of public scoping meetings held on December 6 and 7, 2016.

RUS and the SWCA team began notifying federally recognized tribes with interest in the C-HC Project area about the EIS process with letters sent via registered mail on October 17, 2016, for the first set of public scoping meetings, and on November 17, 2016, for the second set of public scoping meetings (see Appendix B). The letters mailed in October and November 2016, invited the tribes to participate in the National Historic Preservation Act Section 106 review process, attend public scoping meetings, and provide relevant information for inclusion in the EIS. RUS and the SWCA team coordinated and documented activities and input received during the Section 106 review process. The team limited information included in the administrative record to that which was not considered sensitive by the tribes.

In response to feedback provided to RUS after the first set of public scoping meetings in October and November 2016, RUS provided a direct mailing to 66 local government contacts on November 17, 2016, to notify them of the second round of public scoping meetings held on December 6 and 7, 2016.

1.7.2 *Public Scoping Meetings*

RUS held six public scoping meetings to present the RUS NEPA process and timelines, and to answer questions and receive comments regarding the C-HC Project. Table 1.7-1 summarizes the meeting dates, times, locations, and estimated public attendance based on the meeting sign-in sheets. These five meeting locations are within or near the alternative transmission line corridors.

Table 1.7-1. First Public Scoping Meeting Dates, Times, and Locations

Date	Time	Location/Venue	Public Attendance
October 31, 2016	3:00–6:00 p.m.	Peosta Community Centre 7896 Burds Road Peosta, IA 53068	7
November 1, 2016	4:00–7:00 p.m.	Cassville Middle School Cafeteria 715 East Amelia Street Cassville, WI 53806	23
November 2, 2016	4:00–7:00 p.m.	Dodgeville Middle School Cafeteria 951 Chapel Street Dodgeville, WI 53533	142
November 3, 2016	4:00–7:00 p.m.	Madison Marriott West 1313 John Q Hammons Drive Middleton, WI 53562	66
December 6, 2016	4:00–7:00 p.m.	Peosta Community Centre 7896 Burds Road Peosta, IA 53068	17
December 7, 2016	4:00–7:00 p.m.	Deer Valley Lodge 401 West Industrial Drive Barneveld, WI 53507	110

1.7.3 *Scoping Comments Received*

In total, 379 comment letters from 352 commenters were received during the scoping period beginning on October 18, 2016, and ending on January 6, 2017. Government entities and organizations submitting comments are listed in Table 1.7-2 through Table 1.7-4. All other commenters were individuals. Public comments were submitted using comment forms, letters, and emails.

Table 1.7-2. Federal Entities and Federally Recognized Tribes that Submitted Comments

Miami Tribe of Oklahoma	U.S. Environmental Protection Agency
National Park Service	U.S. House Representative (Wisconsin 2nd Congressional District)
U.S. Army Corps of Engineers	U.S. Senator

Table 1.7-3. State and Local Entities that Submitted Comments

Iowa State Historic Preservation Office	City of Dubuque, IA
Iowa Department of Natural Resources	Town of Stark, WI Energy Planning Information Committee (EPIC)
Iowa Department of Cultural Affairs	City of Platteville, WI
Town of Springdale, WI	Town of Vermont, WI
Village of Mount Horeb, WI	Town of Arena, WI Planning Commission
Town of Belmont, WI	Platteville Township, WI

Table 1.7-4. Non-Governmental Organizations that Submitted Comments

Iowa Environmental Council	Black Earth Creek Watershed Association
Environmental Law & Policy Center	Ice Age Trail Alliance
Iowa Chapter of the Sierra Club	Wisconsin Nature Conservancy
Center for Rural Affairs	Wisconsin COUNTS (Citizens Opposed to Unnecessary Transmission Lines)
Vermont Citizens Powerline Action Committee	Trout Unlimited
Driftless Area Land Conservancy	The Prairie Enthusiasts
Minnesota Center for Environmental Advocacy	

The RUS Scoping Report identified 1,736 individual comments contained within the 379 comment letters (SWCA 2017). A summary of the public comments received and organized by concern, issue, or resource topic is presented in Table 1.7-5, in order of the greatest number of comments received to the fewest number of comments received. It is possible that comments addressed multiple topics; therefore, comments may be included in multiple topics below.

Table 1.7-5. Summary of Public Scoping Comments Received, by Topic.

Topic	Number of Comments
Socioeconomics	552
NEPA Process	481
Wildlife	262
Land Use	169
Visual Resources	162
Recreation and Natural Areas	116
Water Resources	112
Vegetation	112
Public Health and Safety	71
Decision Process	61
Impact Analyses	51
Cultural Resources	39
Air Quality	30
Public Involvement	29
Geology	28
Soils	19
Transportation	16

Topic	Number of Comments
Noise	14
Communications Infrastructure	5
Paleontology	1
Total	**2,330**

All issues identified for the C-HC Project are briefly summarized below. The C-HC Project scoping report (SWCA 2017) provides a detailed discussion of all public comments received, comment categories, and representative comments for each category identified below. The scoping report is available at the RUS project website:

USDA Publications environmental studies. Impact Statement Cardinal Hickory Creek.

1.7.3.1 SOCIOECONOMICS

Five hundred fifty-two comments were received regarding socioeconomics. This category received the highest number of comments compared to all topics, with many commenters expressing concerns for potential decreases in property values resulting from the proposed C-HC Project. Comments also included the potential adverse economic impacts resulting from loss of tourism, retirement housing, and business revenue in the area. For example, Letter 125, Comment 2 stated, “The transmission line could be routed to pass through areas that have a broad range of uses that could be impacted. The DEIS should therefore consider the full economic impact of the line on ratepayers, tourism and recreation, farm and other business operations and property values.”

1.7.3.2 NEPA PROCESS

Four hundred and eighty-one comments were received regarding the NEPA process. Many of the comments received questioned the need for the C-HC Project. Letter 169, Comment 3 cites the decline in electricity demand in the Madison area and other Midwest cities. Also related to the purpose of and need for the proposed C-HC Project, Letter 169, Comment 5 suggested “the proposed ‘open access’ transmission line would draw electricity from any or all electricity suppliers that pay highest for access to the line. Besides wind and nuclear, that will include out-of-state coal-fired power plants.” Additionally, Letter 248, Comment 3 questioned whether the proposed C-HC Project could help Wisconsin meet its Renewable Portfolio Standards since the State of Wisconsin’s standard is largely satisfied.

1.7.3.3 WILDLIFE

Two hundred sixty-two comments were received regarding wildlife. Most commenters were concerned about potential adverse impacts the proposed C-HC Project could have on wildlife, including threatened and endangered species and species considered unique to the region known as the Driftless Area in Wisconsin and Iowa. Commenters expressed concerns about potential degradation of habitat (e.g., trout streams), fragmentation of habitat, the potential to introduce invasive species, and potential impacts to nearby state parks, preserves, and other conservation-focused lands that support wildlife.

1.7.3.4 LAND USE

One hundred sixty-nine comments were received regarding land use. Most commenters were concerned about the adverse impacts the proposed C-HC Project would have on their current land use. Commenters expressed concerns about how the proposed transmission line would affect existing agricultural lands and businesses, livestock grazing, and residential land uses. Commenters also expressed concerns about potential adverse impacts to nearby state parks, preserves, and other conservation-focused lands.

1.7.3.5 VISUAL RESOURCES

One hundred sixty-two comments were received regarding visual resources. Many of the comments received about visual resources expressed concern about potential adverse impacts to the Driftless Area landscape from the transmission line structures and wires and cleared vegetation within the ROW. Specific areas that were mentioned in the comments included, but were not limited to, the Ice Age National Scenic Trail (NST), the Platteville "M," Governor Dodge State Park, and the overall scenic, rural vistas of the Driftless Area.

1.7.3.6 RECREATION AND NATURAL AREAS

One hundred sixteen comments were received regarding recreation. Commenters cited the diversity of recreation activities within the proposed C-HC Project area including, but not limited to, hunting, bicycling, boating, motorized travel (car tours, motorcycle riding, four-wheeling, and snowmobiling), and angling. Overall, commenters expressed concern about potential adverse impacts to these recreation activities from the proposed C-HC Project.

Commenters identified many natural areas that exist within the proposed C-HC Project area, such as the Upper Mississippi River National Wildlife and Fish Refuge, Ice Age NST, Governor Dodge State Park, Blue Mound State Park, Military Ridge State Trail, prairie heritage areas, and state natural areas. Comments associated with the natural areas expressed concern for potential disturbances within these areas or indirect impacts to these areas, such as visual impacts or introduction of nonnative vegetation.

1.7.3.7 WATER RESOURCES

One hundred twelve comments were received regarding water resources. Many commenters were concerned about potential adverse impacts to springs, groundwater, and wells, all of which could affect their communities' drinking water supplies. Most common concerns included degradation of these resources as a result of herbicide use, construction materials, and construction activity. Likewise, many commenters expressed related concerns regarding degradation of trout streams and wetlands as a result of the C-HC Project.

1.7.3.8 VEGETATION

One hundred twelve comments were received regarding vegetation. Most commenters expressed concerns with potential adverse impacts the proposed C-HC Project could have on the unique and ecologically rich habitats of the Driftless Area, including pine relics, oak savannas, dry mesic prairies, and wet sedge meadows. Commenters indicated their concern that the C-HC Project would adversely affect numerous rare and listed plant species in the region, through alteration or degradation of habitat (e.g., herbicide runoff and introduction of invasive species).

1.7.3.9 PUBLIC HEALTH AND SAFETY

Seventy-one comments were received regarding public health and safety. Approximately half of these comments expressed concerns that high-voltage power lines and electric and magnetic fields (EMF) could cause negative health effects. Many commenters expressed concerns about stray voltage from the transmission line and the potential harm it could cause to humans and animals (including livestock) within proximity. Commenters also noted the potential for an increased risk of lightning strikes from having nearby transmission line poles.

1.7.3.10 DECISION PROCESS

Sixty-one comments were received regarding the decision process. Many commenters were concerned that the C-HC Project would not be in compliance with Wisconsin siting laws and/or that the project would be in conflict with local land use planning (e.g., the Town of Springdale Land Use Plan and City of Dubuque Code of Ordinances). A few commenters expressed concerns about the proposed C-HC Project crossing environmentally sensitive areas that Wisconsin law may require be avoided.

1.7.3.11 IMPACT ANALYSES

Fifty-one comments were received regarding the impact analyses. Many commenters reiterated the need for comprehensive environmental impact analyses in the DEIS. Other commenters recommended specific projects be included in the DEIS cumulative impacts analysis. For example, Letter 274, Comment 6 suggested that developers might consider following the C-HC transmission line corridor when siting subsequent new underground oil and gas pipelines. Letter 288, Comment 46 recommended that the DEIS consider the Badger-Coulee transmission line, the planned conversion of 28 miles of U.S. Highway (US) 18/151 to a freeway, and the new Vortex Optics industrial park in Barneveld as part of the DEIS cumulative impacts analysis.

1.7.3.12 CULTURAL RESOURCES

Thirty-nine comments were received regarding cultural resources. General comments discussed potential impacts from the C-HC Project on culturally important areas such as the Frank Lloyd Wright residence and Taliesin, local cemeteries, and churches. Commenters expressed concerns about potential adverse impacts from the C-HC Project on Native American effigy mounds, burial mounds, and Native rock art sites located near or within the transmission line corridor. Other commenters were concerned with adverse impacts on historic buildings, monuments, landmarks, and century farms.

1.7.3.13 AIR QUALITY

Thirty comments were received regarding air quality. Comments in this category expressed both support and opposition for the C-HC Project due to the amount of renewable electricity that might be supported by the proposed project. A few commenters also expressed concerns for impacts to local air quality as a result of construction of the proposed transmission line.

1.7.3.14 PUBLIC INVOLVEMENT

Twenty-nine comments were received regarding the public involvement process. Many commenters were concerned that the C-HC Project scoping effort was inadequate, lacked direct outreach to stakeholders including landowners and municipal governments, was at times conducted without enough advance notice to the public, and was at times scheduled in conflict with other important public meetings (i.e., Letter 115, Comment 1 noted that the November 2, 2016, meeting in Dodgeville conflicted with a related meeting held by ATC in Pewaukee). Commenters also suggested that the C-HC Project public scoping effort be expanded going forward to give the public ample opportunity to participate and comment on important topics before they are finalized.

1.7.3.15 GEOLOGY

Twenty-eight comments were received regarding geology. No subcategories were used to code comments for this resource topic. The comments in this category cited the unique geologic features associated with the Driftless Area. Many commenters expressed concerns about potential adverse impacts to the unique geologic features from the proposed C-HC transmission line.

1.7.3.16 SOILS

Nineteen comments were received regarding soils. Most commenters expressed concern about soil erosion, including the resulting degraded aquatic habitat, soil compaction and damage to field tiles, and introduction of invasive species as a result of soil alteration. In addition, commenters expressed concerns regarding a loss in agricultural productivity as a result of altering currently rich soils in the Driftless Area.

1.7.3.17 TRANSPORTATION

Sixteen comments were received regarding transportation. Most commenters were concerned with the potential adverse impacts the proposed C-HC Project would have on aviation, including municipal and private landing strips. Two commenters provided specific information regarding the locations of a helipad and a private airport that are used for agricultural businesses. These would potentially be impacted by the transmission line. Commenters also expressed concerns about how construction of the proposed transmission line would increase wear and tear on local roads.

1.7.3.18 NOISE

Fourteen comments were received regarding noise. Commenters were concerned about the potentially adverse impacts of noise from the transmission line on residents, livestock, wildlife, and visitors to the area.

1.7.3.19 COMMUNICATIONS

Five comments were received regarding the communications infrastructure. Commenters expressed concerns about the transmission line causing interference with the functioning of cellular phones, televisions, and radios.

1.7.3.20 PALEONTOLOGY

One comment was received regarding paleontology. The commenter was concerned about the effects on Paleozoic fossils in Platteville Township and indicated that geology maps show that Platteville Township is in a prime location to find fossil-bearing sedimentary rock.

CHAPTER 2. PROPOSED PROJECT AND ALTERNATIVES

Under NEPA regulations established by the Council on Environmental Quality (CEQ), this DEIS identifies and evaluates reasonable alternatives to the proposed project, as well as the No Action Alternative. Reasonable alternatives are those that are "practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant" (CEQ 1981: Question 1) (40 CFR 1502.14). In determining reasonable alternatives, RUS considered a number of factors such as the Proposed Action's purpose and need (described in Chapter 1), state of the art technology, economic considerations, legal considerations, comments received during the scoping period, availability of resources, and the time frame in which the identified need must be fulfilled.

This chapter describes the C-HC Project and includes information about how alternatives were developed. It also describes alternatives evaluated in this DEIS, including the proposed project and action alternatives, the No Action Alternative, and those alternatives that were considered but not included for detailed analysis.

2.1 Development of Alternatives

RUS regulations (7 CFR 1970.5 (b)(3)(iii)) require the Utilities to "develop and document reasonable alternatives that meet their purpose and need while improving environmental outcomes." As part of the initial investigation of the proposed C-HC Project, the Utilities prepared three corridor-siting documents: the Alternatives Evaluation Study (AES) (Dairyland et al. 2016a), the Alternative Crossings Analysis (ACA) (Burns and McDonnell Engineering Company [Burns and McDonnell] 2016), and the Macro-Corridor Study (MCS) (Dairyland et al. 2016b). The Utilities' reports can be found on the RUS project website:

USDA website link for Cardinal – Hickory Creek Transmission Line Project Publications

The reports are also available on the Utilities' project website:

Cardinal Hickory-Creek Utilities project website.

The AES describes the Utilities' rationale for the proposed C-HC Project, the Utilities' purpose of and need for the action, and the technological means to meet the Utilities' purpose and need. The AES describes the transmission planning process and modeling scenarios used by MISO to evaluate electrical alternatives and to identify the project endpoints: the Hickory Creek Substation in Iowa, and the Cardinal Substation in Wisconsin. The Utilities then developed the C-HC Study Area to develop a range of reasonable route alternatives connecting the two endpoints. As stated in the AES (Dairyland et al. 2016a:41–42):

> *MISO approved a line connecting the Hickory Creek 345-kV substation on the Salem-Hazelton 345-kV transmission line in Iowa to the Cardinal Substation in Wisconsin because of the dominant west-to-east flows of renewable energy across the footprint. This multi-value project (MVP) is a wind outlet to load centers like Madison and Milwaukee. In combination with other MVPs, it enables additional transfer capacity while offloading heavily congested paths near the Quad Cities on the Iowa-Illinois border. In order to route power around the Quad Cities, a connection between northeast Iowa and southcentral Wisconsin was utilized. There are limited connection points to the regional grid in northeast Iowa and southwestern and southcentral Wisconsin. Because the proposed Project takes a route that is relatively direct between the available connection points, any other high-voltage alternative connecting northeast Iowa to southcentral Wisconsin would necessarily be longer and would still have to traverse the Mississippi River.*

The AES explains the MISO process used to define the east and west termini for the C-HC Project. Furthermore, the northern boundary of the Utilities' C-HC Study Area was established in part due to the location of the Wisconsin River. The Utilities determined that including areas north of the Wisconsin River would add a second and third major river crossing to the proposed project and would encounter additional civic and environmental sensitivities, like the community of Spring Green and the Lower Wisconsin Riverway. For these reasons, the C-HC Study Area boundary does not include the Wisconsin River or lands north of it (Dairyland et al. 2016a).

The MISO-approved design for the proposed C-HC Project includes an intermediate substation in the vicinity of Montfort, Wisconsin, which is referred to as the Hill Valley Substation in this document. The potential siting area for this intermediate substation was developed by the Utilities and based on a number of siting criteria, including suitable topography, the locations of existing transmission lines that provide routing opportunities for the new transmission line, the locations of the existing lower-voltage lines that would need to interconnect with this substation, and the avoidance of siting constraints that occur in the area (Dairyland et al. 2016a).

In addition to the AES, the ACA documents the Utilities' investigation and assessment of potential Mississippi River crossing locations for the proposed C-HC Project and identifies the Utilities' preferred crossing alternative (Burns and McDonnell 2016). As discussed in Chapter 1 and in more detail below, the majority of the Mississippi River within the project vicinity is contained within the Upper Mississippi River National Wildlife and Fish Refuge. The ACA identifies seven alternatives for crossing the Mississippi River: three within the Refuge, and four on non-Refuge lands within the city of Dubuque, Iowa. Section 2.2.1.2 provides more information about the city of Dubuque alternatives.

Once the boundaries of the C-HC Study Area were defined, the Utilities identified potential macro-corridors within the C-HC Study Area by completing an opportunities-and-constraints analysis using the results from field reconnaissance and geographic information system (GIS) databases. This analysis is fully explained in the Utilities' MCS, which is the preliminary routing study for the proposed project (Dairyland et al. 2016b). The MCS identifies routing options and potential regulatory, environmental, engineering, and economic constraints considered for 187 preliminary corridors. Initial screening criteria were used to reduce the number of potential corridors. Specifically, the Utilities looked for routing opportunities that minimized impacts to the human and natural environment and had the fewest routing constraints. In Wisconsin, all corridors were initially analyzed using a 3,000-foot-wide to 1-mile-wide corridor centered on existing linear features in the priority specified under Wisconsin law, Wisconsin Statutes 1.12(6). Each potential macro-corridor was then divided into segments for analysis. In Iowa, the Utilities initially identified a broad potential macro-corridor, measuring approximately 12 miles long and approximately 5 miles wide and encompassing portions of Clayton and Dubuque Counties. The following natural and human routing constraints were considered as the Utilities narrowed down the number of the macro-corridors for further analysis:

- Agricultural lands of statewide importance
- Airport obstruction-free zones/airport approach flight paths
- Airports (public and private)
- Archaeological sites
- Center-pivot irrigation systems (where structures would interfere with irrigation)
- Confined animal feeding operations
- Conservation easements
- County forests and forest management areas
- County parks and recreation areas
- Designated or registered national historic districts
- Existing residential areas

- Federal, state, and county land (not otherwise protected)
- Floodways/floodplains
- Geologically unstable or highly erosive areas
- Hospitals/nursing homes
- Landfills/dumps
- Licensed daycare facilities
- Memorial parks/cemeteries
- Military reservations/installations
- Mines, quarries, and gravel pits
- Municipal parks and parks owned or administered by other governmental subdivisions
- National and state wilderness areas
- National forests
- National landmarks
- National monuments
- National recreation areas
- National Register of Historic Places (NRHP) historic sites
- National wild and scenic rivers
- National wildlife refuges
- Native American tribal land
- Nature Conservancy preserves
- Occupied buildings/dwellings
- Open-water expanses greater than 1,000 feet
- Places of worship
- Planned residential areas (reference: Smart Growth legislation definition) or other planned development
- Playgrounds
- Population centers (incorporated and unincorporated municipalities)
- Prime farmlands (reference A-1 zoning)
- Reserve program lands (conservation, wetland)
- Scenic areas/hill crossings at crests
- Scenic travel routes (e.g., designated rustic roads)
- Schools
- State and national recreation trails
- State forests and forest management areas
- State natural areas
- State parks and recreation areas
- State scientific areas
- State wildlife refuges, wildlife areas, game management areas
- State-designated wild and scenic rivers
- Threatened and endangered species critical habitat areas (Federal and state)
- Unique habitats (oak savanna, fen, prairie remnants, etc.)
- VORTAC (aeronautical navigation) tower sites
- Waterfowl nesting or rearing areas
- Wellhead protection areas
- Wetlands considered areas of special natural resource interest, as well as other wetlands

2.2 Alternatives Considered but Not Evaluated in Detail

2.2.1 *Alternative Transmission Line Corridors*

This section describes the alternative transmission line corridors that were identified and investigated by the Utilities during the initial routing studies described above in Section 2.1. This section also describes the Mississippi River crossing alternatives that were investigated and determined to be not feasible. The alternative corridors discussed in this section were not carried forward for detailed analysis in this DEIS for a variety of reasons, as indicated below.

2.2.1.1 WISCONSIN TRANSMISSION LINE CORRIDORS

Table 2.2-1 lists the potential transmission line corridors in Wisconsin that were considered and thoroughly evaluated during their initial siting process but that were removed from further evaluation for the reasons indicated in the table and in the sections below (Dairyland et al. 2016b).

Table 2.2-1. Alternative Transmission Line Corridors Not Carried Forward for Detailed Analysis—Wisconsin

Routing Opportunities	Corridor Description	Reasons Removed from Detailed Analysis	Location
Cardinal Substation-to-Hill Valley Substation Study Area			
1. Existing 69-kV transmission line, USH 14, SH 78, CTH H, CTH K, a railroad corridor, multiple local roads, and new cross-country corridors	Follows a north and westerly direction along an existing 69-kV transmission line, USH 14, and a railroad corridor. Connectors to corridors in the south follow CTH H, CTH K, local roads, and new cross-country routes.	The corridors that go through the communities of Cross Plains, Black Earth, Mazomanie, and Arena were removed because of residential development and civic sensitivities associated with those communities, as well as environmental constraints like the Lower Wisconsin Riverway and associated wetlands. Connector corridors were also removed because they no longer served a purpose.	See Figure 2.2-1
2. Existing 138-kV transmission line, SH 23, CTH T, local roads, and new cross-country corridors	Connectors to an existing 138-kV transmission line.	These corridors were removed because of potential cultural resource impacts, residential development, and environmental impacts to Governor Dodge State Park and conservation lands. Segments that follow the existing transmission line became nonfunctional without their connector segments.	See Figure 2.2-2
3. Existing 69-kV transmission line, USH 18, SH 78, SH 92, CTH J, CTH P, CTH PD, CTH S, local roads, and new cross-country corridors	Follow a southerly direction from just west of the Cardinal Substation to the community of Mount Horeb.	These corridors were removed because potential impacts to residential development in the community of Mount Horeb, and/or added additional mileage because they do not follow a path consistent with the southwesterly direction of the C-HC Project.	See Figure 2.2-3
4. Existing 69-kV transmission lines, USH 23, USH 191, a natural gas pipeline, CTH H, CTH ID, CTH K, CTH YZ, Military Ridge State Trail, and new cross-country corridors	Follow a westerly direction from Mount Horeb to the Hill Valley Substation siting area.	These corridors were removed because of potential impacts to areas such as the Military Ridge State Trail, Cave of the Mounds National Natural Landmark, multiple State Natural Areas, and Blue Mound State Park, and residential areas in the communities of Dodgeville, Blue Mounds, Barneveld, and Ridgeway.	See Figure 2.2-4
5. A natural gas pipeline, SH 23, CTH H, CTH Y, CTH Z, and new cross-country corridors	Segments that connect the northern corridors to the southern to provide geographical diversity.	These corridors were removed due to potential impacts to residential, aviation, cultural resources, and areas such as the Dodgeville Municipal Airport, and Governor Dodge State Park.	See Figure 2.2-5

Routing Opportunities	Corridor Description	Reasons Removed from Detailed Analysis	Location
Hill Valley Substation-to-Mississippi River Study Area			
6. Existing 69-kV transmission line, a natural gas pipeline, USH 18, USH 61, and SH 129	Follows a westerly and then southerly direction from the Hill Valley Substation siting area to the community of Lancaster.	These corridors were removed due to potential impacts to the residential areas in the communities of Montfort and Lancaster, and because an existing 138-kV transmission line provided a straighter, shorter, more direct opportunity that impacted fewer constraints.	See Figure 2.2-6
7. Existing 161- and 69-kV transmission lines, USH 61, SH 35, SH 81, SH 133, and new cross-country corridor	Segments follow a southerly and westerly direction from the community of Lancaster.	These corridors were removed due to potential impacts to the community of Lancaster and because an existing 138-kV transmission line provided a straighter, shorter, more direct opportunity that impacted fewer constraints.	See Figure 2.2-7
8. Existing 69-kV transmission line, and SH 80	Segments exit the Hill Valley Substation siting area to the south toward the community of Livingston.	Portions of the utility and transportation corridors were removed because they travelled directly through a residential area in the community of Livingston.	See Figure 2.2-8
9. SH 80 and new cross-country corridor	Follow a southerly direction from Livingston to the community of Platteville.	These corridors were removed because they were greater in length, less straight, and potentially more impactful to residential constraints than other existing transmission line options.	See Figure 2.2-9
10. Existing 69-kV transmission line, a natural gas pipeline, SH 80, SH 81, and new cross-country corridor	Segments are generally located in the vicinity of the community of Platteville.	These corridors were removed because they did not sufficiently avoid the residential development, and civic and environmental constraints associated with Platteville. Connector segments were also removed as they did not follow a path consistent with the southwesterly direction of the C-HC Project.	See Figure 2.2-10
11. Existing 69-kV transmission line and connector segments along new cross-country corridors	Segments follow a westerly path from Platteville to Cassville.	The corridor was removed because it was longer and potentially more impactful to residential development and civic constraints than the 138-kV transmission line to the south.	See Figure 2.2-11
12. SH 133, SH 81, and a railroad corridor	Segments are located in the vicinity of the community of Cassville.	These corridors were removed because they potentially impacted residential development and civic constraints associated with the community of Cassville and would be difficult to construct due to proximity to residences and the existing railroad corridor.	See Figure 2.2-12

Source: Dairyland et al. (2016b)

* CTH = county highway, SH = state highway, USH = U.S. highway

2.2.1.1.1 CARDINAL SUBSTATION-TO-HILL VALLEY SUBSTATION STUDY AREA

Of the 12 alternative corridors, five are within the Cardinal Substation-to-Hill Valley Substation Study Area. The corridors and the reasons for removing them from consideration in the DEIS are described below.

Alternative Corridors 1

As shown in Figure 2.2-1, this set of corridors begins west of the Cardinal Substation, take various westward routes until they end just east of Spring Green, and would be located north of the proposed Northern Alternatives. Alternative Corridors 1 would follow an existing 69-kV transmission line ROW, U.S. Route 14, State Highway 78, County Highways H and K, a railroad corridor, multiple local roads, and new cross-country corridors. Corridors through the communities of Cross Plains, Black Earth, Mazomanie, and Arena were removed from further consideration because of potential impacts on residential development and civic sensitivities, such as towns and public areas. These corridors were also removed from further consideration because of potential impacts to environmentally sensitive areas such as the Lower Wisconsin Riverway and associated wetlands. Related connector corridors were also removed because they no longer served a purpose.

Alternative Corridors 2

As shown in Figure 2.2-2, this set of corridors would begin west of Alternative Corridors 1 and take various routes west until just north of Blackhawk Lake Recreation Area and, except for a portion extending south through Governor Dodge State Park, would also be north of the proposed Northern Alternatives. Alternative Corridors 2 would follow an existing 138-kV transmission line ROW, State Highway 23, County Highway T, local roads, and new cross-country corridors. These corridors were removed from further consideration because of potential cultural resource impacts, residential development, and environmental impacts to Governor Dodge State Park and conservation lands. Segments that follow the existing transmission line ROW became nonfunctional without their connector segments.

Alternative Corridors 3

As shown in Figure 2.2-3, this set of corridors would occur between the proposed Northern and Southern Alternatives and east, north, and west of Mount Horeb. Alternative Corridors 3 would follow an existing 69-kV transmission line ROW, U.S. Route 18; State Highways 78 and 92; County Highways J, P, PD, and S; local roads; and new cross-country corridors. These corridors were removed from further consideration because they would affect the community of Mount Horeb or increase the length of the potential proposed transmission line ROW because they do not follow the southwesterly direction of the C-HC Project.

Alternative Corridors 4

As shown in Figure 2.2-4, this set of corridors would occur along the proposed Southern Alternatives, between Mount Horeb and just northeast of Linden. Alternative Corridors 4 would follow an existing 69-kV transmission line ROW; U.S. Routes 23 and 191; a natural gas pipeline ROW; County Highways H, ID, K, and YZ; Military Ridge State Trail; and new cross-country corridors. These corridors were removed from further consideration because of potential impacts to the Military Ridge State Trail, Cave of the Mounds National Natural Landmark, multiple state natural areas, and Blue Mound State Park, as well as to the communities of Dodgeville, Blue Mounds, Barneveld, and Ridgeway.

Alternative Corridors 5

As shown in Figure 2.2-5, this set of corridors would occur around Governor Dodge State Park. Alternative Corridors 5 would follow a natural gas pipeline ROW; State Highway 23; County Highways H, Y, and Z; and new cross-country corridors. These corridors were removed from further consideration because of potential impacts to the city of Dodgeville, Dodgeville Municipal Airport, and Governor Dodge State Park.

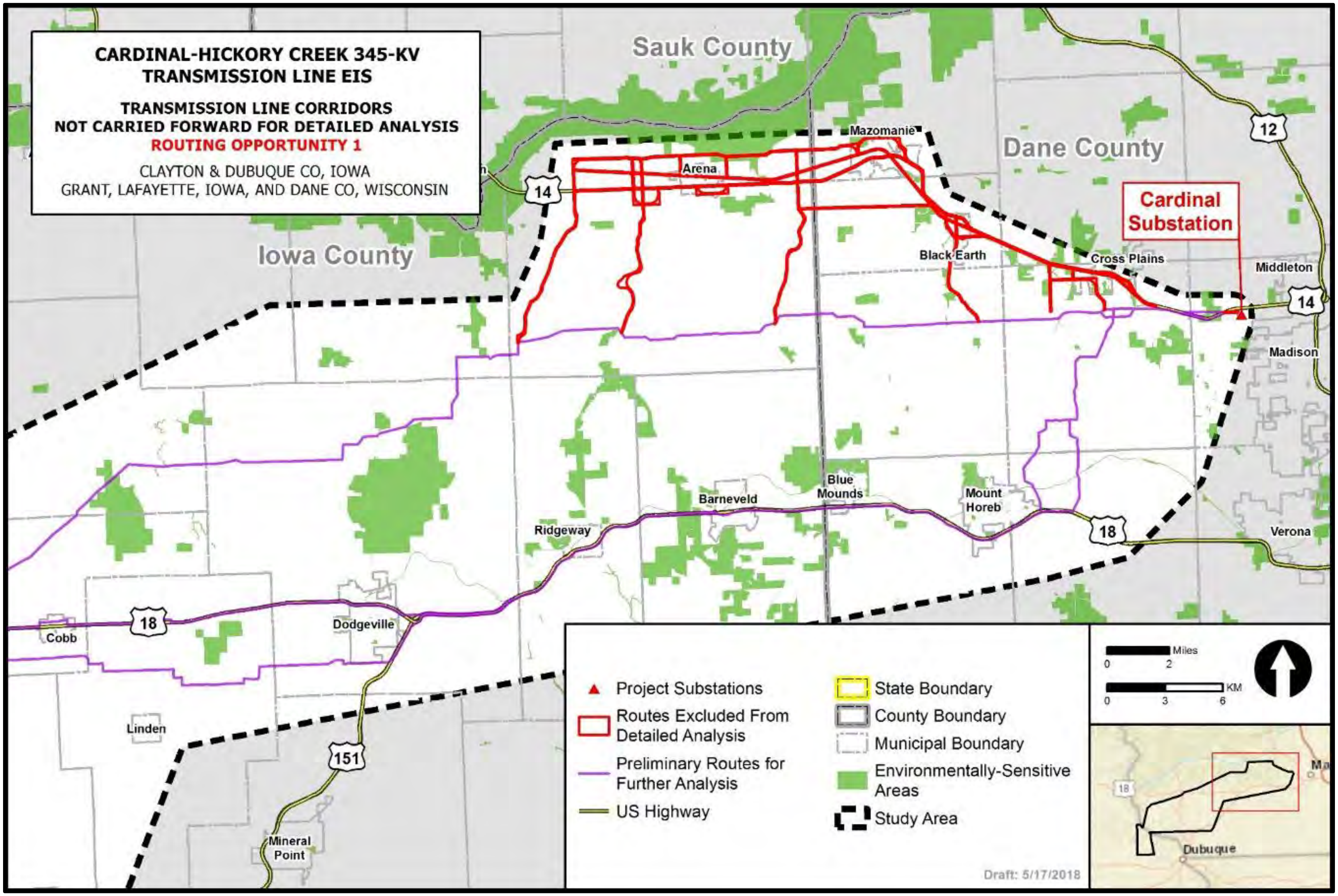

Figure 2.2-1. Alternative Corridors 1 transmission line corridor not considered in detail.

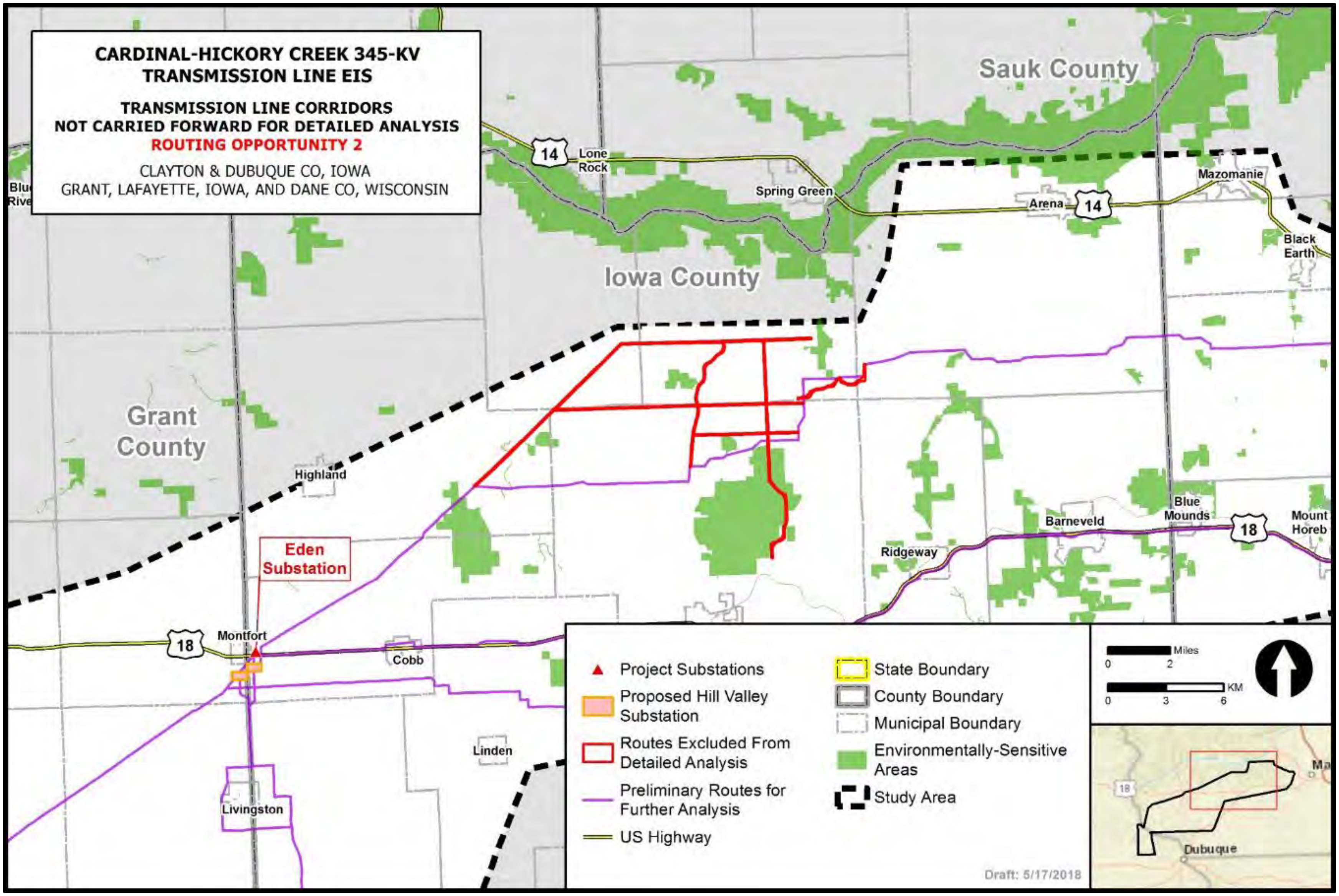

Figure 2.2-2. Alternative Corridors 2 transmission line corridor not considered in detail.

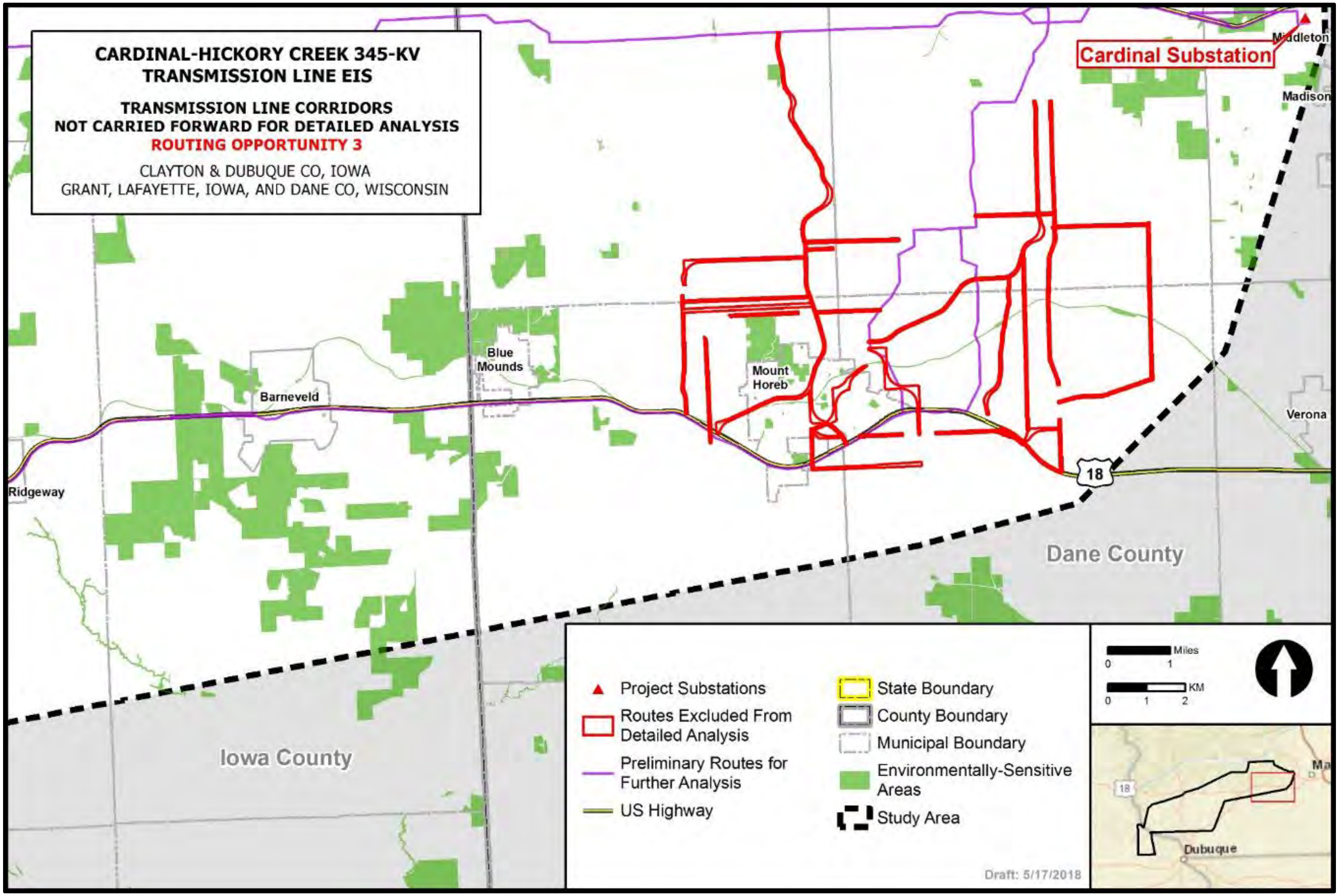

Figure 2.2-3. Alternative Corridors 3 transmission line corridor not considered in detail.

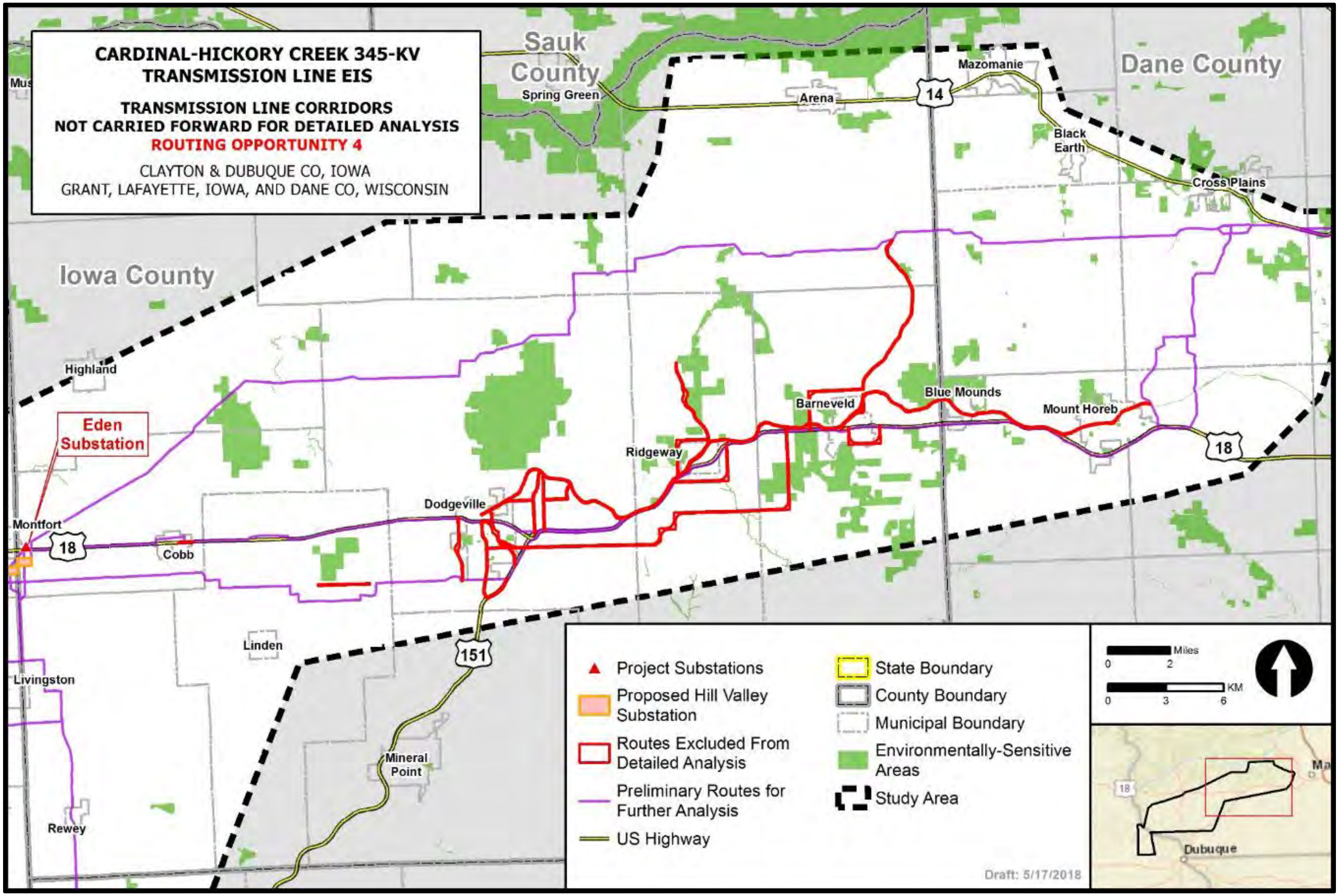

Figure 2.2-4. Alternative Corridors 4 transmission line corridor not considered in detail.

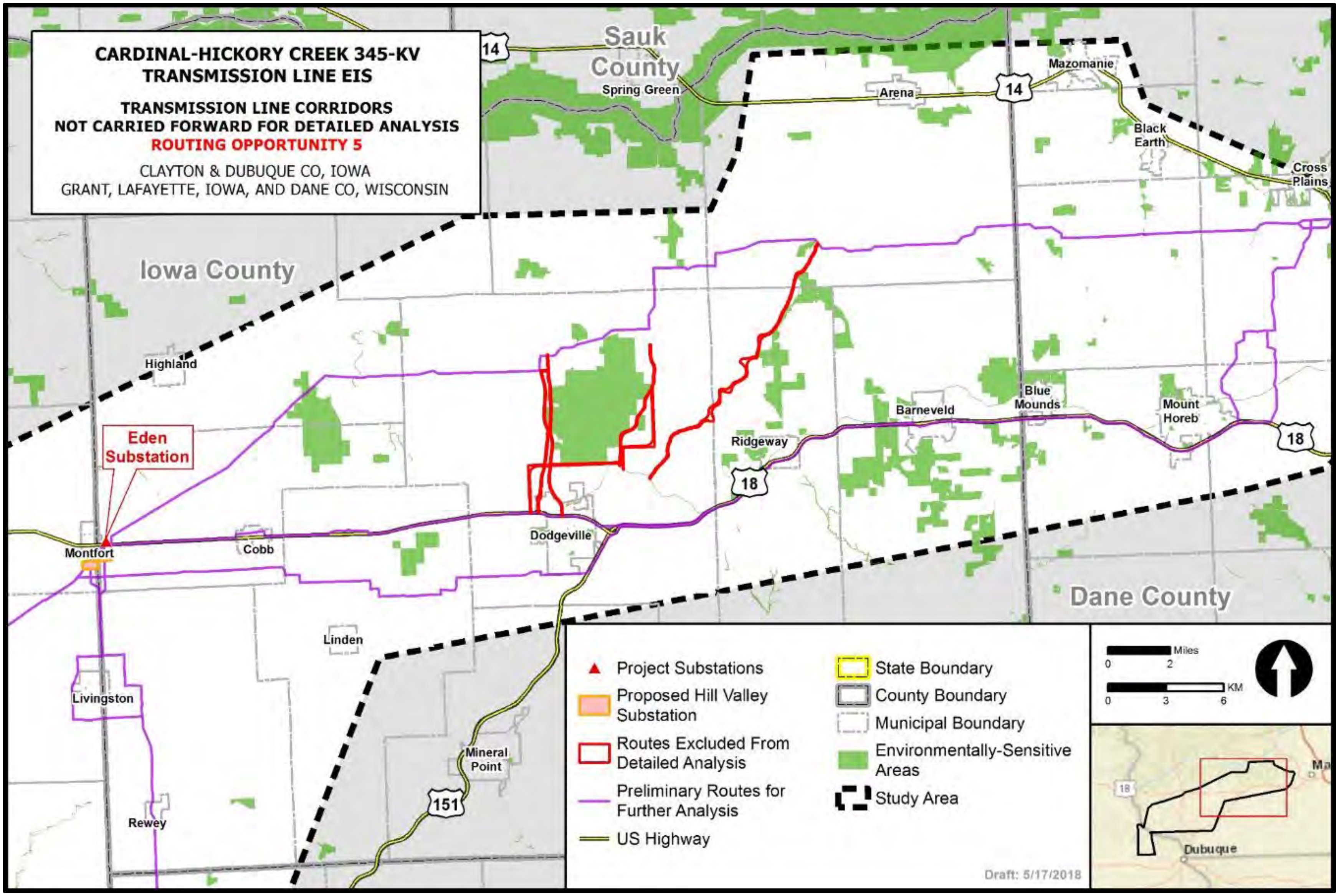

Figure 2.2-5. Alternative Corridors 5 transmission line corridor not considered in detail.

2.2.1.1.2 HILL VALLEY SUBSTATION-TO-MISSISSIPPI RIVER STUDY AREA

Of the 12 alternative corridors, seven are within the Hill Valley Substation-to-Mississippi River Study Area. The corridors and the reasons for removing them from further detailed consideration are described below.

Alternative Corridors 6

As shown in Figure 2.2-6, this set of alternative corridors would occur west of Montfort, westward and southwest to Lancaster, and north of the proposed Northern Alternatives. Alternative Corridors 6 would follow an existing 69-kV transmission line ROW, a natural gas pipeline ROW, U.S. Routes 18 and 61, and State Highway 129. These corridors were removed from further consideration because of potential impacts to the community of Montfort and because an existing 138-kV transmission line ROW provides a straighter, shorter, and more direct route with fewer potential constraints.

Alternative Corridors 7

As shown in Figure 2.2-7, this set of alternative corridors would occur west of Alternative Corridors 6, around Lancaster, then west and southwest to Cassville, on the north side of the proposed Northern Alternatives. Alternative Corridors 7 would follow existing 161- and 69-kV transmission line ROWs; U.S. Route 61; State Highways 35, 81, and 133; and a new cross-country corridor. These corridors were removed from further consideration because of potential impacts to the community of Lancaster and because an existing 138-kV transmission line ROW provides a straighter, shorter, and more direct route with fewer potential constraints.

Alternative Corridors 8

As shown in Figure 2.2-8, these two alternative corridors would go through the eastern part of Livingston. Alternative Corridors 8 would follow an existing 69-kV transmission line ROW and State Highway 80. Portions of the utility and transportation ROWs were removed from further consideration because they went directly through the community of Livingston.

Alternative Corridors 9

As shown in Figure 2.2-9, these two alternative corridors would occur between Livingston and Platteville. One corridor would skirt around east of the Village of Rewey, and the second would be located west of the proposed Southern Alternatives from the western border of Livingston to northeast Platteville. Alternative Corridors 9 would follow State Highway 80 and a new cross-country corridor. These corridors were removed from further consideration because they were longer and less direct, and could have a greater impact on residential areas than other options evaluated.

Alternative Corridors 10

As shown in Figure 2.2-10, this set of alternative corridors would occur between the proposed C-HC Project action alternatives, from east and southeast of Lancaster on the proposed Northern Alternatives, then east and southeast to connect with the proposed Southern Alternatives in the Platteville area. Alternative Corridors 10 would follow an existing 69-kV transmission line ROW, a natural gas pipeline ROW, State Highways 80 and 81, and a new cross-country corridor. These corridors were removed from further consideration because they did not sufficiently avoid residential developments, civic facilities, and environmental constraints associated with Platteville. Connector segments were also removed because they did not follow a path consistent with the southwesterly direction of the proposed C-HC Project.

Alternative Corridors 11

As shown in Figure 2.2-11, this set of alternative corridors would occur west of Alternative Corridors 10, between the active Segments D and E, from west of Platteville and south of Lancaster, westward to just north of Cassville. Alternative Corridors 11 would follow an existing 69-kV transmission line ROW and connector segments along new cross-country corridors. These corridors were removed from further consideration because they were longer and could have greater potential impacts on residential developments and civic constraints, when compared with the 138-kV transmission line ROW to the south.

Alternative Corridors 12

As shown in Figure 2.2-12, this set of alternative corridors would occur north and northwest of Cassville and would provide various options for connecting to active Segments D and E. Alternative Corridors 12 would follow State Highways 133 and 81 and a railroad corridor. These corridors were removed from further consideration because of potential impacts to residential developments and civic constraints associated with the community of Cassville. In addition, geographic constraints, such as the existing railroad corridor and topography, would make them difficult to construct.

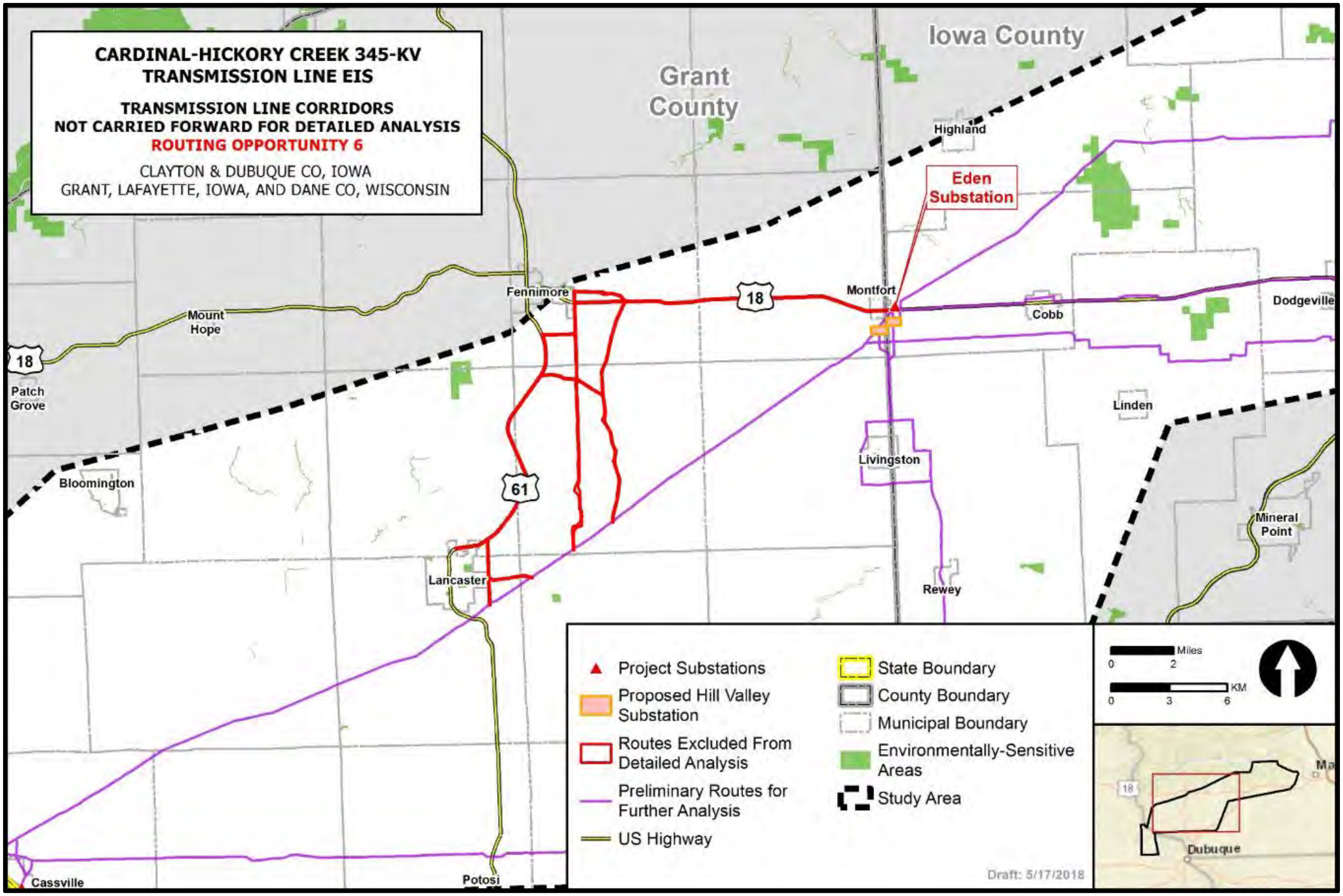

Figure 2.2-6. Alternative Corridors 6 transmission line corridor not considered in detail.

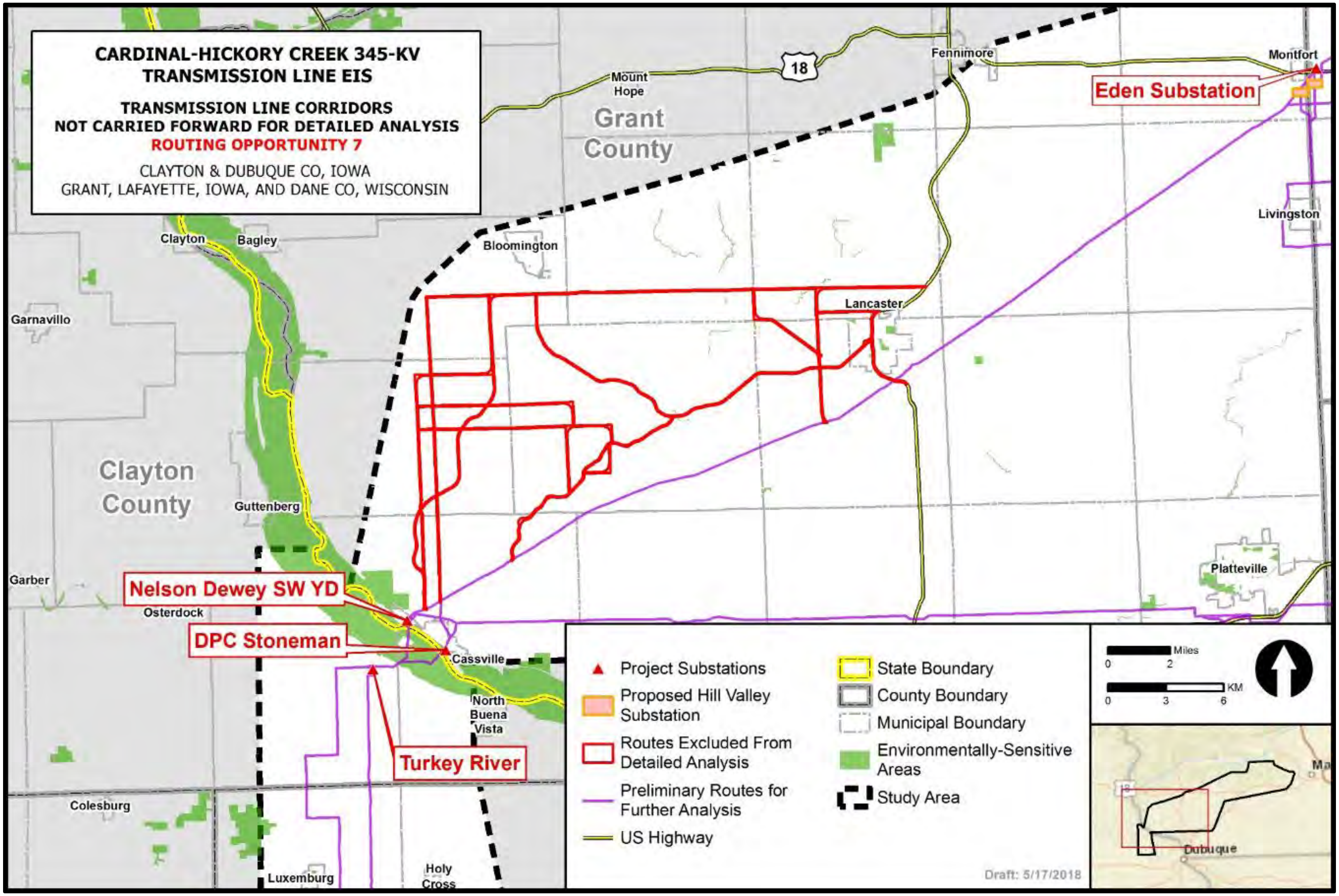

Figure 2.2-7. Alternative Corridors 7 transmission line corridor not considered in detail.

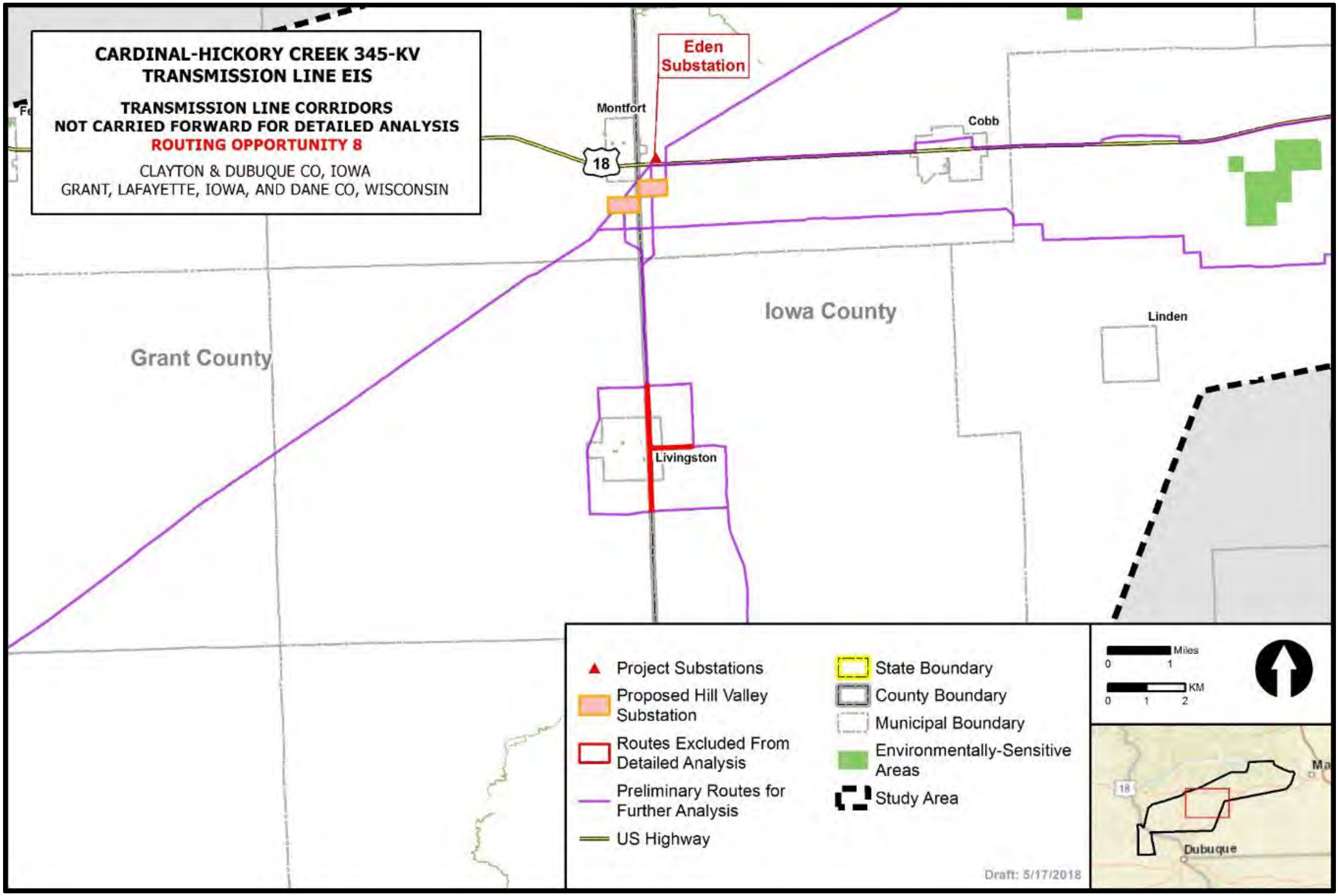

Figure 2.2-8. Alternative Corridors 8 transmission line corridor not considered in detail.

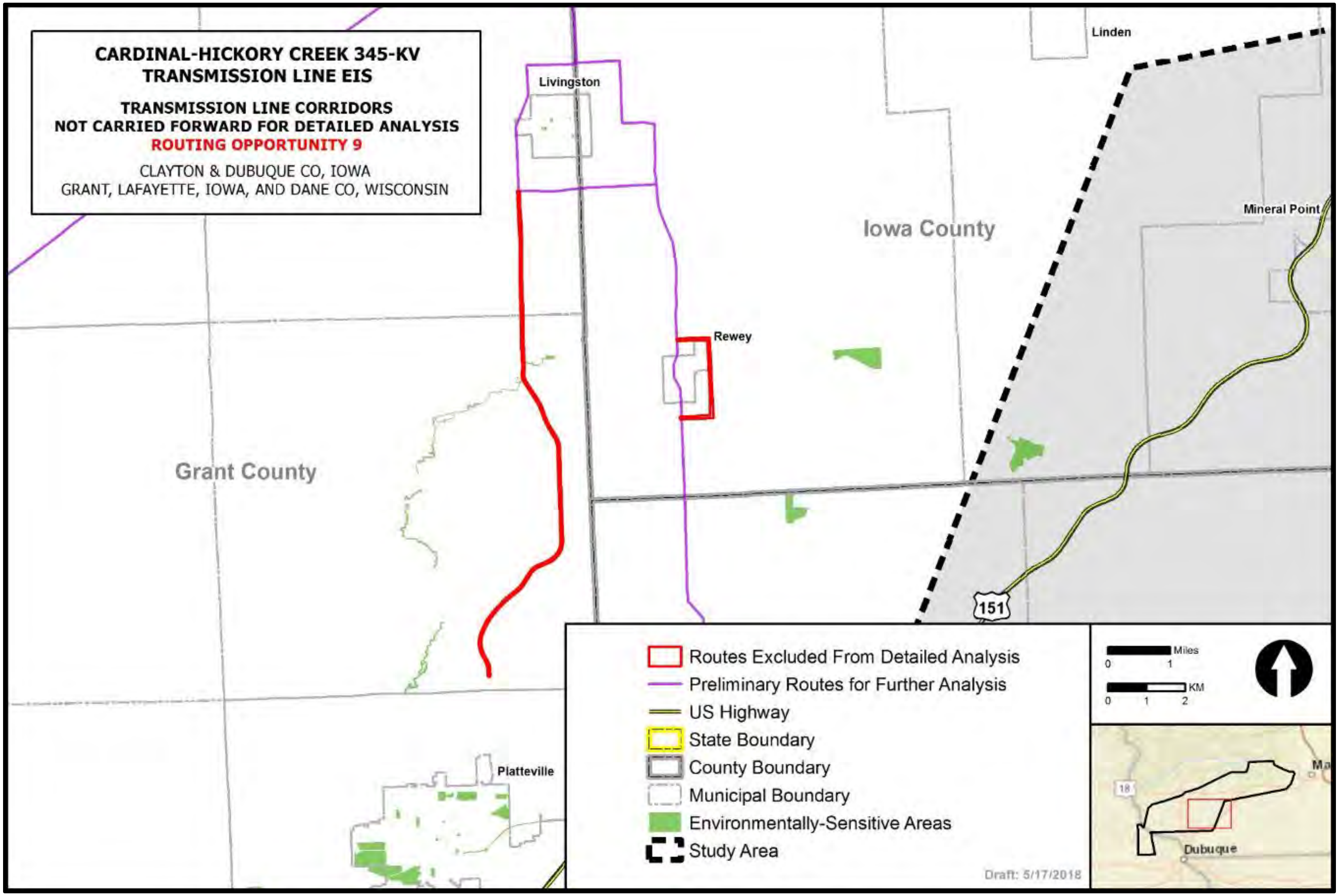

Figure 2.2-9. Alternative Corridors 9 transmission line corridor not considered in detail.

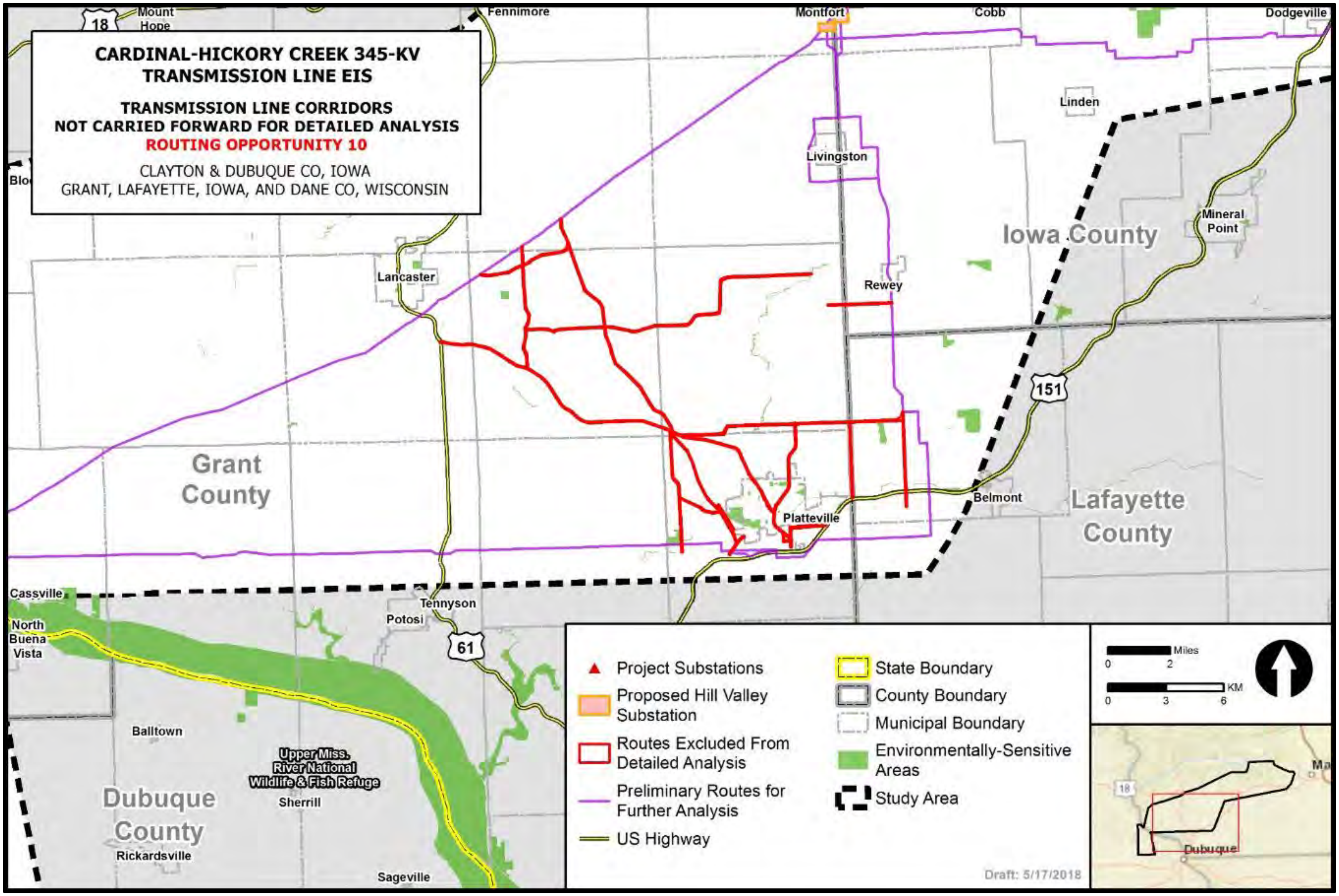

Figure 2.2-10. Alternative Corridors 10 transmission line corridor not considered in detail.

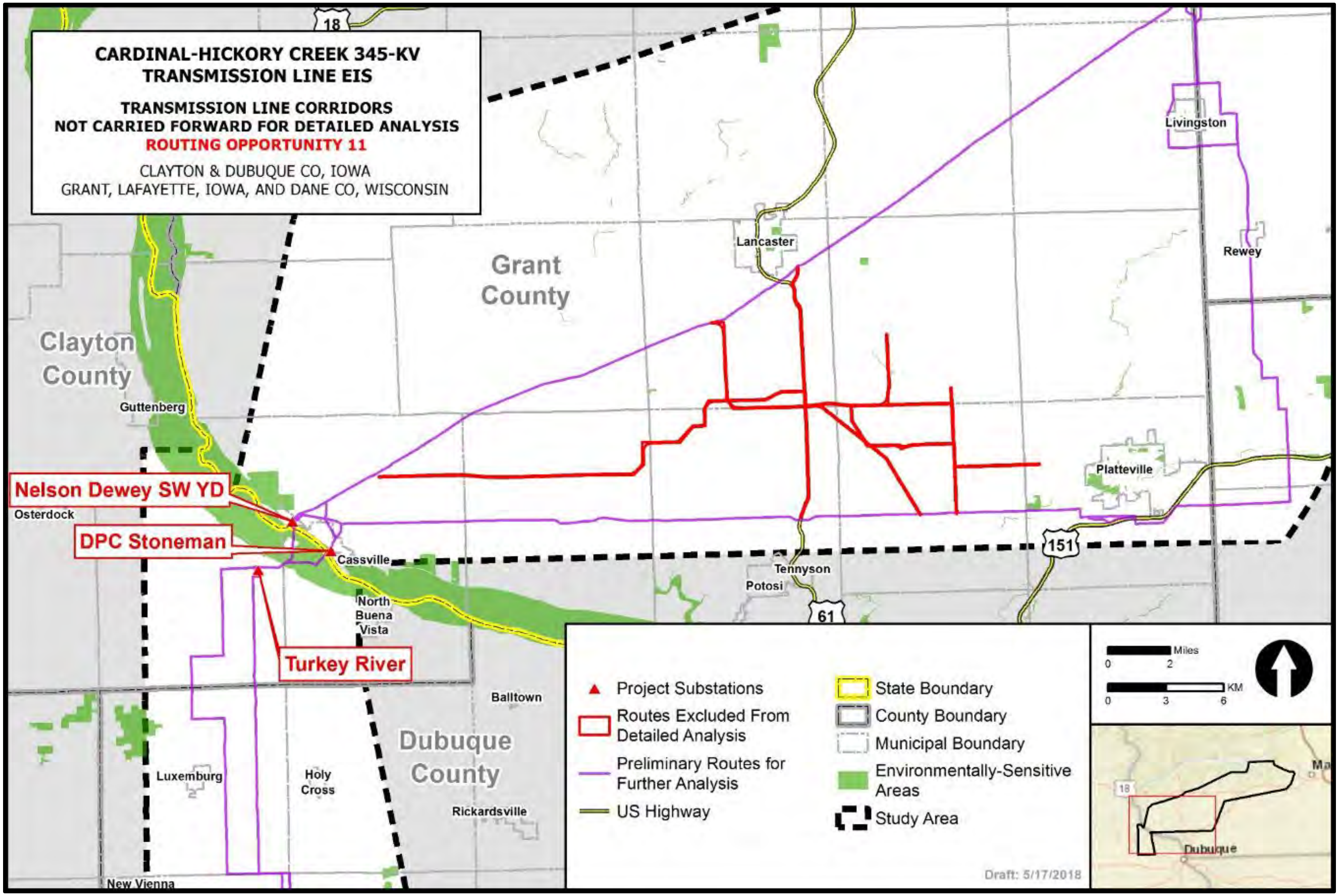

Figure 2.2-11. Alternative Corridors 11 transmission line corridor not considered in detail.

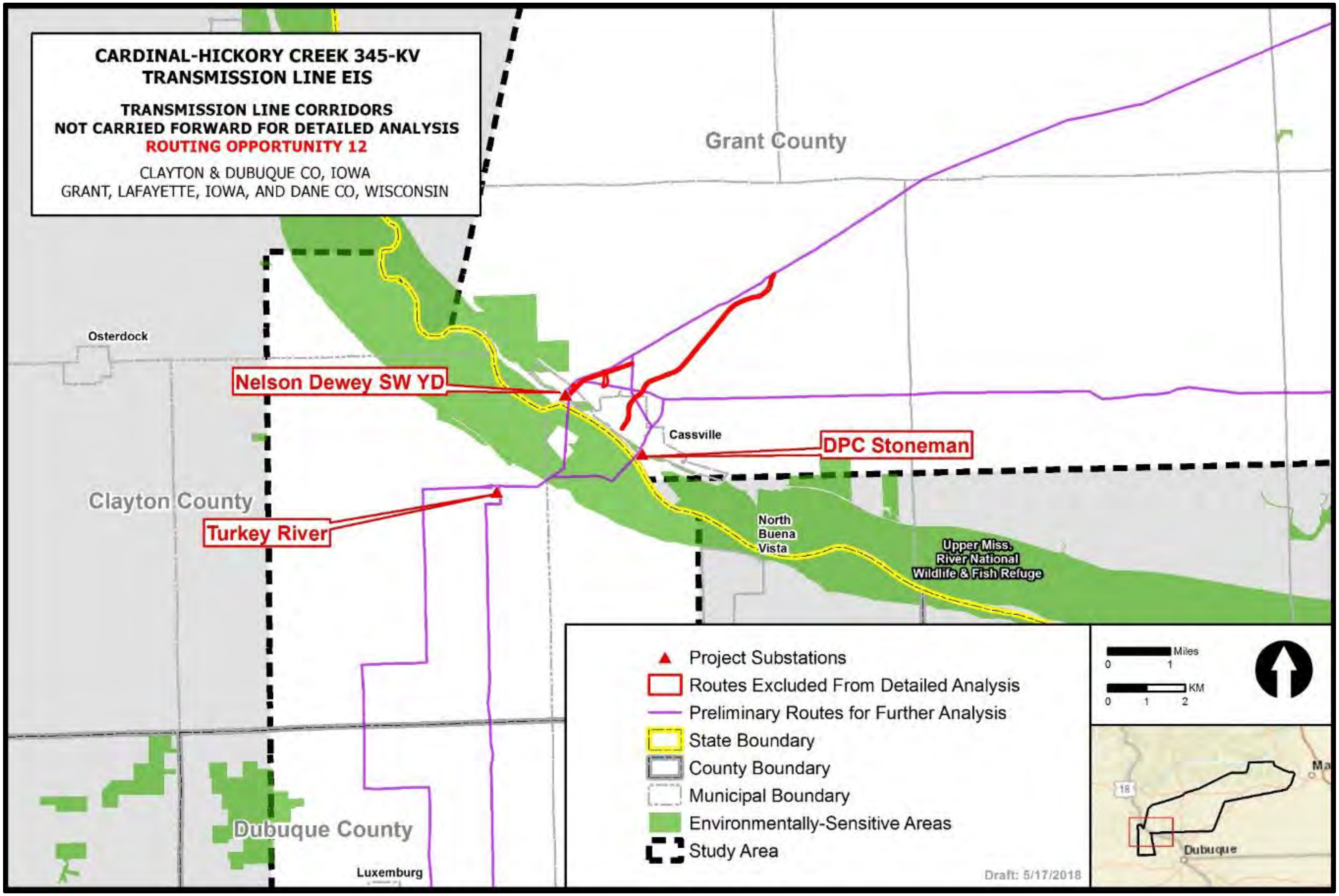

Figure 2.2-12. Alternative Corridors 12 transmission line corridor not considered in detail.

2.2.1.2 ALTERNATIVE MISSISSIPPI RIVER CROSSINGS

During the siting analyses, five alternative corridors were identified and studied for crossing the Mississippi River but were dropped from detailed analyses (Burns and McDonnell 2016). These corridors are shown in Figure 2.2-13 and summarized in Table 2.2-2.

With rationale for dismissal from further consideration in this DEIS. The five alternative corridors for crossing the Mississippi River are:

- Lock and Dam No. 10 in Guttenberg, Iowa (L&D 10)
- Lock and Dam No. 11 in Dubuque, Iowa (L&D 11)
- Highway 61/151 crossing in Dubuque, Iowa (Highway 151 Bridge)
- Julien Dubuque Bridge/Highway 20 crossing in Dubuque, Iowa (Julien Dubuque Bridge)
- Dubuque to Galena 161-kV Transmission Line crossing in Dubuque, Iowa (Galena 161-kV Transmission Line)

The Lock and Dam No. 10 river crossing was removed from further consideration because of potential impacts to archaeological and cultural resources within the city of Guttenberg, Iowa, no existing utility ROWs are located at or near the crossing location, the USACE identified technical/construction and safety issues that prohibited construction, and the alternative potential routes to this river crossing option would be the longest of any river crossing alternative due to its northernmost location.

The Lock and Dam No. 11 river crossing was removed from further consideration because of potential impacts to archaeological and cultural resources, visual resources, and residential development and because it would pass through downtown Dubuque; in addition, there are no existing overhead transmission line ROWs at or near this Mississippi River crossing, and the USACE identified technical and construction issues that prohibit construction.

The Highway 61/151 and Julien Dubuque Bridge/Highway 20 river crossings were removed from further consideration because of potential impacts to residential developments, technical issues during construction, and safety issues during operation and maintenance with highway traffic and infrastructure; in addition, there were no existing overhead transmission line ROWs accessing the crossing.

The Dubuque to Galena 161-kV Transmission Line river crossing was removed from further consideration because of potential impacts to residential developments and downtown Dubuque, as well as to parks and recreation.

In addition to the technical issues listed above, the City of Dubuque also passed a resolution, Resolution No. 215-15, on June 15, 2015, which states that an application for a transmission line license for the C-HC Project would not be permittable under the City’s Code of Ordinances and proceeding with the process required by Chapter 11-6 would not be in the public interest. The City of Dubuque has exclusive permitting authority over whether a transmission line of this voltage can be constructed within its jurisdictional boundary. Due to this resolution, the Utilities determined that routing the C-HC Project through the city of Dubuque was not feasible.

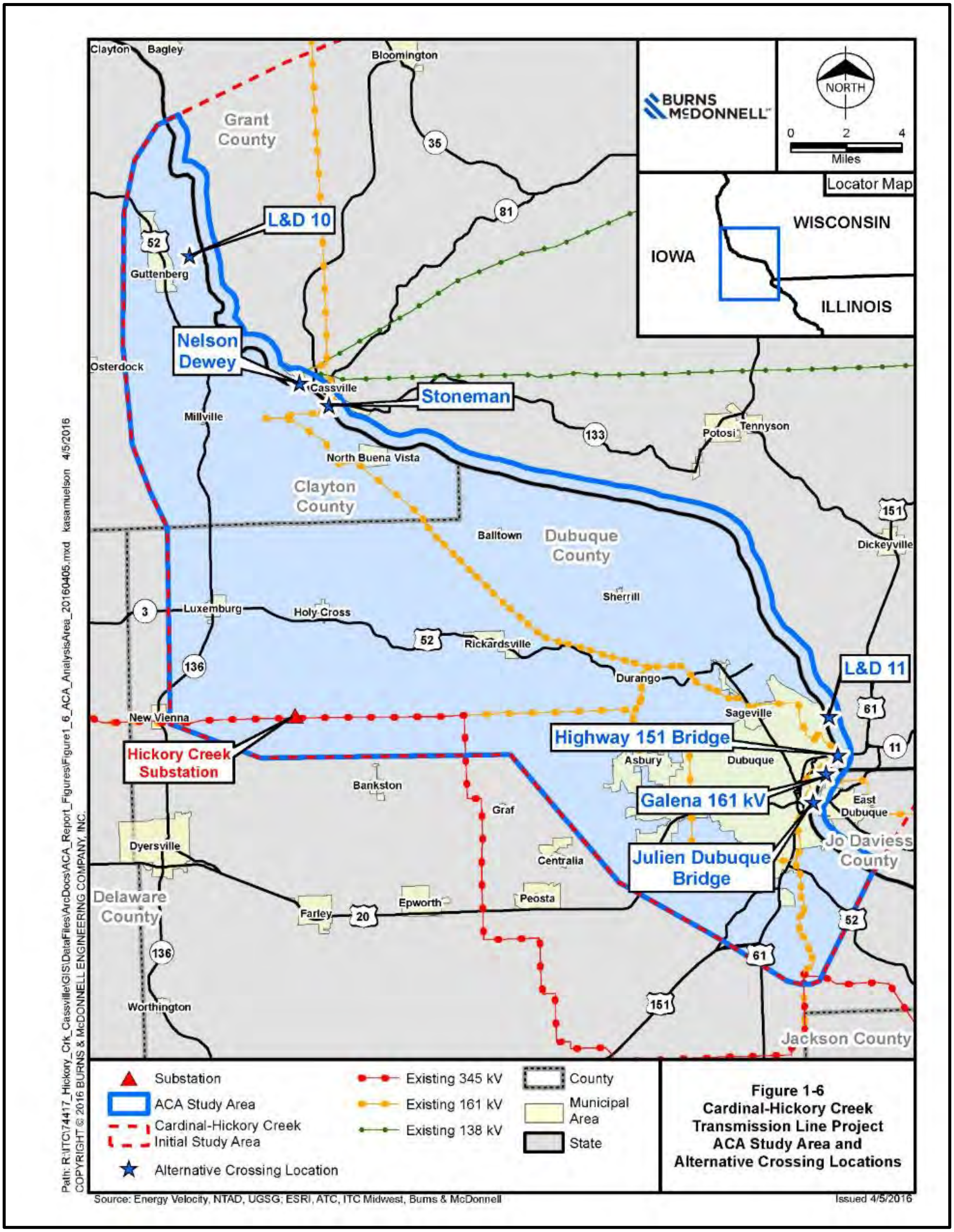

Figure 2.2-13. Alternative Mississippi River crossings not considered in detail. (Source: Burns and McDonnell 2016)

Table 2.2-2. Alternative Transmission Line Corridors Not Carried Forward for Detailed Analysis—Mississippi River Crossing

Corridor Description	Reasons Removed from Detailed Analysis
Lock and Dam No. 10 in Guttenberg, Iowa (L&D 10)	• The City of Guttenberg, Iowa, has more than 350 recorded historic-aged resources including three NRHP districts and several individually listed NRHP properties (including Lock and Dam No. 10 itself). This potential Mississippi River crossing alternative for L&D 10 includes the presence of 196 historic structures within 1,000 feet of the proposed route alignment, the highest among all Mississippi River crossing alternatives. • No existing utility ROWs occur at or near the L&D 10 crossing or on the Wisconsin side of this crossing location; the Wisconsin side is primarily mature woodlands and agricultural fields. • Alternative Mississippi River crossing options immediately upstream and downstream of L&D 10 are limited by proximity to a private airfield to the north of L&D 10 and Goetz Island, Swift Slough, and Guttenberg Ponds Sanctuary within the Refuge to the south. • Safety and technical engineering considerations prohibit construction of transmission facilities on or near Lock and Dam No. 10, per USACE review. • The L&D 10 alternative route is the longest (25.6 miles) compared to all other potential Mississippi River crossing alternatives.
Lock and Dam No. 11 in Dubuque, Iowa (L&D 11)	• The crossing would require routing through urban residential development and downtown Dubuque. • The potential Mississippi River crossing alternative would cross numerous residential properties (58 homes would be within 100 feet of centerline of transmission line corridor, nine of which would be within 25 feet). • There are no existing overhead transmission corridors across the Mississippi River at or near Lock and Dam No. 11. • The crossing presents technical challenges; it would require a 3,200-foot crossing of the Mississippi River with projected structure heights of 250 to 300 feet with permanent lighting. • The C-HC Project would be visible from multiple viewpoint locations at Eagle Point Park. • Lock and Dam No. 11 is a listed site on the NRHP; there are visual/scenic considerations related to the NRHP listing. • Safety and technical engineering considerations prohibit construction of transmission facilities on or near Lock and Dam No. 11, per USACE review.
Highway 61/151 crossing in Dubuque, Iowa (Highway 151 Bridge)	• The City passed a resolution stating that the transmission line route for the C-HC Project would not be permittable. • The potential Mississippi River crossing alternative requires routing through urban residential development and downtown Dubuque. • Corridors to both locations would cross numerous residential properties (58 homes would be within 100 feet of centerline of transmission line corridor, nine of which would be within 25 feet). • Iowa Department of Transportation (Iowa DOT) would not be able to safely perform ongoing routine bridge maintenance while the transmission line is energized. As a result, the line would need to be de-energized during these maintenance activities, which would not allow for the reliable use of a transmission line at these locations and would not meet the purpose of and need for the C-HC Project. • Unresolvable engineering conflicts with bridge safety prohibit construction of transmission facilities on these bridges, per Iowa DOT review of the C-HC Project. • At these locations, the project would result in shutdown or disruption of traffic flow on major bridges between Iowa and Wisconsin/Illinois during construction and maintenance of the transmission line. • Neither bridge location has existing overhead transmission lines.
Julien Dubuque Bridge/Highway 20 crossing in Dubuque, Iowa (Julien Dubuque Bridge)	• The City passed a resolution stating that the transmission line route for the C-HC Project would not be permittable. • The potential Mississippi River crossing alternative requires routing through urban residential development and downtown Dubuque. • Corridors to both locations would cross numerous residential properties (58 homes would be within 100 feet of centerline of transmission line corridor; nine of these would be within 25 feet). • Iowa DOT would not be able to safely perform ongoing routine bridge maintenance while the transmission line is energized. As a result, the line would need to be de-energized during these maintenance activities, which would not allow for the reliable use of a transmission line at these locations and would not meet the purpose of and need for the C-HC Project. • Unresolvable engineering conflicts with bridge safety prohibit construction of transmission facilities on these bridges, per Iowa DOT review of the C-HC Project. • At these locations, the project would result in shutdown or disruption of traffic flow on major bridges between Iowa and Wisconsin/Illinois during construction and maintenance of the transmission line. • Neither bridge location has existing overhead transmission lines.

Corridor Description	Reasons Removed from Detailed Analysis
Dubuque to Galena 161-kV Transmission Line crossing in Dubuque, Iowa (Galena 161-kV Transmission Line)	• The City passed a resolution stating the transmission line route for the C-HC Project through Dubuque would not be permittable. • The potential Mississippi River crossing alternative requires routing through urban residential development and downtown Dubuque. • The corridor would cross numerous residential properties (61 homes would be within 100 feet of centerline of transmission line corridor, nine of which would be within 25 feet). • Requires routing new 345-kV line through Schmitt Island and Riverview Park; the new line would cross recreational fields for which Federal funds were obtained, the use of which may limit or prohibit redevelopment of these areas.

Source: Burns and McDonnell (2016)

2.2.1.3 ALTERNATIVE ROUTES FOR CROSSING THE REFUGE

The Utilities began their route analysis for the C-HC Project by focusing on the crossing of the Mississippi River, as the location of this crossing would determine the potential C-HC Project routes in both Iowa and Wisconsin. The Utilities have been meeting with USFWS since April 2012 to discuss potential crossings, including crossings of the Refuge. At the request of the Refuge manager, the Utilities provided an Alternative Crossings Analysis report to demonstrate that non-Refuge options were infeasible. In the ACA report, the Utilities provided data and analyses supporting that non-Refuge alternatives were not economically or technically feasible and would have greater overall environmental and human impacts, compared with the feasible Refuge crossing locations (Burns and McDonnell 2016). Two alternatives for crossing the Mississippi River and the Refuge were identified as feasible: the Nelson Dewy river crossing and the Stoneman river crossing (Figure 2.2-14). In coordination with the USFWS and other stakeholders four segments were proposed for the alternative crossing the Refuge at the Nelson Dewy river crossing. Two of these segments have been dismissed from further consideration (see Figure 2.2-14). The first segment crossed a private inholding within the Refuge. This segment would minimize impacts to federally managed lands within the Refuge. However, after discussions with the private inholding landowner in 2018, it was determined the landowner would not agree to an easement crossing the landowner’s land, and the Iowa Utilities Board process defers to private landowners’ preferences.

The other segment would avoid the private inholding by paralleling Oak Road to the northwest of the inholding and would continue to follow Oak Road across the Refuge southwest to the railroad corridor along the south boundary of the Refuge. This segment would then parallel the railroad corridor, adjacent to the railroad ROW southeast until it entered the existing 161-kV transmission line ROW to exit the Refuge. This segment was dismissed from further consideration because it is longer than other options considered, and more disturbance within the Refuge would be associated with this segment. Furthermore, the two tight right angles needed for the transmission line to move from along Oak Road to the railroad corridor would require larger structures to ensure the transmission line was structurally engineered. In September 2018, the USFWS agreed to dismiss the option from detailed analysis.

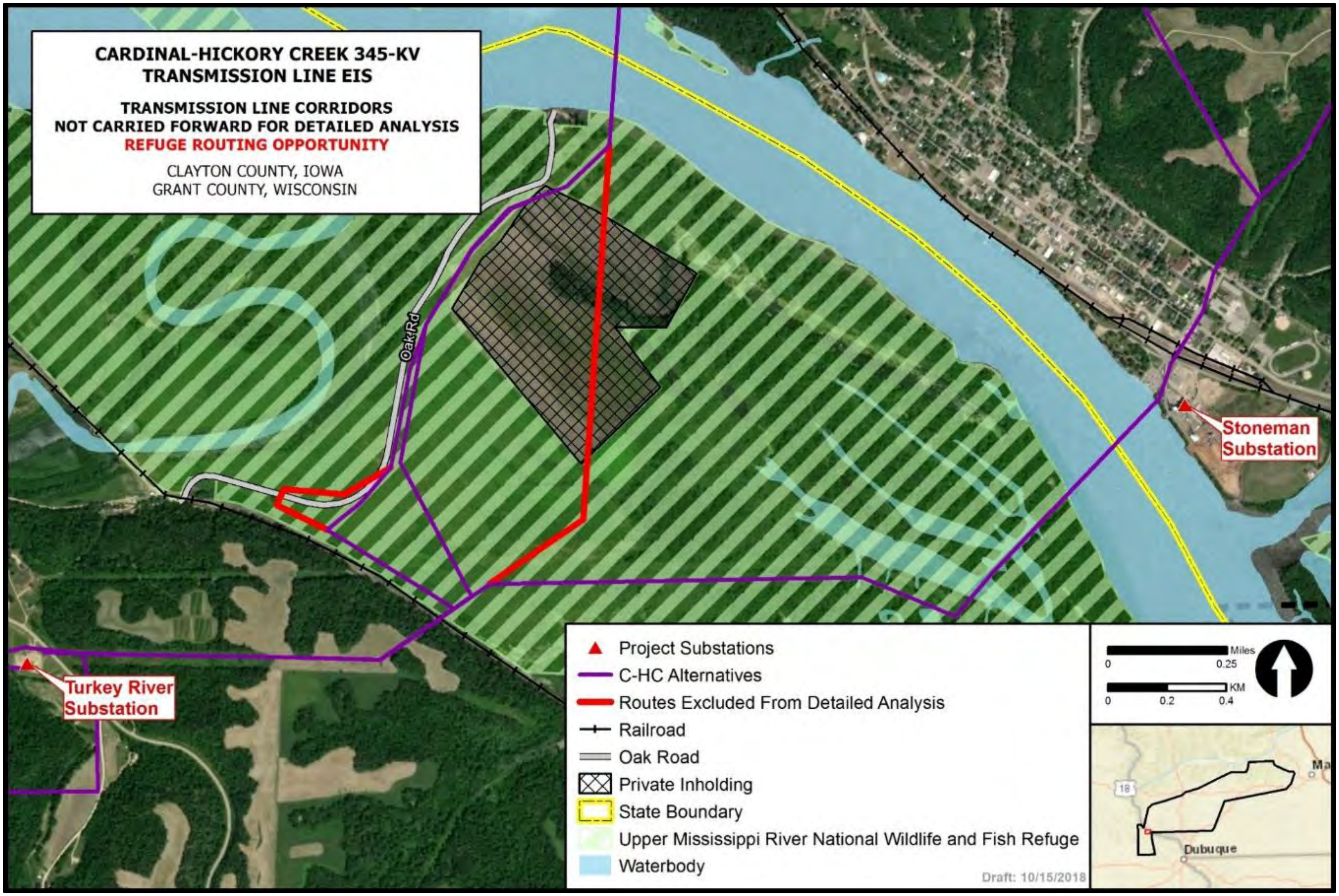

Figure 2.2-14. Refuge segments dismissed from detailed analysis.

2.2.2 *Non-Transmission, Lower-Voltage, and Underground Alternatives*

During public scoping, RUS received approximately 240 comments expressing the need for this DEIS to consider other alternatives to the proposed C-HC Project transmission line. Non-transmission alternatives reviewed for this DEIS include regional or local renewable electricity generation (i.e., solar), energy storage, energy efficiency, and demand response. These electricity generation and management options are briefly described below. In addition, RUS also considered two transmission line alternatives, a lower-voltage alternative and underground burial of the transmission line. These alternatives were not carried forward for detailed analysis.

As discussed in Chapter 1, the need for the Proposed Action considered in this DEIS is to increase the capacity of the regional transmission system to:

- address reliability issues on the regional bulk transmission system and ensure a stable and continuous supply of electricity is available to be delivered where it is needed even when facilities (e.g., transmission lines or generation resources) are out of service;
- alleviate congestion that occurs in certain parts of the transmission system and thereby remove constraints that limit the delivery of power from where it is generated to where it is needed to satisfy end-user demand;
- expand the access of the transmission system to additional resources including: 1) lower-cost generation from a larger and more competitive market that would reduce the overall cost of delivering electricity and 2) renewable energy generation needed to meet state renewable portfolio standards and goals and support the nation’s changing electricity mix;
- increase the transfer capability of the electrical system between Iowa and Wisconsin;
- reduce the losses in transferring power and increase the efficiency of the transmission system and thereby allow electricity to be moved across the grid and delivered to end-users more cost-effectively; and
- respond to public policy objectives aimed at enhancing the nation’s transmission system and to support the changing generation mix by gaining access to additional resources such as renewable energy or natural gas-fired generation facilities.

The non-transmission, lower-voltage, and underground alternatives were evaluated based on the six-point need for the Proposed Action described above.

2.2.2.1 REGIONAL AND LOCAL RENEWABLE ELECTRICITY GENERATION

Many comments received during public scoping suggested that RUS consider community-scale and residential photovoltaic solar projects as an alternative to constructing a 345-kV transmission line. Community solar could include options such as installing solar panels within existing substations or on other open land where such use has been approved. Residential solar refers to installing solar panels on individual homes, either on roofs or on ground-mounted structures. Photovoltaic solar power has the benefit of providing peak electrical generation during hot summer days, which coincides with part of the period of peak demand. However, peak load often extends into summer nights as well, when photovoltaic systems stop generating electricity. Thus, without sufficient power storage capacity, residential photovoltaic solar systems have limited usefulness in resolving the identified grid reliability deficiencies in the region.

Siting and construction of new photovoltaic solar facilities would take time, possibly including the time required for state regulatory review if several large facilities were sited on the Wisconsin side of the Mississippi River. Depending on where they were sited, additional or upgraded transmission line facilities might also be required to integrate this new generation into the electrical grid (PSCW 2011).

An example of the amount of land area and the number of panels that are required to provide significant quantities of electricity using solar photovoltaic panels is provided by five 5-MW solar projects being proposed in the state of Washington (TUUSSO Energy 2018). Each of those 5-MW solar projects would occur on parcels ranging from 40 to 50 acres and would require installation of about 18,000 solar panels. As indicated in Chapter 1, the estimated needed increase in transfer capability in the region is approximately 1,200 MW, depending on the time of year, which would enable a number of new generators to interconnect as well. If the characteristics of the example solar project were scaled up to replace the 1,200 MW of transfer capability, it could mean that a minimum of 9,850 acres of land and 4.432 million panels would be required to satisfy the necessary transfer capability. As with wind power, physical obstructions and local laws might increase the area needed for this capability (PSCW 2011).

Several solar photovoltaic technologies could be employed, at varying levels of cost and efficiency. Crystalline solar cells are more efficient at converting sunlight into electricity and could cost $2.50 to $6.00 per (direct current) watt or less. Thin-film solar cells are less efficient but would also cost less than crystalline cells (PSCW 2011). Each of the five example solar projects described above is estimated to cost $8 to 10 million to construct (TUUSSO Energy 2018).

The average residential solar project, also known as rooftop solar, is 5 kilowatt (kW) (U.S. Energy Information Administration 2015). Approximately 246,000 residential solar projects would be required to replace the 1,200 to 1,300 MW needed capability in the region. For context, as of December 2017, approximately 85 MW of solar generating capacity has been installed in Wisconsin (RENEW Wisconsin 2017).

RUS recognizes the value of renewable energy to our nation’s changing energy mix; however regional and local renewable energy generation is not currently available at a scale to serve as a viable alternative to the Proposed Action. Furthermore, local and regional renewable energy generation does not meet the primary six-point need for the Proposed Action. Specifically, community and residential solar alternatives would not expand the access of the transmission system, reduce transmission losses, or respond to public policy objectives aimed at enhancing the nation’s transmission system. Therefore, the local and regional renewable energy generation alternative was dismissed from detailed analysis in this DEIS.

2.2.2.2 ENERGY STORAGE

One of the C-HC Project’s purposes is to improve the transfer capability between Iowa and Wisconsin. Energy storage, such as the use of batteries, could increase electricity transfer capability by charging or discharging energy, depending on the storage location, when additional transfer capability is required. However, a tremendous amount of storage would be required to replace the increased transfer capability that would be provided the C-HC Project. That volume of storage could only be provided by pumped hydro, compressed air, or molten salt, none of which is available in Wisconsin due to the state’s geographic features (Dairyland et al. 2016a). To provide similar levels of transfer capability and the economic and reliability support of this project, multiple storage installations at a variety of locations would be necessary because a storage device must be recharged after each use and can only run for a certain number of hours before needing a recharge. Battery storage is not a technically feasible alternative at this time due to the large amount of storage capacity that would be required to match the beneficial impacts of the C-HC Project (Dairyland et al. 2016a). Widespread utility-scale energy storage projects by means of electric batteries are still too expensive to consider as a reasonable alternative to the C-HC Project (Dairyland et al. 2016a).

In addition, energy storage does not meet the primary six-point need for the Proposed Action, including addressing reliability issues at a scale commensurate with transmission, alleviating congestion, expanding access of the transmission system, reducing transmission losses, or responding to public policy objectives aimed at enhancing the nation's transmission system. Therefore, the energy storage alternative was dismissed from detailed analysis in this DEIS.

2.2.2.3 ENERGY EFFICIENCY

Participation in energy efficiency programs is voluntary in Wisconsin (PSCW 2011). MISO considered energy efficiency in all four of its futures modeling efforts and found that energy efficiency could not eliminate the need for the C-HC Project (Dairyland et al. 2016a). To replace this project with energy efficiency, energy-efficiency efforts would have to eliminate demand to a level that all the Renewable Portfolio Standards and Goals would be met with existing renewable resources and that the reliability and congestion benefits would be achieved through a dramatic reduction in flows on the regional grid. An increase in energy efficiency substantial enough to offset the need for the proposed C-HC Project would not be possible (Dairyland et al. 2016a). Implementing energy efficiency programs also would have to be monitored continuously to make sure that load levels do not increase to the point where they cause problems for the transmission system (PSCW 2011).

In addition, energy efficiency does not meet the primary six-point need for the Proposed Action. Specifically, this alternative does not address reliability issues on the regional bulk transmission system at a scale commensurate with transmission, expand the access of the transmission system to additional resources, reduce the losses in transferring power, or respond to public policy objectives aimed at enhancing the nation's transmission system and supporting the changing generation mix. Therefore, the energy efficiency alternative was dismissed from detailed analysis in this DEIS.

2.2.2.4 DEMAND RESPONSE

As with energy efficiency, demand response (also known as load reduction and load shifting) results in a decreased need for electricity. FERC defines demand response as "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" (FERC 2010). If load reduction were contracted to respond to real-time market signals, it could provide some congestion relief. However, the level of demand response needed to provide sufficient congestion relief to match the scope of the C-HC Project, is not known to currently exist.

The PSCW has previously noted that demand response programs rely on voluntary compliance by electricity users. For other transmission line projects that implement load reduction programs as an alternative to transmission lines, load management programs are monitored continuously to make sure that load levels do not increase to the point where they cause problems for the transmission system (PSCW 2011).

The PSCW has noted that the *Energy Efficiency and Customer-Sited Renewable Resource Potential in Wisconsin* study completed by the Energy Center of Wisconsin (2009) suggests that peak demand could cost-effectively be reduced by 1.6% annually on a statewide basis, after a ramp-up period. If this level of reduction could be achieved in the C-HC Project area, peak demand growth could be negative. However, as indicated above, there is no regulatory authority to ensure energy user compliance with load reduction and energy efficiency goals and, thus, no mechanism has been identified that would ensure adequate participation over time (PSCW 2011).

Demand response does not meet the primary six-point need for the Proposed Action. Similar to energy efficiency, discussed above, this alternative does not address reliability issues on the regional bulk transmission system at a scale commensurate with transmission, expand the access of the transmission system to additional resources, reduce the losses in transferring power, or respond to public policy objectives aimed at enhancing the nation's transmission system and supporting the changing generation mix. Therefore, the demand response alternative was dismissed from detailed analysis in this DEIS.

2.2.2.5 LOWER-VOLTAGE TRANSMISSION LINE

During the development of the MVP portfolio, MISO did consider whether portions of the portfolio could be lower-voltage. In relation to the C-HC Project, MISO considered whether rebuilding the overloaded 138-kV lines between northeast Iowa and southwestern Wisconsin would be better than constructing a 345-kV line (MISO 2012b:29). MISO rejected this lower-voltage alternative because the estimated costs were greater than the C-HC Project, and it would not provide the same level of benefits (Dairyland et al. 2016a).

The development of MISO operating guides for multiple element outages highlights the need for a new high-voltage connection into southwestern Wisconsin. Under the lower-voltage alternative, multiple transmission line and associated facility improvements would be required to avoid loss of load in addition to any combination of lower-voltage lines. Additionally, a lower-voltage alternative would result in higher line losses than a 345-kV transmission line and would be less economically efficient (see Section 1.4.2.2 for an explanation of voltage and line losses).

As discussed in Chapter 1, many wind developments in Iowa and Minnesota list the C-HC Project as a conditional project. While further study would be required, it is likely that the number of conditional projects would grow under any lower-voltage alternative. In other words, it is likely that, in addition to a lower-voltage alternative, additional transmission lines (new or rebuilt) would be required to convey wind from Iowa and Minnesota to the rest of the MISO area, including Wisconsin.

Furthermore, a lower-voltage alternative would provide less flexibility for supporting emerging public policy initiatives. Lower-voltage lines have lower ratings and higher impedances, which means less flexibility to accommodate new public policy requirements that rely on the ability to move large amounts of renewable energy from one geographic area to another.

The lower-voltage transmission line alternative does not meet the primary six-point need for the Proposed Action, including reducing transmission losses or responding to public policy objectives aimed at enhancing the nation's transmission system. Based on these considerations, alternative voltages were dismissed for detailed analysis in this DEIS.

2.2.2.6 UNDERGROUND TRANSMISSION LINE

Sometimes regulatory agencies and the public suggest that transmission lines be placed underground to reduce their visibility and to reduce or avoid other potential impacts. In a comment letter dated September 6, 2018, the NPS requested that the RUS and C-HC Project Utilities consider the cost and feasibility of constructing portions of the transmission line underground in the vicinity of the Ice Age NST and Cross Plains Complex located near Cross Plains, Wisconsin, to avoid potential visual resource impacts to the trail and complex. This section addresses the request made in the NPS comment letter. The analysis contained in this section would also apply to other segments of the C-HC Project.

The transmission lines used for underground construction are highly complex, compared with overhead construction. There are two main types of underground transmission lines. One type is constructed in a conduit pipe with fluid or gas pumped or circulated through and around the cable to manage heat and insulate the cables. The other type is a solid dielectric cable, which requires no fluids or gas and is a more recent technological advancement (PSCW 2011). Underground cables have different technical requirements than overhead lines and have different environmental impacts. Due to their different physical, environmental, and construction needs, underground transmission generally costs more and may be more complicated to construct than overhead lines.

The design and construction of underground transmission lines differ from overhead lines because of two significant technical challenges that need to be overcome: 1) providing sufficient insulation inside the conduit so that cables can be within inches of grounded material; and 2) dissipating the heat produced inside the conduit during the operation of the electrical cables (PSCW 2011). Other design and construction elements also differ between underground transmission lines and overhead transmission lines, as discussed below.

Different types of underground transmission lines require different ancillary facilities. Some of these ancillary facilities are constructed underground, while others are aboveground and may have a significant footprint or structures visible at a distance. These facilities may include underground vaults, aboveground transition structures, transition stations, and pressurizing plants.

The trenching for the construction of underground lines causes greater overall disturbance to resources than overhead lines, which results in larger environmental impacts. Soil excavation and disturbance would be required to construct trenches along the entire ROW, rather than just at discrete structure locations. Most commonly, trenches are at least 6 to 8 feet deep to keep cables below the frost line (PSCW 2011). When bedrock or subsoils consisting of large boulders are encountered, blasting may be required (PSCW 2011). Overhead line construction disturbs resources mostly at the site of each transmission line structure. Trenching an underground line through farmlands, forests, wetlands, and other natural areas can cause significant land disturbances and impacts to environmental resources (PSCW 2011). For example, when constructing an underground line through a sensitive area, there would likely be greater impacts from underground construction due to the trenching required, compared with overhead construction, where the sensitive area could either be spanned or structures would be constructed in discrete locations within the area. Depending on the depth to groundwater and whether the construction methods require the excavation to be dry, significant volumes of water may need to be managed. Where waterways cross the ROW, boring beneath the waterway would be required to install an underground line. Once a transmission line is installed underground, ongoing vegetation management would be needed to maintain the ROW free of woody vegetation and root systems.

Many engineering factors significantly increase the cost of underground transmission facilities. As the voltage increases, engineering constraints and costs dramatically increase. This is the reason why existing underground distribution lines typically include lower voltages (12–24 kV). In Wisconsin, there are approximately 12,000 miles of total transmission lines, including just over 100 miles of underground transmission lines. There are also no existing 345-kV underground segments in Wisconsin.

Costs for constructing underground transmission lines are determined by the local environment, the distances between splices and termination points, and the number of ancillary facilities required. Other costs consideration for underground transmission lines are ROW access, construction limitations in urban areas, conflicts with other utilities, trenching construction issues, crossing natural or human-made barriers, and the potential need for forced cooling facilities (PSCW 2011).

Post-construction issues such as aesthetics, electric and magnetic fields, and property values are usually less of an issue for underground lines. Underground lines are not as visible after construction and tend to have less impact on property values and aesthetics than overhead lines. Underground transmission lines produce lower magnetic fields than aboveground lines because the underground conductors are placed closer together, which causes the magnetic fields created by each of the three conductors to cancel out some of the others' fields. This results in reduced magnetic fields (PSCW 2011).

Apart from cost and construction issues, there are continued maintenance and safety issues associated with the ROW of underground transmission lines. The ROW must be kept safe from accidental contact by subsequent construction activities. To protect individual lines against accidental future dig-ins, a concrete duct bank, a concrete slab, or patio blocks are installed above the line, along with a system of warning signs (HIGH-VOLTAGE BURIED CABLE). Additionally, if the lines are not constructed under roads or highways, the ROW must be kept clear of vegetation with long roots such as trees, which could interfere with the system (PSCW 2011).

In 2011, the PSCW estimated that the general costs for constructing underground transmission lines range from 4 to 14 times more than the costs for overhead lines of the same voltage and same distance. For example, a typical new 69-kV overhead single-circuit transmission line costs approximately $285,000 per mile, compared with $1.5 million per mile for a new 69-kV underground line (without the terminals). A new 138-kV overhead line costs approximately $390,000 per mile, compared with $2 million per mile for underground (without the terminals) (PSCW 2011).

To help inform a more project-specific cost estimate for constructing a portion of the C-HC Project underground, two reports were referenced:

The *CapX2020 345 kV Underground Report* (CapX2020 report) prepared by Power Engineers, Inc. (Power Engineers Inc. 2010). Available at: http://www.capx2020.com/Projects/pdf/085-247_Xcel_CAPX2020_Underground%20Report_02-24-10_RevB.pdf

The *Cardinal-Hickory Creek Transmission Line Project Alternative Crossings Analysis* (ACA report; Burns and McDonnell 2016). Available at: https://www.rd.usda.gov/publications/environmental-studies/impact-statements/cardinal-%E2%80%93-hickory-creek-transmission-line. Accessed March 15, 2017.

The CapX2020 report presents a theoretical 2-mile segment of transmission line and analyzes two potentially viable options for constructing a 345-kV transmission line underground. Although the report is helpful in estimating the costs for underground transmission line construction, the limitations and assumptions within the report may not apply to the C-HC Project. Based on design, engineering, and construction information related to the equipment, materials, and methods used (at the time) to construct a 345-kV transmission line underground, the report estimated between $41.45 million and $45.55 million per mile in 2010 dollars for underground construction (Power Engineers, Inc. 2010).

The ACA report was prepared specifically for the segments of the C-HC Project that would cross the Mississippi River and the Refuge. The ACA report analyzed proposed alternative segments of transmission line against 38 criteria, including engineering considerations, environmental issues, and potential social impacts that provide a basis for pricing out the cost to construct the Mississippi River and Refuge segments underground. It is important to note that the segments analyzed in the ACA would include more technically advanced engineering and construction methods and would affect environmental resources to a higher degree than would be necessary for undergrounding at the NPS Ice Age NST and Cross Plains Complex. Depending on the results of the 38 variables analyzed in the report, the ACA report estimated costs for constructing the 345-kV transmission line underground between $40.4 million and $42.2 million per mile in 2016 dollars.

Understanding that the cost estimates provided in the two reports would not translate directly to the affected environment of the NPS Ice Age NST and Cross Plains Complex (the CapX2020 costs would likely escalate and the ACA costs would likely decrease), a rough order of magnitude of $40 million per mile was determined to be a reasonable cost estimate for underground construction in the vicinity of the Ice Age NST and Cross Plains Complex.

For the C-HC Project, the Utilities estimate that the proposed new 345-kV transmission line in the vicinity of the NPS Ice Age NST and Cross Plains Complex would cost between $4.5 million and $5 million per mile to construct overhead. Additionally, the Utilities estimate that roughly 11.4 miles of transmission line would need to be constructed underground in the vicinity of the NPS Ice Age NST in order to avoid visual impacts that would be observed from key observation points associated with the trail and Cross Plains Complex. This mileage estimate is informed by viewshed analysis conducted specifically for the key observation points associated with the NST and complex, as discussed in detail in Section 3.11. Therefore, in order to avoid visual resource impacts along 11.4 miles of transmission line with underground construction of the C-HC Project, the associated rough cost estimate would be on the order of $456 million ($40 million over 11.4 miles), compared with $51.3 million to $56.5 million for overhead construction of the same length.

Additionally, repair costs for an underground line are usually greater than costs for an equivalent overhead line. Leaks can cost $50,000 to $100,000 to locate and repair. A leak detection system for a cable system can cost from $1,000 to $400,000 to purchase and install, depending on the system technology. Molded joints for splices in certain types of underground transmission line could cost about $20,000 to repair. Field-made splices could cost up to $60,000 to repair (PSCW 2011). Easement agreements may require the utility to compensate property owners for disruption in their property use and for property damage that is caused by repairing underground transmission lines on private property. Underground transmission lines have higher life-cycle costs than overhead transmission lines when combining the costs of construction, repair, and maintenance over the life of the line.

The method to construct transmission lines underground is not in conflict with the primary six-point need for the Proposed Action; however, this construction method could be significantly more impactful to resources and much more expensive (estimated to be approximately 8 times more costly) than overhead construction of the C-HC Project. In addition, there are operational limitations and maintenance issues that must be weighed against the advantages. Based on these considerations, the method of constructing underground transmission lines was dismissed from detailed analysis in this DEIS.

2.3 Description of Alternatives

2.3.1 *No Action Alternative*

The No Action Alternative “provides a benchmark, enabling decision makers to compare the magnitude of environmental effects of the action alternatives” (CEQ 1981:Question 3) (40 CFR 1502.14). The No Action Alternative provides the environmental baseline against which the other alternatives are compared (RUS regulation 7 CFR 1970.6 (a)).

Under the No Action Alternative, RUS would not provide funding for Dairyland’s portion of the C-HC Project, and the USFWS and USACE would not grant the ROWs or regulatory permits necessary for the C-HC Project to cross the Refuge. The project would not be built, and existing land uses and present activities in the analysis area would continue.

As discussed in detail in Chapter 1, the wind generation currently developed, under construction, or proposed for Iowa would not be adequately served with increased transmission capacity to population centers in the east under the No Action Alternative. There are a number of wind generation projects in MISO that are dependent upon completion of the C-HC Project (see Table 1.4-2).

Also under the No Action Alternative, operating guides would need to stay in place to address the risk of cascading outages in southwestern and southcentral Wisconsin. Finally, other transmission system improvements listed in Table 2.4-1 would likely be needed in the future.

2.3.2 *Alternative Transmission Line Routes*

The C-HC Project area, as described from east to west, would begin at the Cardinal Substation in the town of Middleton, in Dane County, Wisconsin. The transmission line would cross Iowa County and connect to a new Hill Valley Substation near the village of Montfort, Wisconsin. Depending on the selected alternatives, the new substation would be built in either Grant County or Iowa County, Wisconsin. The transmission line would then exit the substation, cross Grant County, and cross the Mississippi River near Cassville, Wisconsin. There are two potential Mississippi River crossing alternatives near Cassville. The river crossing would include two 345-kV double-circuited lines, one operated at 345 kV and the other at 161 kV. The 345-kV transmission line would terminate at the existing Hickory Creek Substation in northwest Dubuque County, Iowa. The line operated at 161 kV would connect to the Turkey River Substation in eastern Clayton County, Iowa. Where the proposed project would cross the Mississippi River, the ROW would occur within the Refuge, managed by both the USFWS and USACE. All other portions of the project area would cross private land.

The Utilities propose to construct a new approximately 100- to 125-mile 345-kV transmission line between Dane County, Wisconsin, and Dubuque County, Iowa. The proposed project includes the following facilities:

- At the existing Cardinal Substation in Dane County, Wisconsin: a new 345-kV terminal within the substation;
- **At the proposed Hill Valley Substation near the village of Montfort, Wisconsin:** an approximately 22-acre facility with four 345-kV circuit breakers, one 345-kV shunt reactor, one 345/138-kV autotransformer, and three 138-kV circuit breakers;
- **At the existing Eden Substation near the village of Montfort, Wisconsin:** transmission line protective relaying upgrades to be compatible with the new protective relays installed at the new Hill Valley Substation and replacement of conductors and switches to meet Utilities' operating limits;
- Between the existing Eden Substation and the proposed Hill Valley Substation near the village of Montfort, Wisconsin: a rebuild of the approximately 1 mile of Hill Valley to Eden 138-kV transmission line;
- **At the existing Wyoming Valley Substation near Wyoming, Wisconsin:** installation of nine 16-foot ground rods to mitigate potential fault current contributions from the C-HC Project;
- Between the existing Cardinal Substation and the proposed Hill Valley Substation: a new 50- to 53-mile (depending on the final route) 345-kV transmission line;
- Between the proposed Hill Valley Substation and existing Hickory Creek Substation: a new 50- to 70-mile (depending on the final route) 345-kV transmission line;
- **At the Mississippi River in Cassville, Wisconsin:** a rebuild and possible relocation of the existing Mississippi River transmission line crossing to accommodate the new 345-kV transmission line and Dairyland's 161-kV transmission line, and which would be capable of operating at 345/345-kV but would initially be operated at 345/161-kV;

- depending on the final route and the Mississippi River crossing locations:
    - a new 161-kV terminal and transmission line protective relaying upgrades within the existing Nelson Dewey Substation in Cassville, Wisconsin;
    - a replaced or reinforced structure within the Stoneman Substation in Cassville, Wisconsin;
    - multiple, partial, or complete rebuilds of existing 69-kV and 138-kV transmission lines in Wisconsin that would be collocated with the new 345-kV line;

- **At the existing Turkey River Substation in Dubuque County, Iowa:** two 161/69-kV transformers, four 161-kV circuit breakers, and five 69-kV circuit breakers; and
- **At the existing Hickory Creek Substation in Dubuque County, Iowa:** a new 345-kV terminal within the existing Hickory Creek Substation.

The estimated total cost for the proposed C-HC Project is $500 million (in 2023 dollars). Dairyland intends to request financial assistance from RUS to fund its anticipated 9% ownership interest in the C-HC Project. If approved, the in-service date would be scheduled for 2023.

RUS has identified six alternatives for the C-HC Project. These alternatives consist of individual route segments that, when combined, form complete route alternatives connecting the Cardinal Substation in Wisconsin with the Hickory Creek Substation in Iowa (Figure 2.3-1). Figure 2.3-2 through Figure 2.3-13 show the alternative routes and Hill Valley Substation alternatives. Each alternative route segment is defined as a 150-foot-wide ROW in Wisconsin and a 200-foot-wide ROW in Iowa, within a larger 300-foot-wide analysis area. As the project continues to be developed, conditions would be identified or encountered during survey, engineering, ROW acquisition, and construction that may necessitate the Utilities to make adjustments within the larger 300-foot-wide corridor. These adjustments would address specific localized conditions, circumstances, and landowner requests not readily apparent as part of the route development and environmental review processes. Such adjustments would not be anticipated to result in substantial (if any) additional or different impacts. Any adjustments would generally be intended to reduce overall environmental impacts, to reduce project inconvenience to landowners, or to protect public safety.

Appendix C provides additional details regarding each segment considered in this DEIS as well as the complete route alternatives presented below.

Following the presentation of the six complete action alternatives for the C-HC Project, is a discussion of how these six alternatives would cross the Refuge (see Section 2.3.2.7).

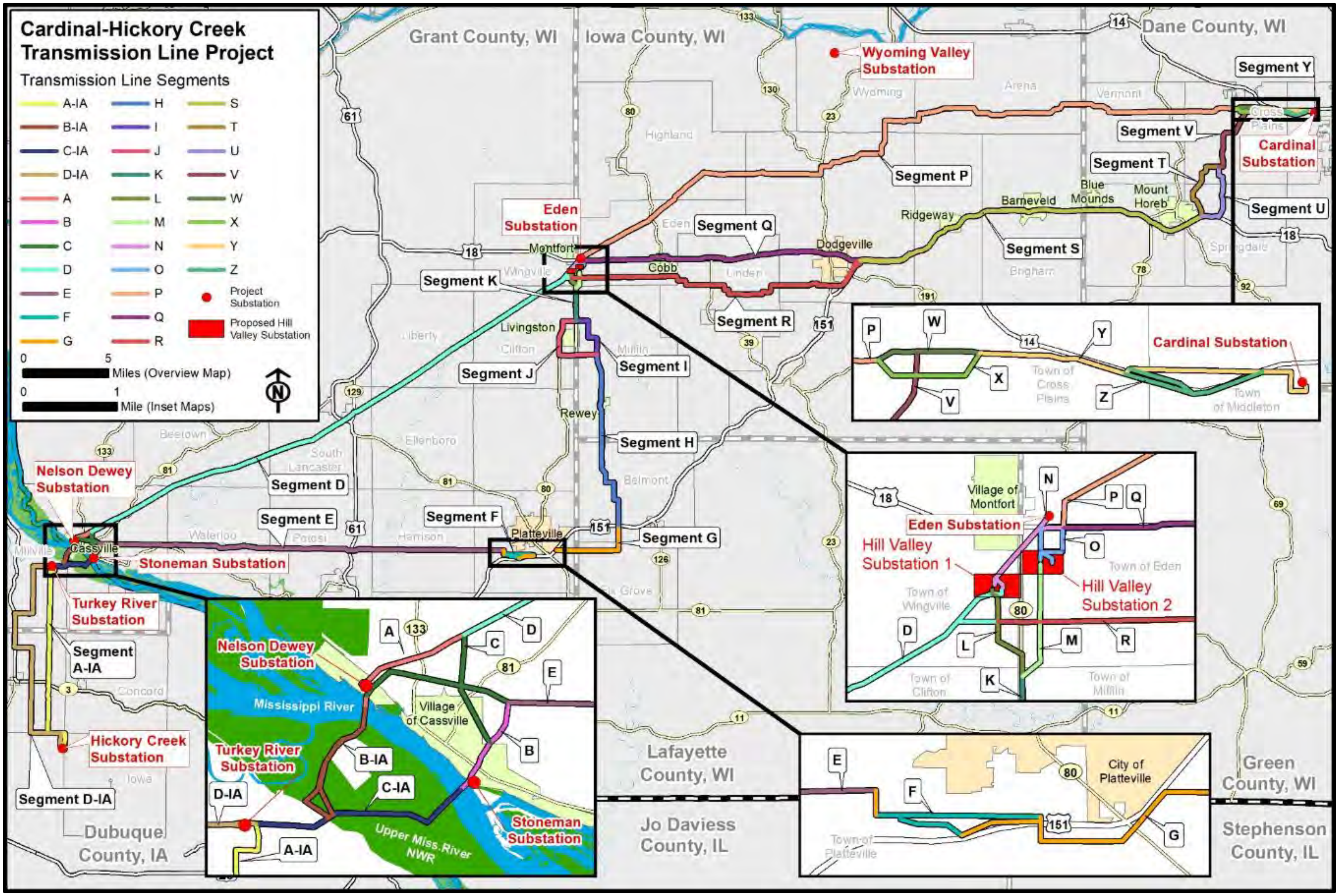

Figure 2.3-1. Transmission line alternative corridor segments map.

2.3.2.1 ALTERNATIVE 1: NORTH CORRIDOR BASELINE

Alternative 1 would include approximately 99 miles of transmission line, composed of the segments listed in Appendix C, Table C-4. Approximately 65 miles would be collocated with existing ROWs for transmission lines, railroads, and roadways. In places where the proposed transmission line is collocated with existing transmission lines, the lines would be installed with a double-circuit configuration on new transmission line structures, and the existing transmission line ROW would be used to accommodate the new structures. The typical ROW would be 150 feet wide in Wisconsin and 200 feet wide in Iowa, based on design standards used by the Utilities in each state. However, in exceptional circumstances, the ROW would differ from the typical widths. For example, one pinch-point location requires a 70-foot ROW, while the Refuge would have a 260-foot-wide ROW. Approximately 34 miles of transmission line would occur in new ROW.

Starting on the east end of Alternative 1 at the Cardinal Substation, Segments Y and W would follow the existing 69-kV transmission line to Segment P. Segment P would be a section of new transmission line ROW located along the northern half of the C-HC Study Area. Segment P would then connect with Segment N before connecting to the new Hill Valley Substation near Montfort, Wisconsin. Although either Substation Alternative S1 or S2 could be used, it is assumed that Substation Alternative S1 would be constructed for Alternative 1 (see Figure 2.3-3). Segments D and A would then connect the new Hill Valley Substation with the property containing the Nelson Dewey Substation, just northwest of Cassville, Wisconsin. The line would not connect into, but would bypass, the Nelson Dewey Substation.

Once the C-HC Project transmission line exits southward from the Nelson Dewey Substation property, 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 Dubuque County, Iowa. Under this alternative, the existing 161-/69-kV double-circuit configuration at the existing Stoneman Substation Mississippi River crossing would be removed and would require a modification of the physical structure of the Stoneman Substation. Under this alternative, the existing ROW for the 161-kV line within the Refuge would be revegetated following the requirements of USFWS and USACE.

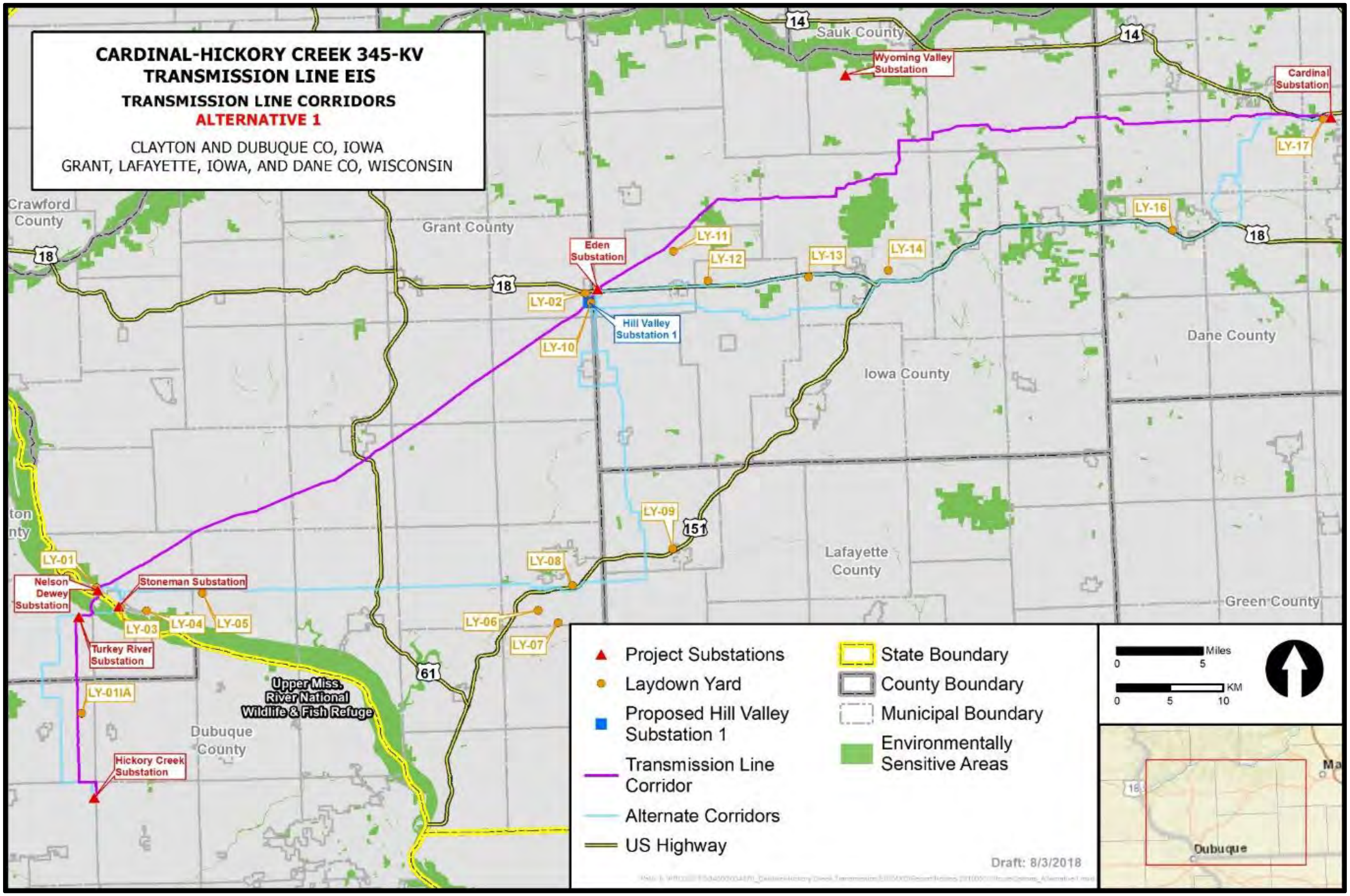

Figure 2.3-2. Alternative 1 transmission line corridor map.

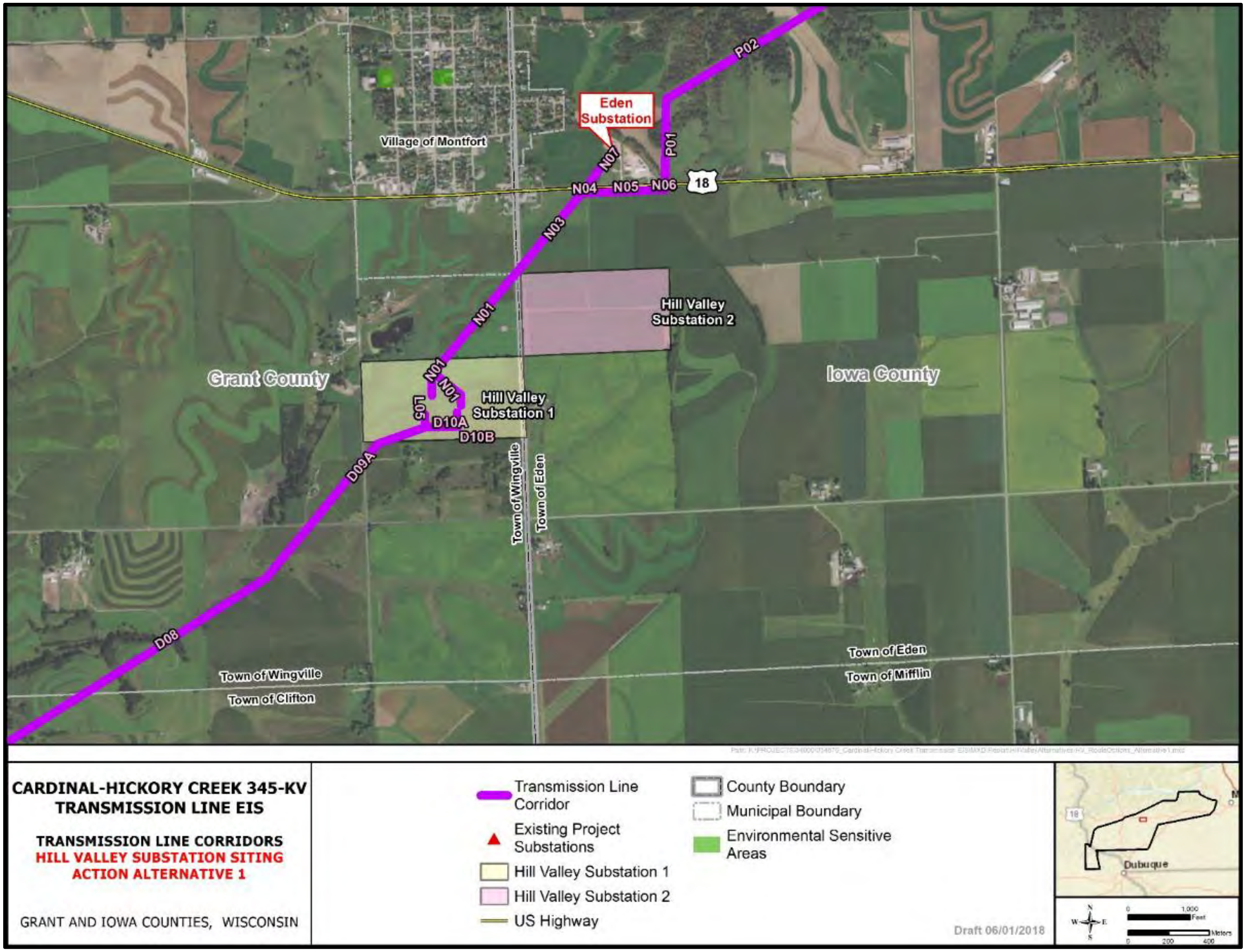

Figure 2.3-3. Alternative 1 Hill Valley Substation map.

2.3.2.2 ALTERNATIVE 2: NORTH CORRIDOR WITH SOUTHERN VARIATION

Alternative 2 would include approximately 105 miles of transmission line, composed of the segments listed in Appendix C, Table C-5. Approximately 68 miles would be collocated with existing ROWs for transmission lines, railroads, and roadways. In places where the proposed transmission line is collocated with existing transmission and distribution lines, the lines would be installed with a double-circuit configuration on new transmission line structures, and the existing transmission line ROW would be used to accommodate the new structures. The typical ROW would be 150 feet wide in Wisconsin and 200 feet wide in Iowa, based on design standards used by the Utilities in each state. However, in exceptional circumstances, the ROW would differ from the typical widths. For example, one pinch-point location requires a 70-foot ROW, while the Refuge would have a 260-foot-wide ROW. Approximately 37 miles of transmission line would occur in new ROW.

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 (see Figure 2.3-5). The alternative would then follow Segment D before reaching the Mississippi River, where it would cross southeast on Segment C; and then follow part of Segment B and enter the property containing the Stoneman Substation but would not connect to that substation. Alternative 2 would then exit south of the Stoneman Substation property 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.

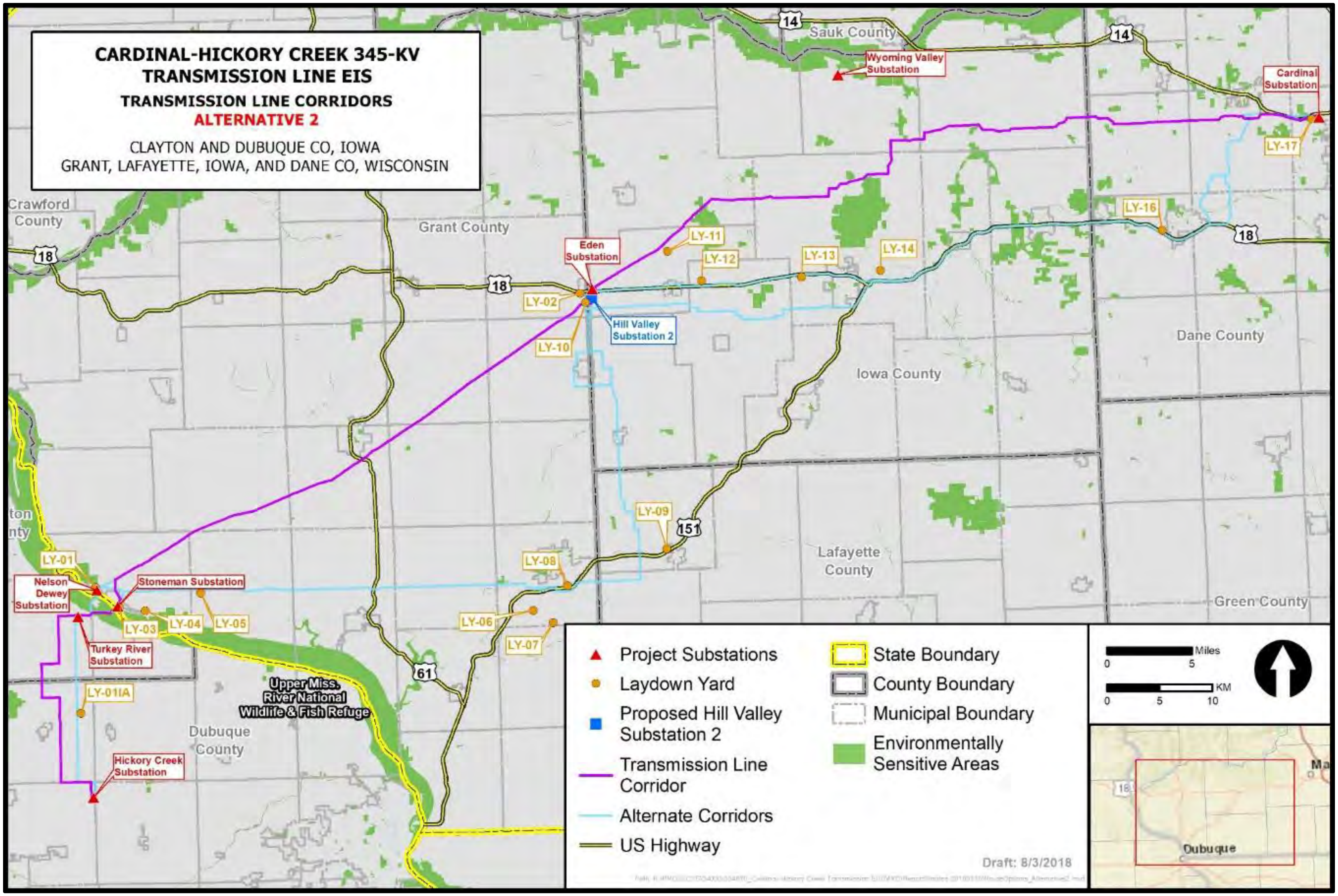

Figure 2.3-4. Alternative 2 transmission line corridor map.

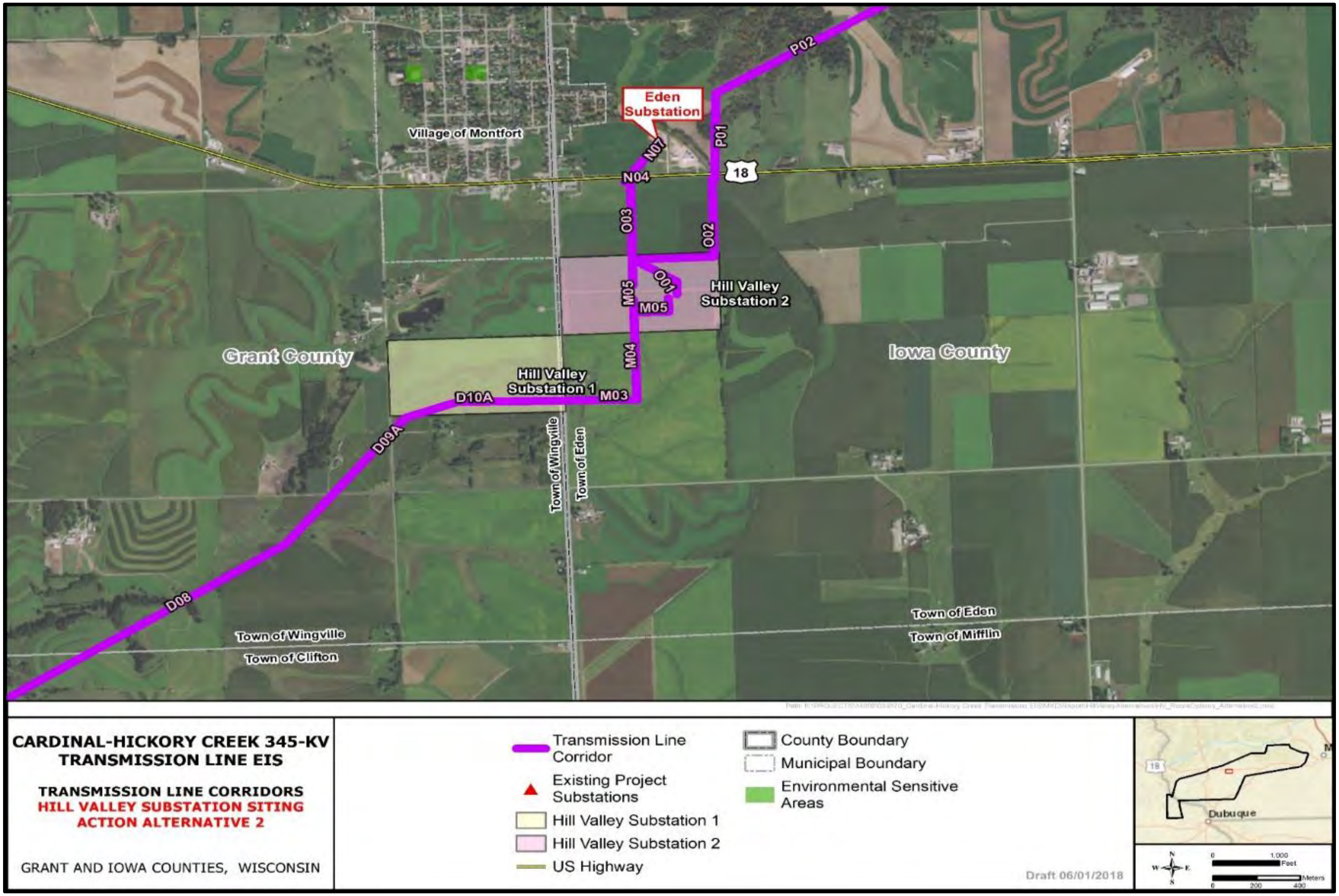

Figure 2.3-5. Alternative 2 Hill Valley Substation map.

2.3.2.3 ALTERNATIVE 3: NORTH–SOUTH CROSSOVER CORRIDOR

Alternative 3 would include approximately 117 miles of transmission line, composed of the segments listed in Appendix C, Table C-6. Approximately 79 miles would be collocated with existing ROWs for transmission lines, railroads, and roadways. In places where the proposed transmission line is collocated with existing transmission and distribution lines, the lines would be installed with a double-circuit configuration on new transmission line structures, and the existing transmission line ROW would be used to accommodate the new structures. The typical ROW would be 150 feet wide in Wisconsin and 200 feet wide in Iowa, based on design standards used by the Utilities in each state. However, in exceptional circumstances, the ROW would differ from the typical widths. For example, one pinch-point location requires a 70-foot ROW, while the Refuge would have a 260-foot-wide ROW. Approximately 38 miles of transmission line would occur in new ROW.

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 (see Figure 2.3-7). 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 enter the property containing the Stoneman Substation in Cassville, Wisconsin, but would not connect to that substation. 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.

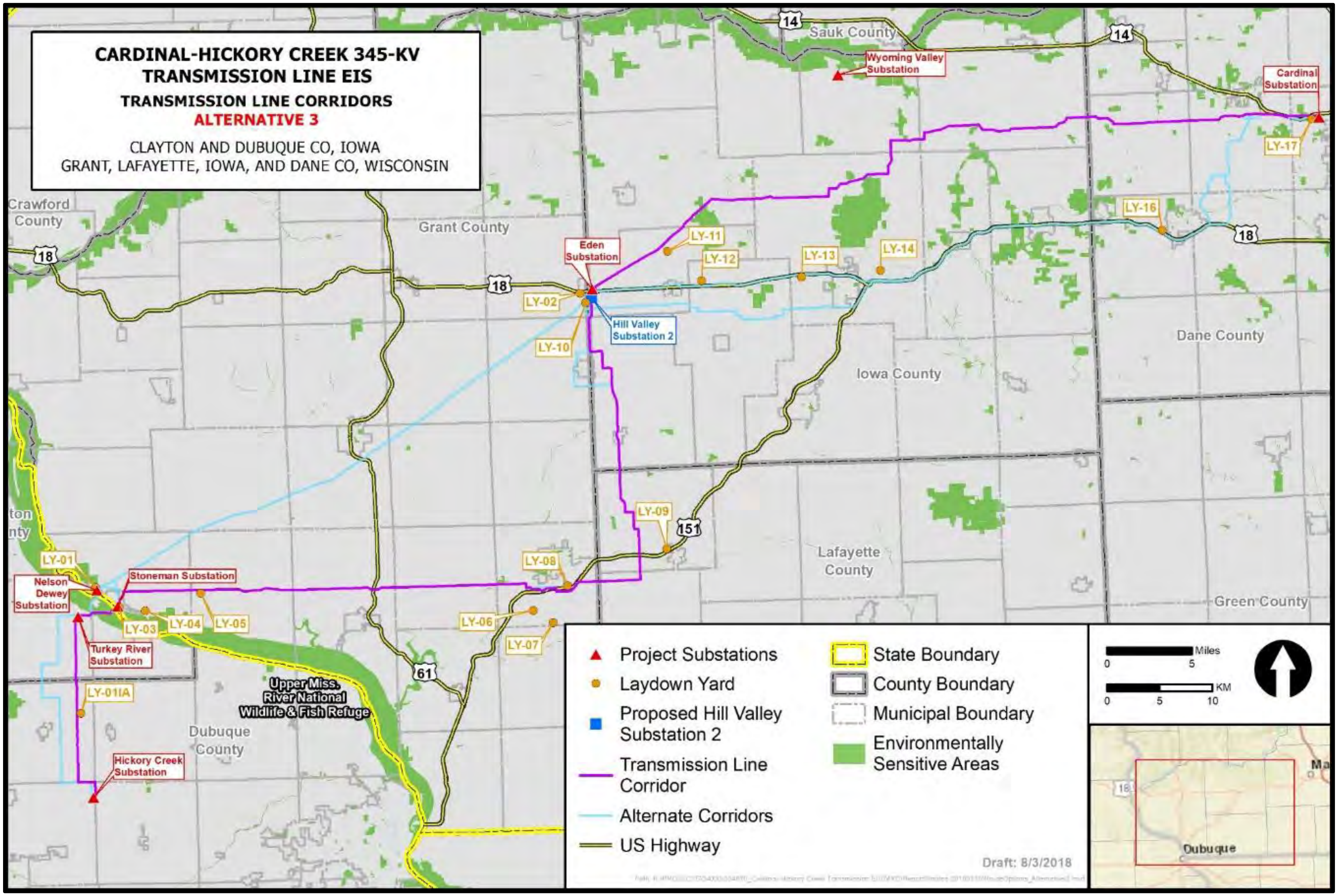

Figure 2.3-6. Alternative 3 transmission line corridor map.

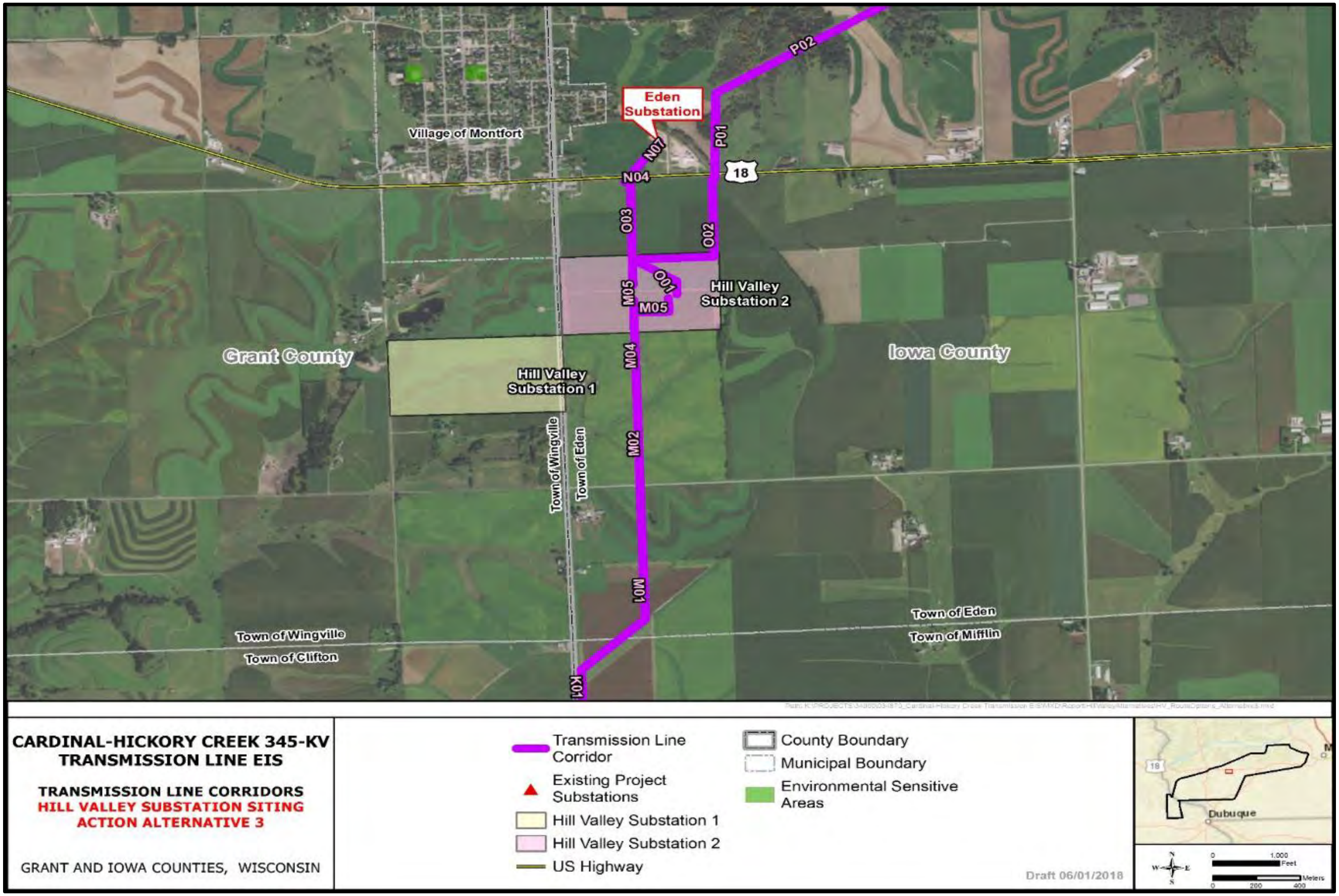

Figure 2.3-7. Alternative 3 Hill Valley Substation map.

2.3.2.4 ALTERNATIVE 4: SOUTH BASELINE CORRIDOR

Alternative 4 would include approximately 119 miles of transmission line, composed of the segments listed in Appendix C, Table C-7. Approximately 109 miles would be collocated with existing ROWs for transmission lines, railroads, and roadways. In places where the proposed transmission line is collocated with existing transmission and distribution lines, the lines would be installed with a double-circuit configuration on new transmission line structures, and the existing transmission line ROW would be used to accommodate the new structures. The typical ROW would be 150 feet wide in Wisconsin and 200 feet wide in Iowa, based on design standards used by the Utilities in each state. However, in exceptional circumstances, the ROW would differ from the typical widths. For example, one pinch-point location requires a 70-foot ROW, while the Refuge would have a 260-foot-wide ROW. Approximately 10 miles of transmission line would occur in new ROW.

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. Route 18 along Segment S, until it reaches and then passes on the north side of Dodgeville and traverses west on Segments Q and N; then follows Segment O south into the new Hill Valley Substation Alternative 2 (see Figure 2.3-9).

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.

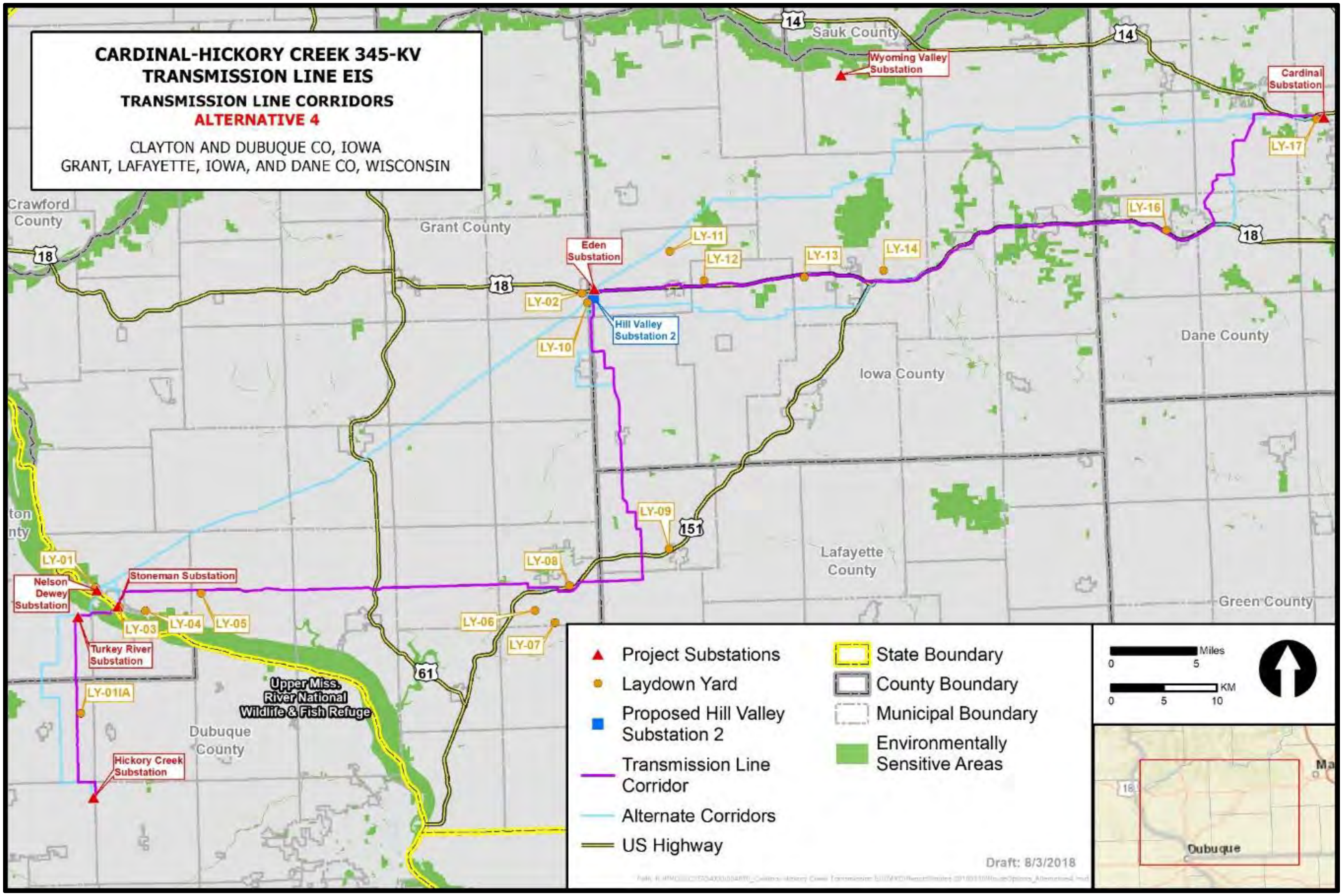

Figure 2.3-8. Alternative 4 transmission line corridor map.

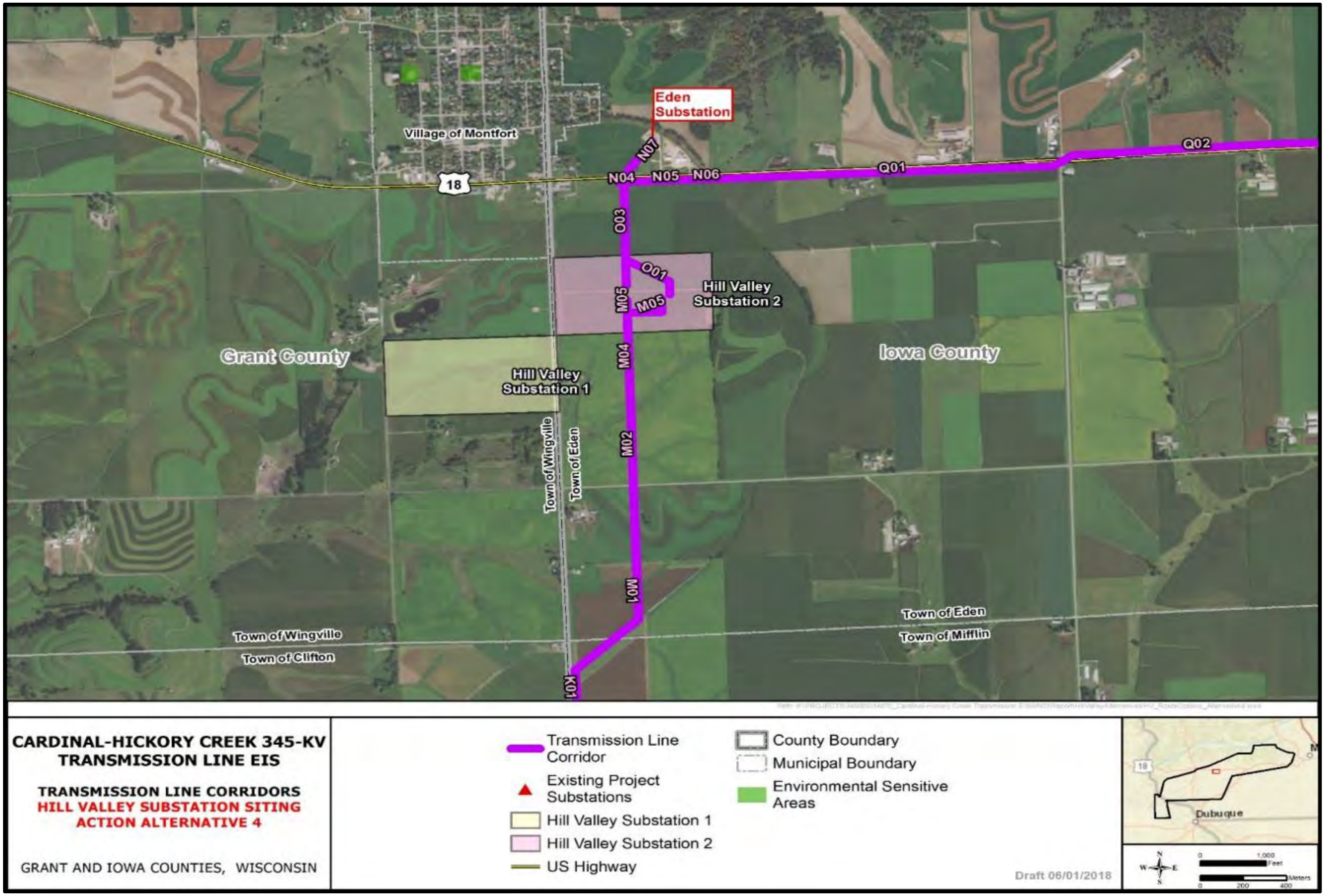

Figure 2.3-9. Alternative 4 Hill Valley Substation map.

2.3.2.5 ALTERNATIVE 5: SOUTH ALTERNATIVE CORRIDOR

Alternative 5 would include approximately 128 miles of transmission line, composed of the segments listed in Appendix C, Table C-8. Approximately 117 miles would be collocated with existing ROWs for transmission lines, railroads, and roadways. In places where the proposed transmission line is collocated with existing transmission and distribution lines, the lines would be installed with a double-circuit configuration on new transmission line structures, and the existing transmission line ROW would be used to accommodate the new structures. The typical ROW would be 150 feet wide in Wisconsin and 200 feet wide in Iowa, based on design standards used by the Utilities in each state. However, in exceptional circumstances, the ROW would differ from the typical widths. For example, one pinch-point location requires a 70-foot ROW, while the Refuge would have a 260-foot-wide ROW. Approximately 10 miles of transmission line would occur in new ROW.

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 until it passed just west of Klevenville. The alternative would then pass just south of Mount Horeb, heading southwest along U.S. Route 18 and along Segment S, then would 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 (see Figure 2.3-11).

After leaving the substation, the transmission line would go 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 would traverse west on Segments G, F, E, and C; then would turn south to the Nelson Dewey Substation. After leaving the Nelson Dewey Substation, the alternative would turn south on Segment A, and then would follow 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 and would require a modification of the physical structure of the Stoneman Substation. Under this alternative, the existing ROW for the 161-kV line within the Refuge would be revegetated following the requirements of USFWS and USACE.

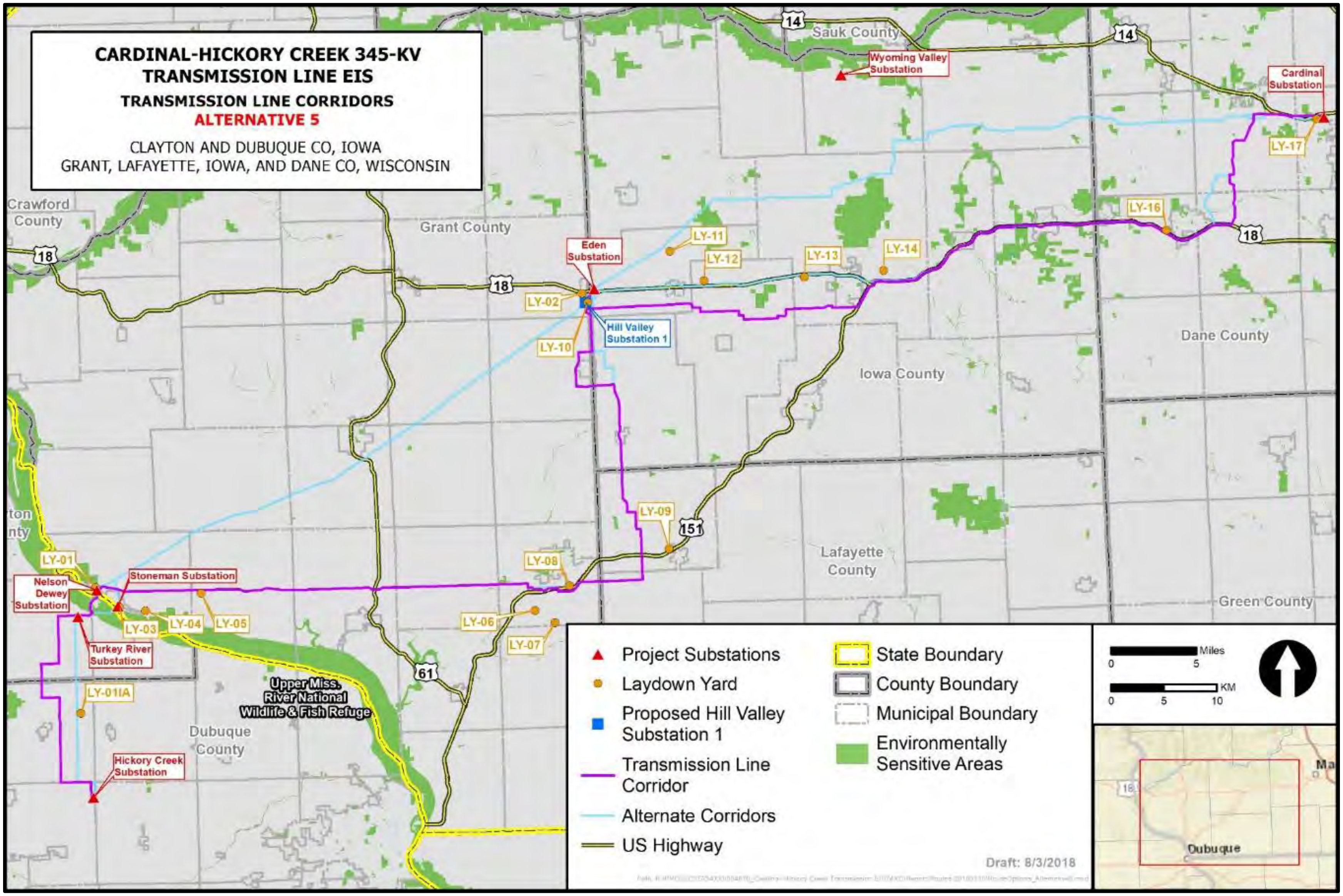

Figure 2.3-10. Alternative 5 transmission line corridor map.

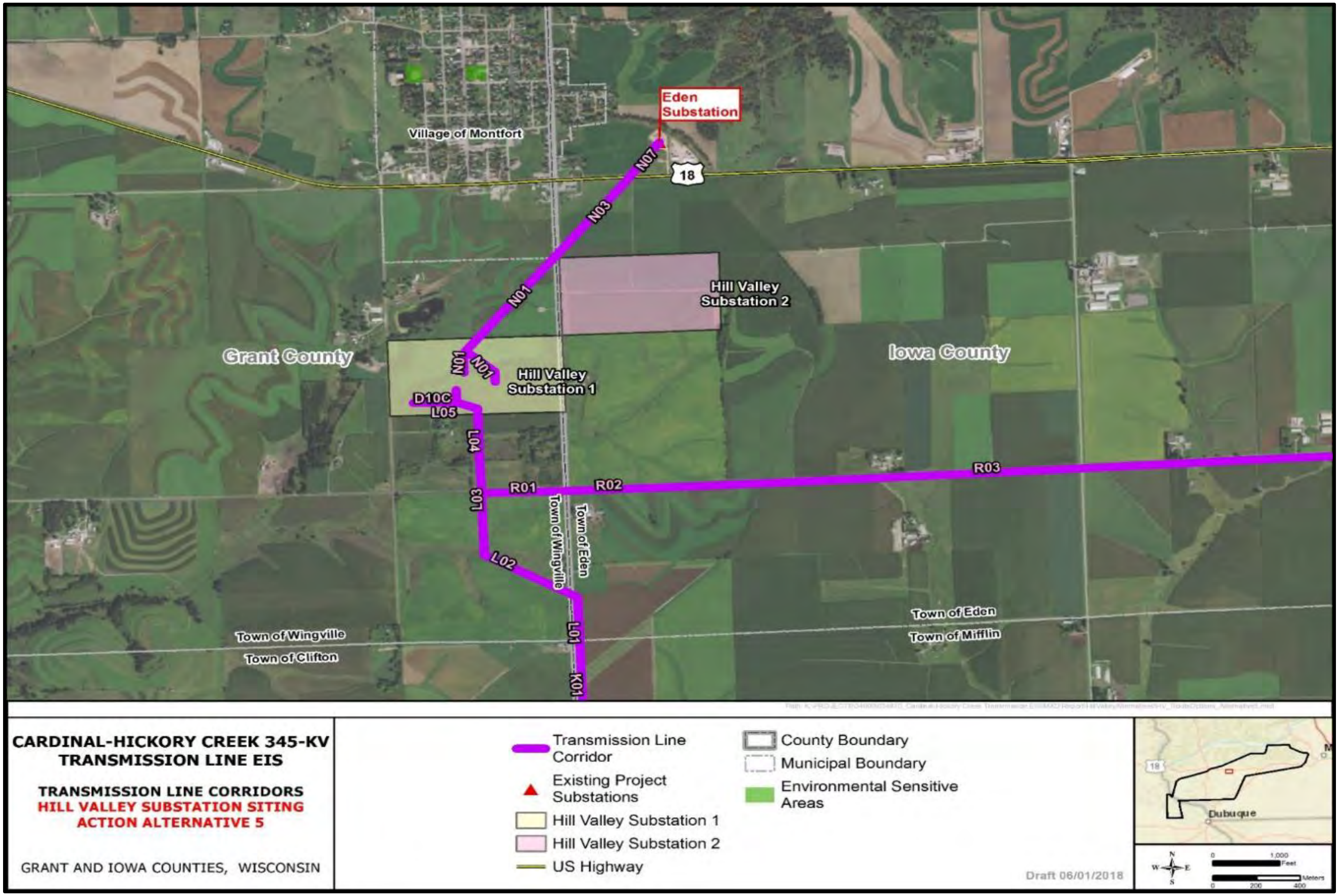

Figure 2.3-11. Alternative 5 Hill Valley Substation map.

2.3.2.6 ALTERNATIVE 6: SOUTH–NORTH CROSSOVER CORRIDOR

Alternative 6 would include approximately 101 miles of transmission line, composed of the segments listed in Appendix C, Table C-9. Approximately 97 miles would be collocated with existing ROWs for transmission lines, railroads, and roadways. In places where the proposed transmission line is collocated with existing transmission and distribution lines, the lines would be installed with a double-circuit configuration on new transmission line structures, and the existing transmission line ROW would be used to accommodate the new structures. The typical ROW would be 150 feet wide in Wisconsin and 200 feet wide in Iowa, based on design standards used by the Utilities in each state. However, in exceptional circumstances, the ROW would differ from the typical widths. For example, one pinch-point location requires a 70-foot ROW, while the Refuge would have a 260-foot-wide ROW. Approximately 4 miles of transmission line would occur in new ROW.

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. Route 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 (see Figure 2.3-13).

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 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, 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. Under this alternative, the existing ROW for the 161-kV line within the Refuge would be revegetated following the requirements of USFWS and USACE.

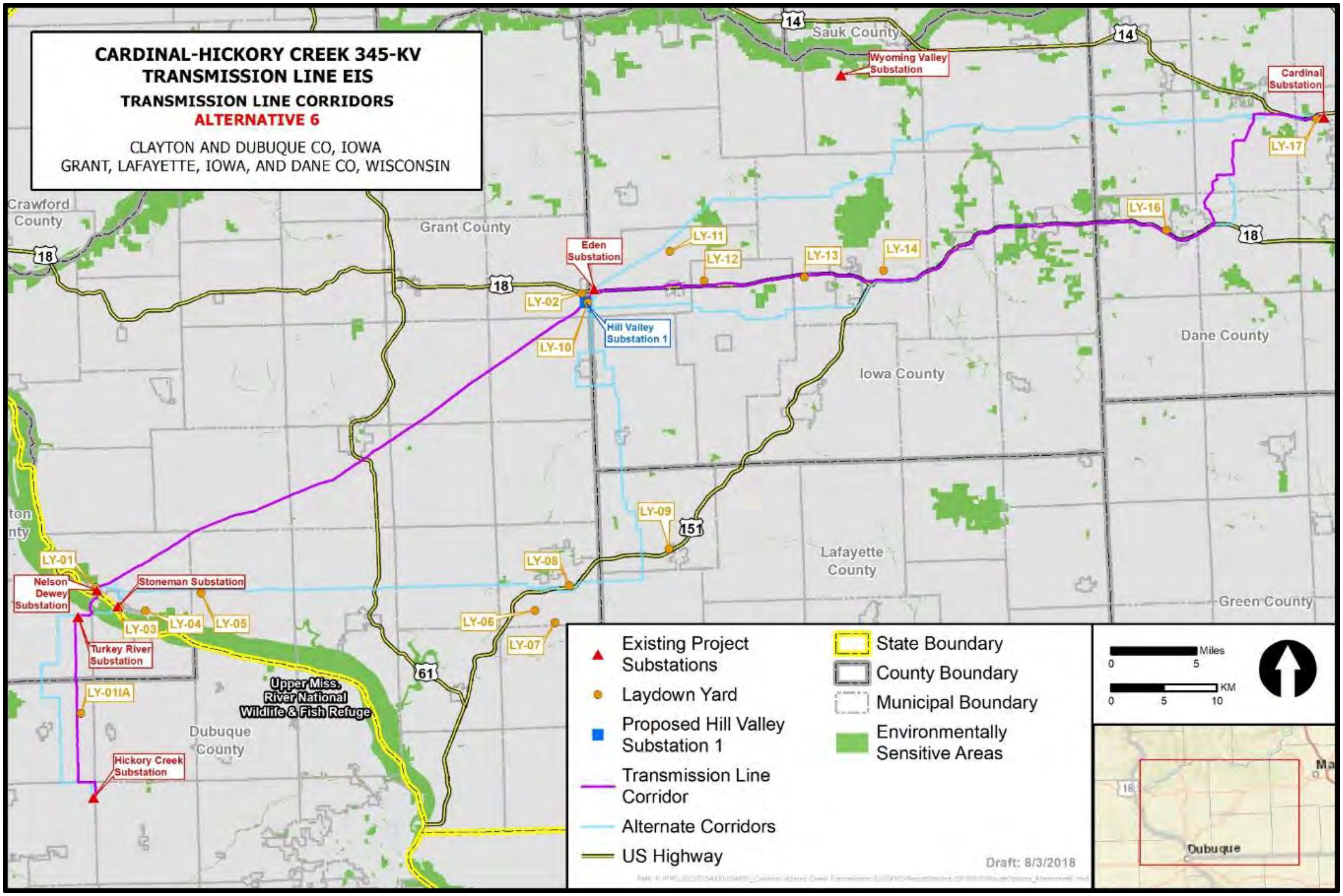

Figure 2.3-12. Alternative 6 transmission line corridor map.

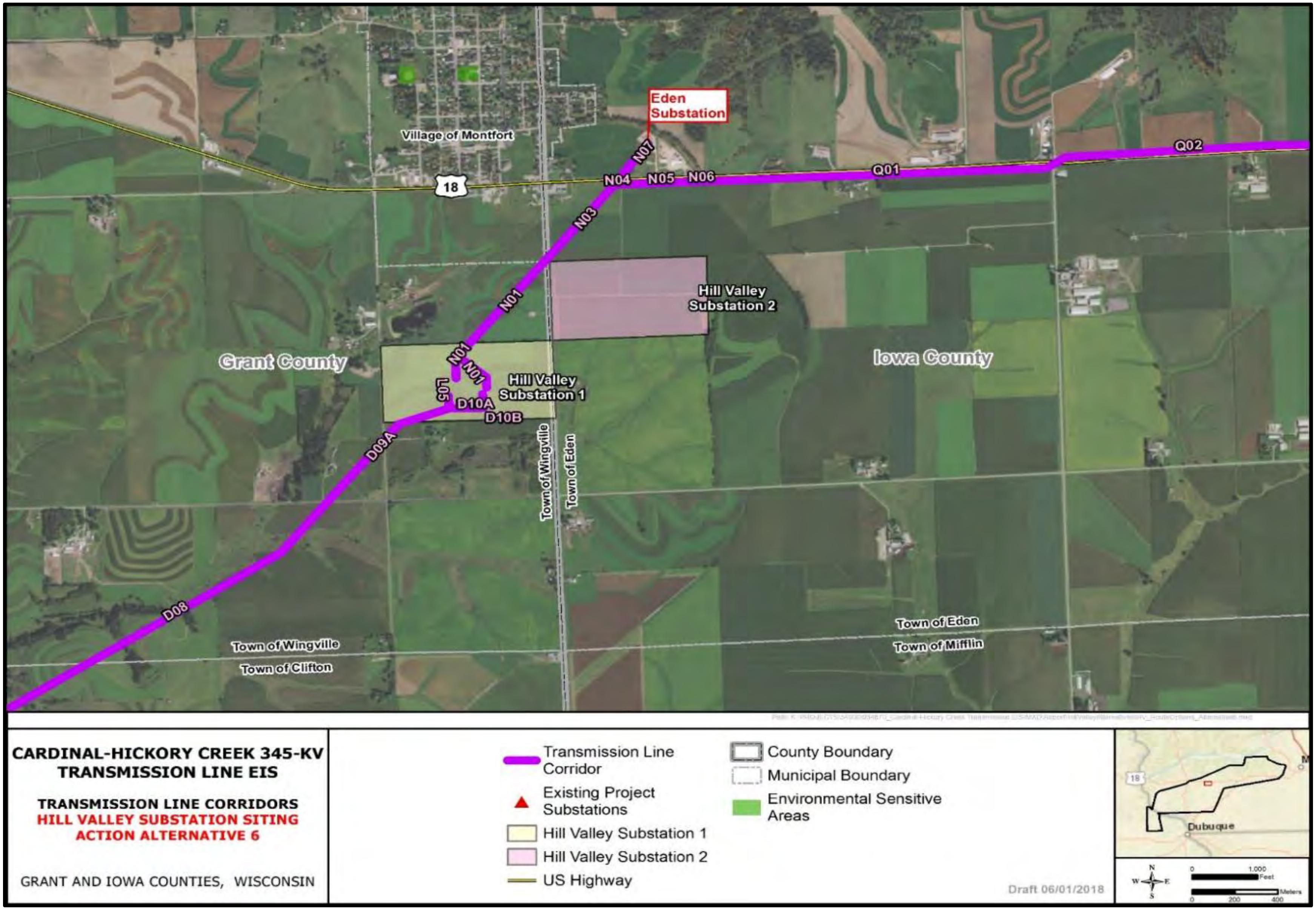

Figure 2.3-13. Alternative 6 Hill Valley Substation map.

2.3.2.7 ALTERNATIVES WITHIN THE REFUGE

All action alternatives would cross the Refuge. There are three different options for crossing the Refuge that were carried forward for detailed analysis, as described below and shown in Figure 2.3-14. Alternatives B-IA1 and B-IA2 are associated with the Nelson Dewey Mississippi River crossing, while Alternative C-IA is associated with the Stoneman Mississippi River crossing (Table 2.3-1). The ROW width for all alternatives within the Refuge would be 260 feet wide to accommodate the low-profile H-frame structures.

2.3.2.7.1 SEGMENT B-IA1

Segment B-IA1 would connect with Segment A in Wisconsin and Segment A-IA or D-IA in Iowa. Starting at the Mississippi River, Segment B-IA1 would generally follow Oak Road from the Turkey River landing for approximately 4,800 feet (0.9 mile), and then it would head southeast to connect with the existing 161-kV transmission line ROW (see Figure 2.3-14). Then, the transmission line would head southwest to climb the bluff and cross the Canadian Pacific railroad tracks and 360th Street along the southern boundary of the Refuge. Segment B-IA1 would continue west to the vicinity of the Turkey River Substation, as shown in Figure 2.3-14. In total, Segment B-IA1 would be 6,597 feet (1.2 mile) long, and the ROW would cover 39 acres (Table 2.3-1).

2.3.2.7.2 SEGMENT B-IA2

Segment B-IA2 would connect with Segment A in Wisconsin and Segment A-IA or D-IA in Iowa. Starting at the Mississippi River, Segment B-IA2 would generally follow Oak Road from the Turkey River landing for approximately 5,200 feet (1 mile), and then it would head southwest before running parallel to the Canadian Pacific railroad tracks (see Figure 2.3-14). Along the railroad tracks, the C-HC Project would not overlap the railroad ROW due to safety requirements. The C-HC Project would also overlap with the existing 69-kV transmission line ROW, also referred to as the N-9 transmission line, for approximately 200 feet. Then, the C-HC Project would head southwest to climb the bluff and cross the Canadian Pacific railroad and 360th Street along the southern boundary of the Refuge. Segment B-IA2 would continue west to the vicinity of the Turkey River Substation, as shown in Figure 2.3-14. In total, Segment B-IA2 would be 7,408 feet (1.4 mile) long, and the ROW would cover 44 acres (see Table 2.3-1).

2.3.2.7.3 SEGMENT C-IA

Segment C-IA would connect to Segment B in Wisconsin and cross the Mississippi River, following the existing 161-kV ROW in the Refuge, which is 150 feet wide and approximately 14 acres across the Refuge. Segment C-IA would expand the ROW to 260 feet wide and would follow the existing 161-kV ROW within the Refuge for the total length of the segment within the Refuge. Segment C-IA would continue west to the vicinity of the Turkey River Substation as shown in Figure 2.3-14. In total, Segment C-IA would be 7,738 feet (1.5 mile) long, and the ROW would cover 46 acres (see Table 2.3-1). Fourteen of these acres would overlap existing 161-kV ROW.

Table 2.3-1. Summary of C-HC Project Options for Crossing the Refuge

Segment	Length within Refuge (miles)	ROW within Refuge (acres)	Collocation with Other ROWs (acres)	Associated C-HC Project Action Alternative
B-IA1	1.2	39	2	1, 5, and 6
B-IA2	1.4	44	4	1, 5, and 6
C-IA	1.5	46	23	2, 3, and 4

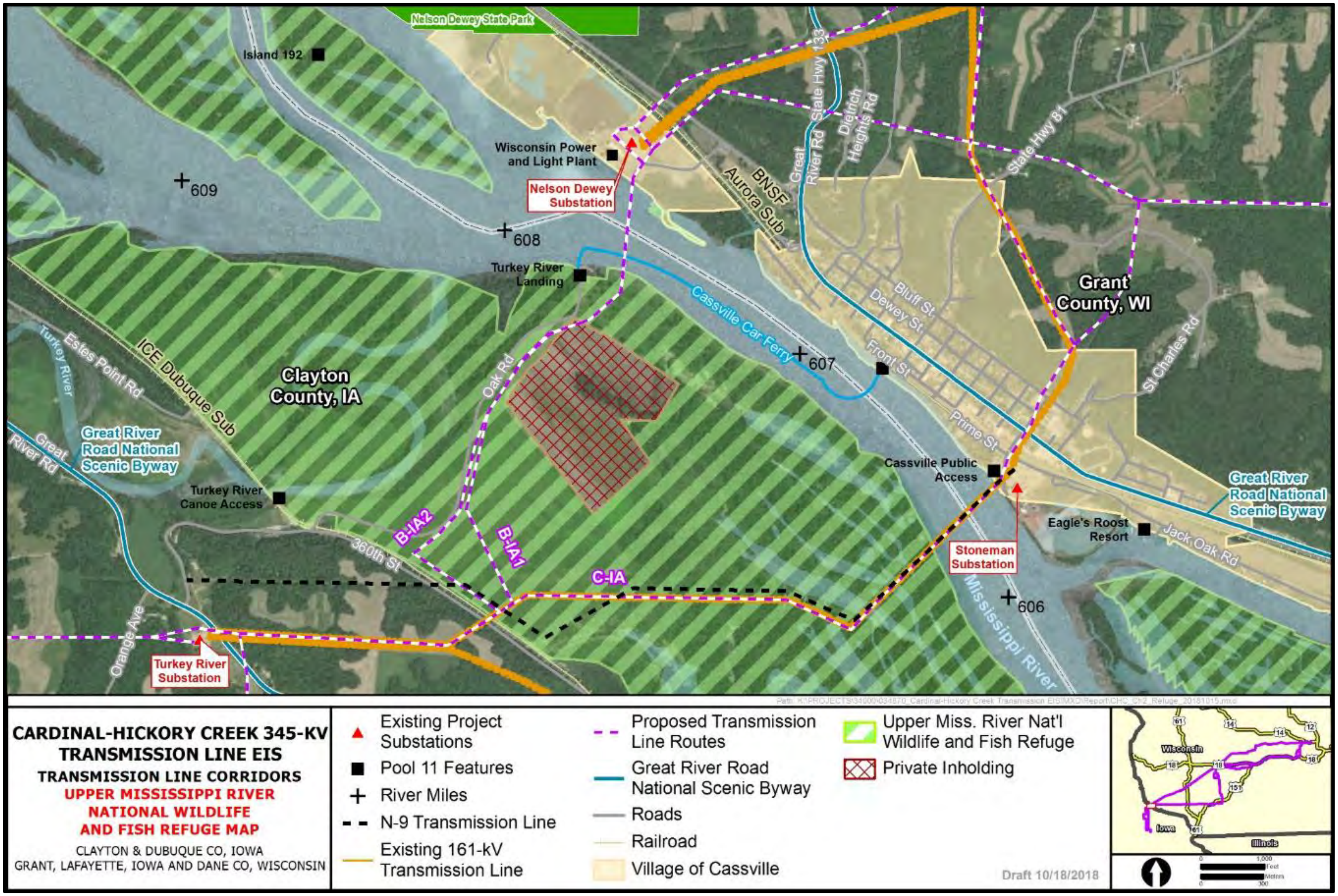

Figure 2.3-14. C-HC Project options for crossing the Refuge.

2.4 Description of the Proposed Project

This section provides a description of the project components, preconstruction activities, construction activities, operational and maintenance activities for the C-HC Project. The information presented below would be applicable for all action alternatives.

2.4.1 *Project Components*

The major components of the C-HC Project include transmission line facilities, substations, and communication systems. The following subsections provide more detail about the project components. Typical design characteristics for the major project components are listed in Table 2.4-1. Final design characteristics would be determined in the detailed design phase of the project.

Table 2.4-1. Typical Transmission Line Components

Transmission Line Facility	Description
Transmission line structures	Monopole steel structures Low-profile H-frame tubular steel (Refuge)
Typical structure height	90–175 feet for monopole structures 75 feet for low-profile H-frame structures (Refuge)
Typical span length	500–1,200 feet for monopole structures 500–600 feet for low-profile H-frame (Refuge)
Number of structures per mile	4–11 per mile
Directly embedded structures *Temporary ground disturbance* *Permanent ground disturbance*	See Section 2.4.1.3.1 below for details. 100 × 100–foot workspace (0.23 acre); 20 to 30 feet deep 6 feet in diameter per structure (0.001 acre)
Reinforced concrete caissons *Temporary ground disturbance* *Permanent ground disturbance*	See Section 2.4.1.3.1 below for details. 100 × 100–foot workspace (0.23 acre); 20 to 60 feet deep Up to 12 feet in diameter per structure (0.003 acre)
Voltage	345,000 volts or 345 kV
Circuit configuration	Varies depending on location. Options include: 345-kV single circuit 345/69-kV double circuit 345/138-kV double circuit 345/161-kV double circuit 345/345-kV double circuit across Mississippi River but operated at 345/161-kV
Conductor size and type	Outside of Mississippi River crossing: Diameter: 1.404 inches Type: Bundled T2 477 Hawk Mississippi River crossing: Diameter: 1.814 inches Type: Bundled T2-795 Drake
Design ground clearance of conductor	27 feet

2.4.1.1 SUBSTATIONS

Multiple existing substations along the proposed C-HC Project routes would be improved under any of the six action alternatives. In addition, one new substation, named the Hill Valley Substation, would be constructed near Montfort, Wisconsin.

Cardinal Substation

At the Cardinal Substation in Dane County, Wisconsin, modifications would be within the existing fenced area under all action alternatives. The following modification would be installed:

- Two 345-kV dead-end structures with foundations to terminate the transmission line;
- One 345-kV circuit breaker, foundations, and control cables for transmission line switching;
- Protection and control panel for the new 345-kV transmission line;
- Fiber-optic communication and supervisory control and data acquisition (SCADA) equipment for system protection, remote control, and monitoring of the substation; and
- Disconnect switches, buswork, lightning protection structures, instrument transformers, surge arresters, and all appurtenances for a complete substation installation.

Construction within the substation includes drilled pier foundations ranging in size from 3 to 7 feet in diameter and 10 to 25 feet deep. The foundations would support transmission line dead-end structures, static masts, and bus and equipment support structures. Spoils from the excavation would be removed from the site. Spoil disposal could include transferring the material to an adjacent landowner or other user who needs fill material. The Utilities' standard practice is to avoid disposing of clean soil in a landfill, if possible. Where there is disturbance associated with installing underground conduit for control and communication cables, removed soil would be returned to the trench, and crushed rock surfacing would be added as needed. Substation modifications would include stormwater and erosion control BMPs, as required by Wisconsin Administrative Code (WAC) Chapters NR 216 and NR 151.

Eden Substation

An existing 138-kV transmission line that connects to the Eden Substation in Iowa County, Wisconsin, would be connected to the new Hill Valley Substation. As a result of this connection, additional equipment would be needed to meet transmission rating requirements. The Utilities would replace the existing protective relay system at the Eden Substation to be compatible with the new protective relays installed at the new Hill Valley Substation. A new fiber-optic communication and SCADA equipment would be installed for system protection, remote control, and monitoring. Conductors and switches would be replaced within the Eden Substation to meet Utilities' operating limits. All modifications would be within the existing fenced area. No new foundations would be installed.

Wyoming Valley Substation

Ground grid improvements would be required at the Wyoming Valley Substation in Iowa County, Wisconsin. The Utilities would install nine 16-foot ground rods to mitigate potential fault current contributions from the C-HC Project. Ground rods would be hammered into the ground and would be placed inside the fence around the perimeter of the substation. All modifications would be within the existing fenced area.

Proposed Hill Valley Substation

Under all action alternatives, a new Hill Valley Substation would be constructed near Montfort, Wisconsin (see Figure 2.3-2–Figure 2.3-13). Two potential locations for the intermediate substation have been identified. The proposed substation would be sited on approximately 80 acres with approximately| 10 acres of fenced area surrounding the equipment. Approximately 22 acres of the site would be used for the substation, access drive, and stormwater drainage features (see Figure 2.4-1). Additional area outside of the graded footprint would allow transmission lines to connect to the substation. Substation design would include stormwater and erosion control BMPs, as required by WAC Chapters NR 216 and NR 151. Any excess soil material would be disposed of by either transferring the material to an adjacent landowner or other user who needs fill material or transferring the material to a landfill. The Utilities' standard practice is to avoid disposing of clean soil in a landfill, if possible.

The existing 138-kV transmission line (X-16) could connect the Eden Substation with the new Hill Valley Substation.

Equipment within the Hill Valley Substation would include:

- Circuit breakers—five 345-kV and three 138-kV;
- One 345/138-kV autotransformer, foundation, and control cables;
- One 345-kV 80 mega volt ampere reactive (MVAR) oil-filled shunt reactor with foundation, secondary oil containment, and control cables;
- 345-kV and 138-kV line steel dead-end structures with foundations to terminate the transmission lines;
- New ATC standard control house; and
- Disconnect switch, coupling capacitor voltage transformer (345-kV and 138-kV), and security equipment (voltages vary).

The proposed Hill Valley Substation would be built as a four-position 345-kV ring bus and three-position 138-kV ring bus with one 345-/138-kV transformer. The site has an ultimate design to accommodate a full build out to a six-position 345-kV breaker-and-a-half bus configuration, eight-position 138-kV breaker-and-a-half bus configuration, and two 345-/138-kV autotransformers.

Nelson Dewey Substation

Under all action alternatives, the connection of the existing 138-kV transmission line to the Hill Valley Substation would require the following changes at the Nelson Dewey Substation in Grant County, Wisconsin:

- Replacing a protection and control panel for the 138-kV transmission line to the Hill Valley Substation;
- Installing fiber-optic communication and SCADA equipment for system protection, remote control, and monitoring of the substation; and
- Replacing disconnect switches and buswork to meet required ratings.

As part of Action Alternatives 1, 5, or 6, the following changes at the Nelson Dewey Substation would occur:

- Reconfigure the substation with two 161-/69-kV transformers, four 161-kV circuit breakers, and five 69-kV circuit breakers;
- Install one 161-kV steel dead-end structure with foundations to terminate the transmission lines;
- Install protection and control panel for the Turkey River Substation configuration;

- Install fiber-optic communication and SCADA equipment for system protection, remote control, and monitoring of the substation; and

- Install disconnect switches, buswork, lightning protection structures, instrument transformers, surge arresters, and all appurtenances for a complete substation installation.

At the Nelson Dewey Substation, all modifications would be within the existing fenced area. Construction within the substation includes drilled pier foundations ranging in size from 3 to 5 feet in diameter and from 10 to 25 feet deep. The foundations would support transmission line dead-end structures and bus and equipment support structures. Slabs-on-grade that are 8 feet square and up to 2 feet thick would be used for the circuit breaker. Spoils from the excavation would be removed from the site. Spoil disposal could include transferring the material to an adjacent landowner or other user who needs fill material. The Utilities' standard practice is to avoid disposing of clean soil in a landfill, if possible. Where there is disturbance associated with installing underground conduit for control and communication cables, soils removed would be returned to the trench, and crushed rock surfacing would be added as needed. Substation modifications would include stormwater and erosion control BMPs, as required by WAC Chapters NR 216 and NR 151.

Stoneman Substation

Under Action Alternatives 1, 5, and 6, the following changes would be needed to support the removal of the 161-kV line and 69-kV line at the Stoneman Substation in Grant County, Wisconsin:

- Removing the 161-kV and 69-kV transmission line terminals

- Removing the existing protection and control relays from the control house

Under Action Alternatives 2, 3, and 4, the following changes would be needed at the Stoneman Substation:

- Removing the 69-kV transmission line terminals

- Removing the existing protection and control relays from the control house

At the Stoneman Substation, all modifications would be within the existing fenced area. No new foundations would be installed. No soil disturbance is anticipated.

Turkey River Substation

Under all action alternatives, the Turkey River Substation in Clayton County, Iowa, would need two 161-/69-kV transformers, four 161-kV circuit breakers, and three 69-kV circuit breakers.

Hickory Creek Substation

Under all action alternatives, the Hickory Creek Substation in Dubuque County, Iowa, a new 345-kV terminal, would be constructed within the existing fenced area.

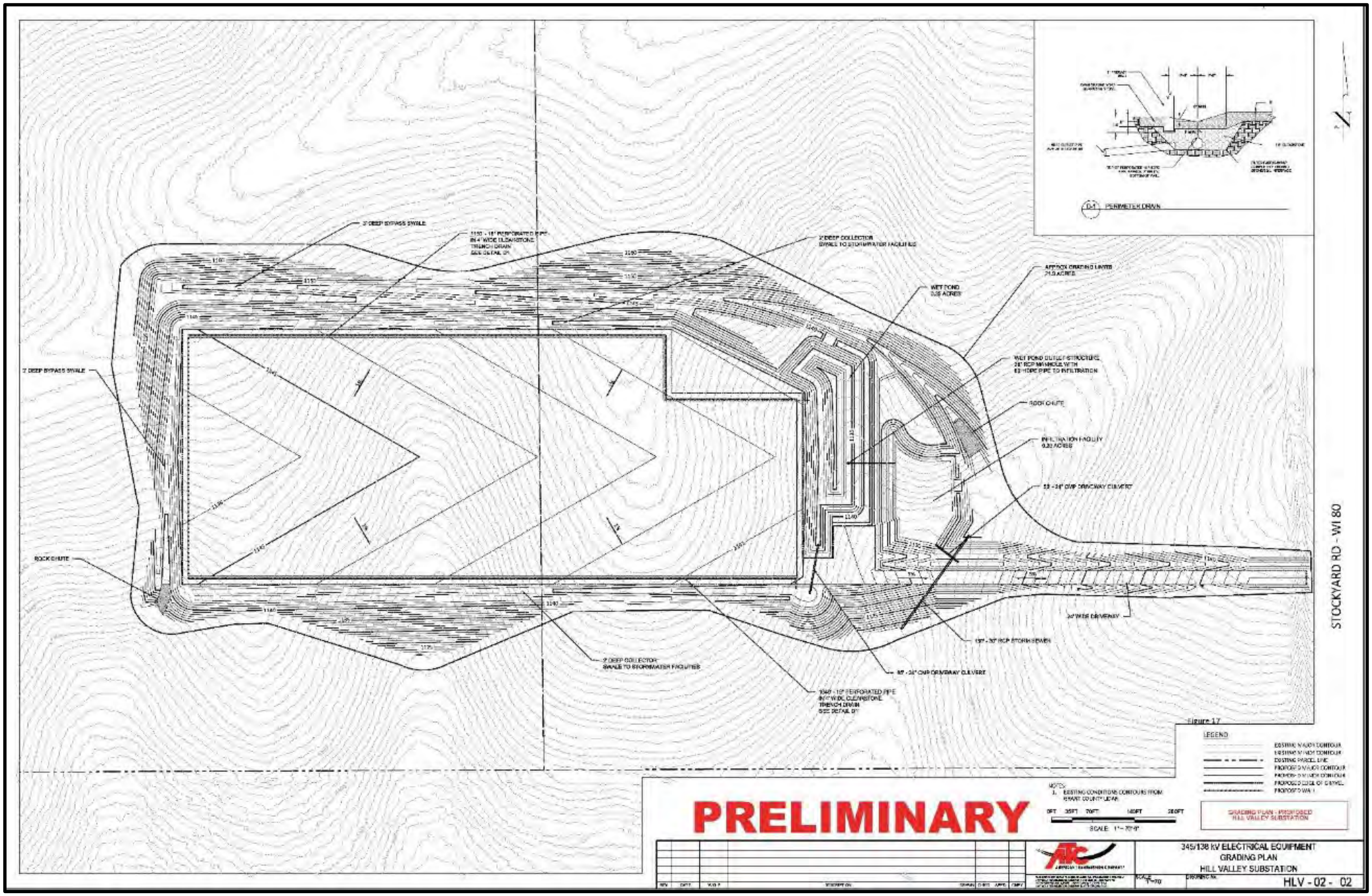

Figure 2.4-1. Preliminary grading plan for the Hill Valley Substation.

2.4.1.2 TRANSMISSION LINE STRUCTURES

For most of the C-HC Project, the Utilities propose to use monopole steel structures that would typically be approximately 150 feet tall, with some structures ranging up to 175 feet tall, depending on site conditions. A typical 345-kV single-circuit structure is shown in Figure 2.4-2. Typical double-circuit structures are shown in Figure 2.4-3 for 345-/69-kV lines and in Figure 2.4-4 for 345-/138-kV lines. The structures would support the three-phase aluminum conductors steel reinforced (ACSR) cables for the C-HC Project 345-kV transmission line, in addition to two overhead shield wires for lightning protection and protective relay communications. At least one of the overhead shield wires would be fiber-optic cable and in certain locations both shield wires would be fiber-optic cable. Alternative structure designs might be used at some locations along the route to reduce potential impacts. For example, depending on the final route, the C-HC Project 345-kV line might be collocated with existing transmission lines. Typical spans would be 500 to 1,200 feet between transmission line structures, depending on topography and other physical conditions considered during final design.

The collocated 345-/161-kV structures for the portion of the C-HC Project through the Refuge would primarily be low-profile, tubular-steel, approximately 75-foot-tall, horizontal-symmetrical H-frame structures, to minimize the likelihood of avian collisions. This lower, wider profile would require a 260-foot-wide ROW through the Refuge (Figure 2.4-5). Structures would be placed in concrete foundations with a typical span length of approximately 500 to 600 feet. To raise the height of the conductors to cross the Mississippi River, one transition structure would be required in the Refuge, between the other low-profile structures in the Refuge and the river-crossing structure. This transition structure would be approximately 80 to 90 feet tall and would have a 500- to 600-foot span length. The crossing structures on the banks of the Mississippi River also would be tubular-steel H-frame structures and would be approximately 196 feet tall (Figure 2.4-6).

The C-HC Project transmission line at the Mississippi River crossing would be designed and constructed to double-circuit 345-/345-kV specifications, but it initially would be energized at 345-/161-kV until the need arises to increase the voltage of the 161-kV line to a 345-kV line. The increased capacity of the second circuit would avoid potential impacts to the Refuge if another future 345-kV transmission line is needed between Wisconsin and Iowa, because the line would already be constructed to carry the additional voltage. Regardless of the voltage configuration, there would only be one pair of double-circuit structures for crossing the Mississippi River, one on each side of the river.

The Mississippi River crossing structure heights and conductors tensioning/sag would be designed to meet or exceed the minimum clearances required above the navigable river channel, as defined by U.S. Coast Guard requirements. The Utilities would continue to work closely with the USFWS to identify the final design of the C-HC Project and to determine the most appropriate structure design to minimize wildlife and aesthetic impacts in the Refuge.

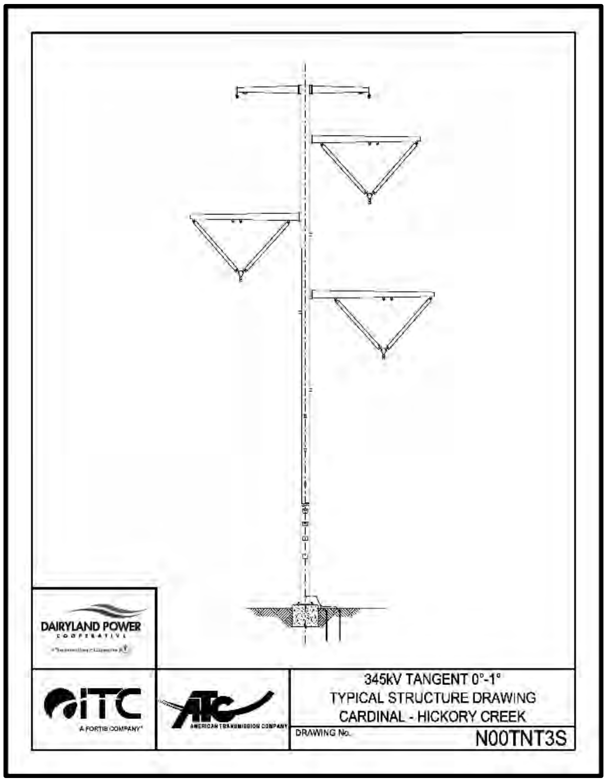

Figure 2.4-2. Typical 345-kV single-circuit monopole structure.

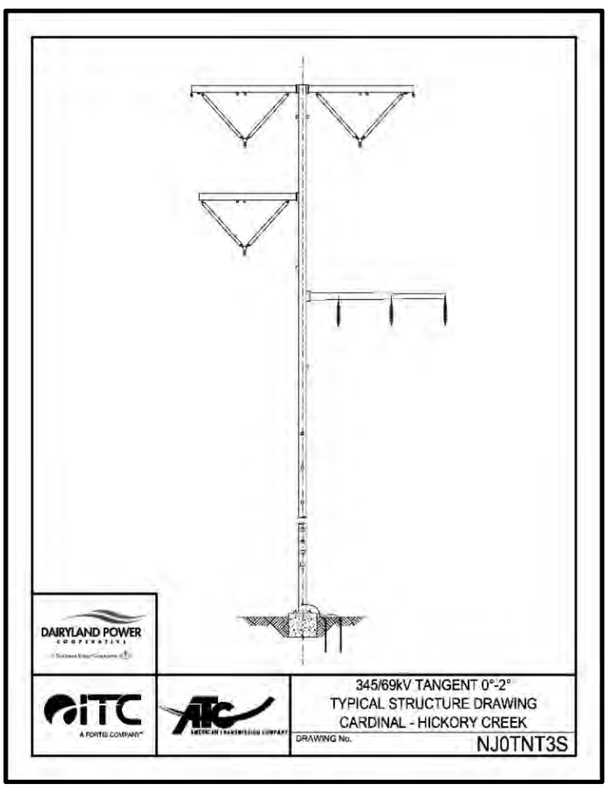

Figure 2.4-3. Typical 345-/69-kV double-circuit monopole structure.

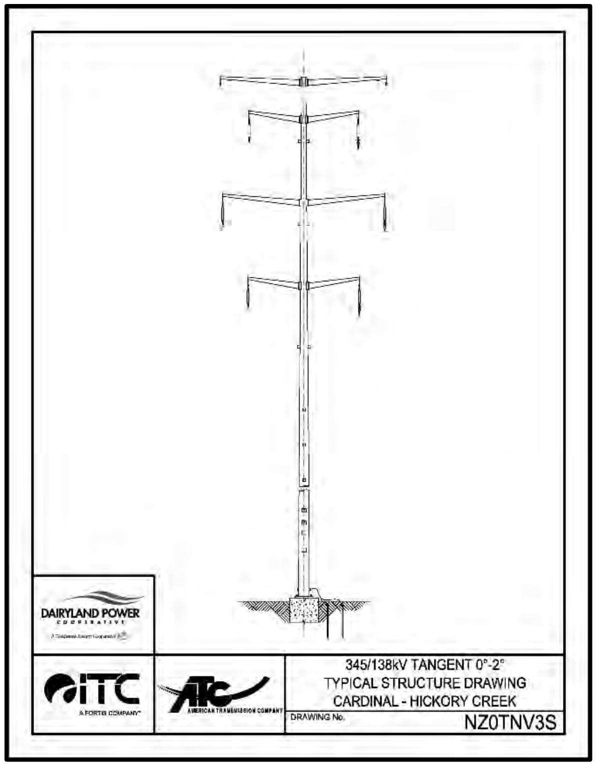

Figure 2.4-4. Typical 345-/138-kV up to 345-/345-kV double-circuit monopole structure.

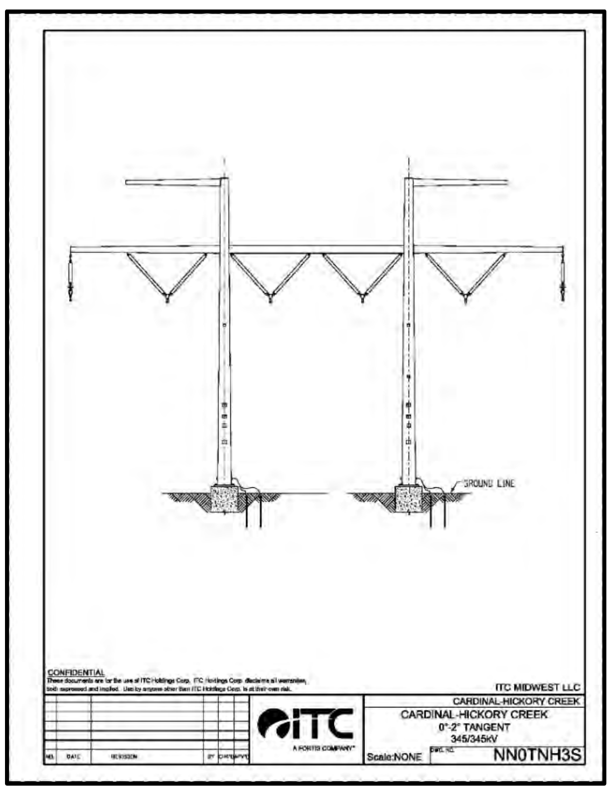

Figure 2.4-5. Low-profile 345-/345-kV double-circuit structure for the Refuge crossing.

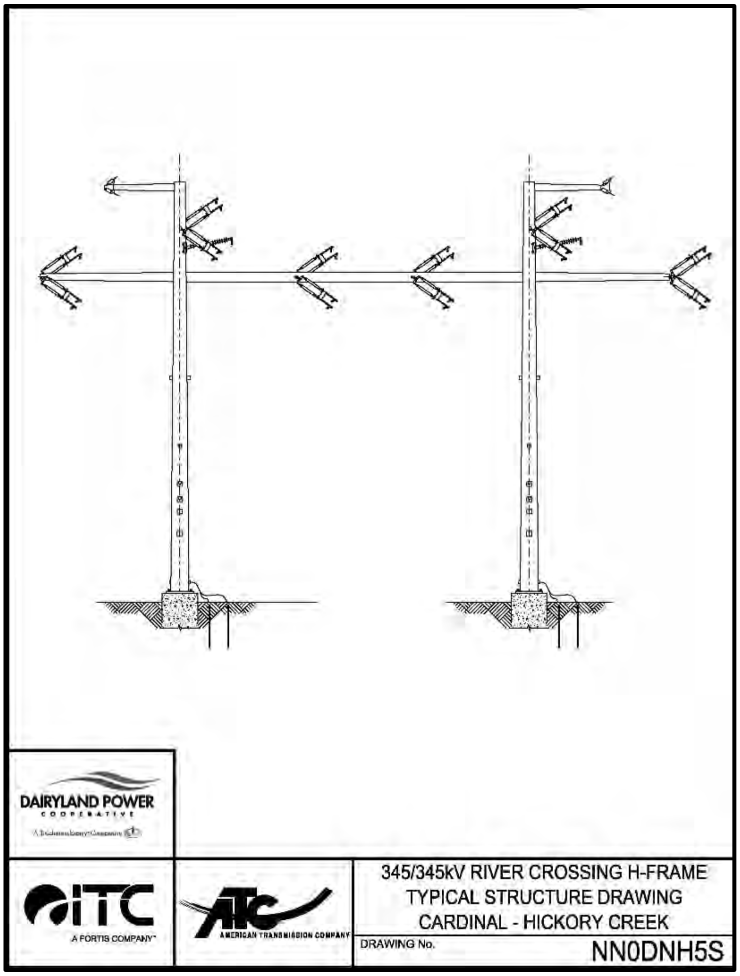

Figure 2.4-6. Low-profile 345-/345-kV double-circuit structure for the Mississippi River crossing.

2.4.1.3 STRUCTURE FOUNDATIONS

2.4.1.3.1 TYPICAL FOUNDATIONS

Two types of structure foundations would be primarily used for the C-HC Project: directly embedded structures and reinforced concrete caissons. Directly embedded structures tend to be more economical than concrete foundations and are typically used for tangent and small-angle structures. Soil conditions would determine the appropriate foundation type and the required dimensions of the drilled holes. Where poor soils conditions exist, deeper and wider excavations would be necessary. Typical equipment for this phase of construction would include dump trucks, drill rigs, cranes, vacuum trucks, and tanker trucks.

The Utilities estimate that an average area of 100 × 100 feet would be temporarily disturbed to install each foundation, with approximately 1,850 cubic yards of native cut-and-fill material per structure.

For directly embedded structures, the excavated holes would be 3 to 6 feet in diameter and 20 to 30 feet deep. Permanent disturbance would be approximately 6 feet in diameter per structure installed using this foundation type.

For reinforced concrete caissons, the excavated holes would be 5 to 12 feet in diameter and 20 to 60 feet deep. The volume of the holes would average 30 to 60 cubic yards, but could exceed 150 cubic yards for several of the largest foundations. Permanent disturbance would be up to 12 feet in diameter per structure installed using this foundation type.

2.4.1.3.2 ALTERNATIVE FOUNDATIONS

In some places, access would be limited or protection of natural resources would be paramount (or both), making alternative construction methods prudent for consideration. Alternative foundations that might be needed to construct the C-HC Project include micro-piles, helical piers, vibratory piles, and vibratory caissons. Once geotechnical studies are completed, the type and design of each foundation would be finalized, considering the soil/rock characteristics and to mitigate potential impacts in specific locations.

Micro-Pile Foundations

Micro-piles are a type of deep foundation with a high strength design consisting of a relatively small-diameter casing, rod, or both. The number and size that are used depend on the transmission structure weight, subsurface soil conditions and profiles at various depths, and lateral forces, such as wind and turning angles. Typically, there are three to 12 piles per transmission structure leg. A typical pile is approximately 5 inches in diameter in the upper section and as small as 1 inch in diameter at the bottom and could be 25 to over 50 feet deep. During construction, the micro-pile casing is drilled down to the design depth, an all-thread reinforcing steel bar is typically inserted, and high-strength cement grout is then pumped into the casing. The micro-pile is then commonly capped with concrete collars to which the transmission structure is bolted.

This type of foundation is suitable for remote rocky locations, such as the east and west bluffs of the Mississippi River and possibly other locations to be identified during final project design. The construction of micro-pile foundations would still require vehicle access to transmission structure sites, but small excavators and pick-up trucks could be used for construction rather than larger and heavier cranes and concrete trucks. Use of smaller equipment could reduce the potential environmental impacts.

Helical Pier Foundations

A second alternative foundation is a helical pier foundation, which is suitable for areas with high water tables, expansive soils, fill, or other unstable conditions where a deep foundation would typically be required. Helical piers are also known as screw piles. They are composed of a steel pipe shaft or solid bar with a screw or helix tip that, when rotated, pulls the shaft into the ground. Typically, three to six piers are used per transmission foundation or pole. The helical screws could be 6 to over 20 inches in diameter and, depending on the soil profile, the piers typically could be 10 to over 80 feet deep. A large hydraulic auger system twists the piles down through unsuitable soils to the more dense materials below, and measures the torque for the correct resistance for the design loadings. After the piers are installed, they are capped with concrete or a welded steel collar, to which transmission structures are bolted. This installation method would require no soil excavation or removal, as is common with other drilling techniques.

Helical pier foundations are also suitable for deep wet environments. The hydraulic augers can be installed using marsh buggies, minimizing the potential impacts to natural resources. In other transmission construction projects, the Utilities have used marsh buggies to access the construction sites during frozen conditions.

Vibratory Piles

Vibratory piles, or hammer-driven piles, are the most common driven-pile system and are used where poor soil conditions would result in otherwise excessively large drilled pier foundations. The pile can be an H-beam or pipe, and the hammers can be diesel or hydraulically driven. The number of piles per foundation depends on the loading requirements of the transmission structure and the soil conditions at various depths. Each pile would typically be 3 to 10 inches in diameter and could be up to 120 feet deep. The piles are often sectionalized and linked together to be driven to deeper depths. They are typically capped with steel.

Equipment used to construct these types of foundations is considerably heavier than that used for micro-piles. Vibratory piles require a large track-mounted crane for installation of the piles. The benefit of using vibratory or hammer-driven piles is that low ground-pressure track equipment can be used to minimize environmental impacts and the potential footprint of the impacts. Because concrete is not used, extensive matting is not required for concrete trucks to access the foundation sites.

Vibratory Caissons

Vibratory caisson foundations are directly embedded foundations that use a vibratory hydraulic hammering system to drive a single steel cylindrical foundation into the ground. They are typically used in sandy soils, saturated or very loose soils, and wetlands. These foundations can be many feet in diameter. For construction, the multisided hollow steel caisson is fitted with a temporary special cap for strength, and the vibrating machine forces it into the ground. The inside can be backfilled to various depths with material to prevent buckling and stress. This foundation can be constructed with either a crane that is driven to the location, or a helicopter-based vibratory caisson and hammer unit. However, helicopters can only be used to construct lightly loaded structure foundations, such as for tangent structures.

2.4.1.4 INSULATORS AND CONDUCTORS

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

The C-HC transmission line would be energized at 345 kV. The Utilities propose to use a bundled pair of TP-477 kilo circular mils ACSR (Hawk) conductors for each phase of the 345-kV circuit. The aboveground midspan conductor height would be highly variable because of the topography along the routes but would be a minimum of 27 feet above the ground surface. All structures would use two shield wires to help protect the conductors from lightning strikes. Depending on the transmission line configuration, the two shield wires could consist of one standard steel stranded wire, and one steel and aluminum stranded wire containing a 48-fiber-optic bundle core (generally known as an optical ground wire, or OPGW), or two OPGWs. OPGWs provide lightning protection and a communication path. In the case of the Mississippi River crossing, there would be two OPGWs, one with a 48-fiber-optic bundle and another with a 144-fiber-optic bundle core.

2.4.1.5 RIGHT-OF-WAY REQUIREMENTS

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

Utilities negotiate with landowners to pay for and obtain a legal easement to use their land for a transmission line ROW. An easement agreement is the method by which a utility ensures that the transmission line ROW is kept clear of vegetation, buildings, and other structures that could interfere with the line's operation. An easement agreement also provides the landowner certain land use controls and conditions.

The temporary C-HC Project transmission line construction ROW might be wider than the permanent ROW, to provide adequate room for the construction equipment to build the transmission line. Then the permanent C-HC Project transmission line ROW easement must be wide enough to keep the conductors a safe distance from buildings, trees, the ground, and other features as they hang between the transmission poles or other structures. Outside of the C-HC Project transmission line ROW, easements also might be needed for construction or operation and maintenance access roads.

The C-HC Project would typically have a permanent 150-foot-wide ROW in Wisconsin and 200-foot-wide ROW in Iowa, based on design standards used by the Utilities in each state. In a few select locations the proposed ROW would vary from 70 to 260 feet wide. For example, the ROW would be 260 feet wide in the Refuge to accommodate the low-profile structures. In only a few locations, the ROW would be narrower than 150 feet to address pinch-points or constraints associated with other infrastructure.
For much of its length, the C-HC Project ROW would share or overlap existing ROWs of other electric lines, roads, and railroads. The Utilities have stated that all new C-HC Project transmission line easements would be acquired where the project ROW overlaps other existing transmission line ROWs. The disposition of the existing, but potentially unneeded, transmission line easements would be determined on a case-by-case basis by the Utilities.

In a number of locations, there are existing lower-voltage electric lines along the proposed C-HC Project transmission line routes that would be relocated and double circuited with the new C-HC Project 345-kV line, using a portion of the existing ROW. In other cases, the Utilities propose to relocate the existing line elsewhere. In a few locations where lower-voltage transmission lines are poorly sited and use multiple-angle structures, the Utilities propose to double circuit the existing and new C-HC Project 345-kV transmission lines on a new ROW where there might be fewer impacts or a better alignment.

2.4.1.6 ACCESS ROADS

Wherever possible, the C-HC Project ROW would be accessed from existing public roads that intersect the ROW. Where public roads do not intersect the ROW, existing farm lanes (e.g., gravel or grassed two-track lanes), driveways, and cleared forest roads or trails would be used for access, along with existing waterway crossings such as bridges or culverts. Before construction begins on the C-HC Project transmission line, some of these existing access roads might need modifications and improvements to allow for safe equipment movement to and from the C-HC Project ROW. These modifications might include vegetation removal, grading, or gravel placement (or all three).

New access roads are sometimes needed where natural constraints, such as steep hills, large and/or high-quality wetlands due to their beneficial ecosystem services, or other limitations, do not allow direct access from existing public or private roads. The constraints the Utilities cite as requiring access roads would include slopes greater than 20%, river crossings wider than 12 feet, and access limitations along roads and railroads. Appendix C identifies the preliminary estimated number of access roads that have been identified by the Utilities for the alternative routes.

Access within wetlands might include using ice roads; completing work during dry or frozen conditions; or using low ground-pressure equipment, construction mats, or temporary construction bridges. Permanent wetland fill is not proposed for access roads. Any methods used in wetlands would be subject to applicable permitting review and approval.

Most of the access roads would be restored to pre-construction conditions after construction activities are complete. Depending on landowner negotiations and requirements, the improved access roads may be left in place. Some access roads may be required for long-term maintenance and safe operation of the transmission line.

2.4.2 *Preconstruction Activities*

Preconstruction activities for the C-HC Project would include permit acquisition, installation of erosion control and other BMPs, surveying and staking, ROW clearing and matting, access road and laydown yard construction, site grading, and construction of temporary staging areas and conductor pulling sites. It is also important to note that local distribution companies often relocate their distribution facilities ahead of transmission line construction. If temporary removal or relocation of fences is necessary, the installation of temporary or permanent gates would be coordinated with the landowner. The C-HC Project ROW agent would also work with landowners for early harvest of crops, where possible.

2.4.2.1 PERMITTING AND INSTALLATION OF ENVIRONMENTAL COMMITMENTS AND MITIGATION MEASURES

Most state and Federal permits must be acquired before the start of construction. Conditions of most or all of these approvals would usually require a number of preconstruction environmental surveys. C-HC Project environmental surveys would include the finalization of wetland boundaries, the presence or absence of specific protected species, the presence or absence of invasive species, or archaeological site boundaries that would likely be impacted by construction activities. To ensure that the Utilities have a complete and intact route, most negotiations with landowners would be concluded before the start of construction.

Different locations and soil conditions along the C-HC Project ROW would require different construction equipment and techniques, as well as a variety of environmental commitments and mitigation measures. Soil conditions and stability would be tested using preliminary boreholes, as part of final project design and before the start of construction. Soil borings are typically completed using rubber-tired or tracked drill rigs. Local variations in some conditions, such as the depth to bedrock, depth to the water table, or volume of rainfall, might require specific engineering or environmental solutions, environmental commitments, and mitigation measures during subsequent C-HC Project construction.

Installation of erosion control BMPs are location-specific and implemented prior to anticipated ground disturbance. Where unexpected ground disturbance occurs, BMPs are installed prior to or immediately after the disturbance occurs. Typical erosion control equipment includes all-terrain vehicles and trucks for crew transportation, as well as skid loaders, tractors, backhoes, hydro-seeders, and other light-duty equipment.

2.4.2.2 SURVEY AND STAKING

Surveying and staking would be used throughout multiple phases of the C-HC Project. Some examples would be surveying and staking for locating and marking the ROW, environmentally sensitive areas boundaries, foundations or structure locations, property or section lines, underground and aboveground utilities, etc. Surveying and staking would be performed prior to and sometimes after construction activities such as constructability reviews, soil borings, laydown yards, clearing, foundations, and hole excavations. These activities are generally completed by a two-person crew travelling by foot, ATV, or pick-up truck.

2.4.2.3 RIGHT-OF-WAY CLEARING AND MATTING

For the majority of the C-HC Project ROW, the full width of the ROW would be cleared before the start of construction. However, in a few unique places where the routes would cross hilly terrain, tree clearing might be avoided or minimized due to the existing adequate clearances between the proposed conductors and tree heights. Where these areas exist, some woody vegetation could be left in place, provided that the vegetation posed no safety or reliability concerns to the transmission line and that the trees would not interfere with access to the electric facilities during construction and long-term maintenance. Identification of these areas would require additional surveys at each location to determine the ground elevations, anticipated mature tree heights, and maximum line-loading conditions. These locations would be identified during final engineering of the C-HC Project.

In upland shrubby grasslands and cropped fields, the C-HC Project ROW would be cleared with a mower. Other vegetation would be cut at or slightly above the ground surface by hand or by using mechanized mowers, sky trims, processors, or harvesters. Rootstocks would generally be left in place, except in areas where stump grinding would be necessary to facilitate the movement of construction vehicles. Woody vegetation might be chipped with a forestry mower or a chipper and scattered over the ROW in nonagricultural upland areas. In wetlands or floodplains, care would be taken to ensure that the mowed or chipped material is spread in accordance with the requirements of any necessary permits.

During the clearing process, matting might be installed to ensure stable work conditions in wetlands and unstable soil areas (Figure 2.4-7 and Figure 2.4-8), or to provide temporary bridges across waterways (Figure 2.4-9). Mats also could reduce rutting and excessive soil disturbance, as well as impede the spread of invasive species. Construction matting would be installed with rubber-tired mat trucks, forwarders, forklifts, or skid loaders. Mat access roads would generally be 16 to 20 feet wide and mat work platforms for structures might be 100 × 100 feet or more, depending on the type of transmission structure used. In many cases, these mats would be left in place through all phases of construction.

Figure 2.4-7. Mats in wet meadow.

Figure 2.4-8. Timber mats being placed in wooded wetland.

Figure 2.4-9. Timber-mat equipment bridge at a stream crossing.

If the C-HC Project transmission line follows an existing transmission ROW, existing transmission structures would be removed after new structures are installed due to outage constraints associated with the transmission lines. The construction company would use bucket trucks, cranes or digger derricks, backhoes, pulling machines, pole trailers, or dumpsters. On uplands, the underground portions of wood poles would be pulled from the ground and the holes backfilled. In wetlands, these holes would normally close as the pole is removed or after a freeze/thaw cycle. Sometimes in sensitive or high-quality wetlands, the old poles would be cut off even with the ground to avoid additional disturbance. Pulled or cut poles would be removed from the site and would be recycled, taken to a landfill, or given to the landowner.

Steel structures would be removed in a similar way to wood structures. If the steel structures have concrete foundations, the foundations would be removed down to a depth of about 3 feet in non-cultivated areas and 4 feet in cultivated areas. 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.

All erosion control measures (e.g., silt fences, slope breakers) needed to maintain stable site conditions would be installed.

2.4.2.4 ACCESS ROAD CONSTRUCTION AND SITE GRADING

Modifications could include vegetation removal, grading, and/or gravel placement. This work would typically be completed using bulldozers, trackhoes, skid-loaders, and dump trucks.

Access within wetlands would include one or more of the following construction methods: 1) completing work during dry or frozen conditions, 2) using low ground-pressure equipment, and/or 3) using temporary construction mats. The Utilities are not proposing permanent wetland fills for improving existing access roads or constructing new temporary access roads. Where grading or the placement of gravel is required, erosion control or stormwater BMPs would be implemented.

Transmission line structures are generally installed at existing grades. However, in areas with more than 10% slopes, structure sites and work areas would have to be graded level or fill, or mats would have to be brought in to create working pads. Work pads or platforms would be at least 30 × 30 feet to minimize difficult grading in steeper topography. Work areas would be up to 100 × 200 feet in flatter areas, which allows for a more efficient workspace.

In locations where C-HC Project structures would be constructed within or in proximity to a highway ROW, the Utilities would have to communicate with the appropriate state department of transportation to determine suitable structure locations and grade restoration to prevent erosion and maintain appropriate surface water drainage along the highway.

2.4.2.5 TEMPORARY STAGING AREAS AND CONDUCTOR PULLING SITES

During construction, temporary staging/laydown areas, helicopter landing pads, and conductor pulling/handling sites would be required. Temporary off-site laydown yards might be needed, depending on access, security, efficiency, and safety for warehousing supplies. These yards would be used to store job trailers, construction vehicles and equipment, transmission line structures, conductors, cables, and other related materials and equipment. A typical laydown yard would be about 10 acres, with a minimum of a 30-foot-wide driveway for ingress and egress. Laydown yard locations are shown on Figure 2.3-2, Figure 2.3-4, Figure 2.3-6, Figure 2.3-8, Figure 2.3-10, and Figure 2.3-12. Laydown yards would be selected to minimize the amount of disturbance and preparation required from grading and clearing, such as paved sites, parking lots, old gravel pits, and fields. Additional smaller staging areas would be located along the C-HC Project ROW to store construction materials and for structure laydown and framing before installation. Often these sites are on agricultural lands that are temporarily taken out of production (with compensation to the landowner) for the purpose of temporarily storing tower sections, reels of conductor, and other necessary components.

Helicopter landing zones/pads also might be required. Preferred sites would be in close proximity to the C-HC Project ROW, relatively flat (1% to 2% slope), require minimal site preparation, and would be free of obstructions, such as vacant parking lots, quarries, gravel pits, or fallow fields. Depending on the type of helicopter used, a temporary 50 × 50–foot landing pad or a 1- to 2-acre helicopter laydown yard would be needed for structure assembly, and equipment and material storage. Typical spacing between helicopter landing zones would be 3 to 7 miles.

Temporary conductor pulling/handling sites would also be required. A typical conductor pulling/handling site would be approximately 40 × 300 feet and would be spaced approximately every 10,000 feet, depending on the type of conductor to be used.

2.4.3 *Construction Activities*

Major construction activities for the C-HC Project include augering and blasting for foundations, foundation installation, structure erecting, constructor stringing, substation construction, and site restoration. During construction, the Utilities might ask the landowners to remove or relocate equipment and livestock from the C-HC Project ROW. Disturbances would likely occur in the areas immediately surrounding C-HC Project transmission line structures. Construction is estimated to occur over a two-year period.

2.4.3.1 AUGERING AND BLASTING FOR FOUNDATIONS

In most soils, C-HC Project transmission line structure foundations could be excavated using an auger on a standard drilling rig (Figure 2.4-10). The augered soils would be temporarily piled off to the side of the excavation, in upland locations. Sensitive upland areas would be avoided as discussed in further detail in Chapter 3. If contaminated materials are encountered during the construction, spoils would be isolated, and steps would be taken to determine disposal requirements in accordance with applicable regulations.

In wetlands and agricultural fields, the topsoil would be segregated from the subsoils and stockpiled off to the side. In wetlands, the subsoils would often be piled on timber matting, or on a geotextile fabric for disposal at a later time (Figure 2.4-11). Stockpiled materials would be prevented from entering any wetlands or waterways by the use of proper erosion control methods, such as silt fence, silt socks, or wattles.

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

When subsurface soils consist of unconsolidated materials, such as gravel or cobbles, the excavation site might alternatively have to be filled with water to prevent the sidewalls from collapsing. The water pressure would keep the walls of the excavation intact during the augering process. When the appropriate depth is reached, a casing would be inserted into the excavation and the water would be pumped out and disposed of as described for dewatering, above.

When bedrock is close to the soil surface or when subsoils primarily consist of large boulders and large cobbles, blasting might be required to complete the structure excavation. Explosives would be placed in holes drilled into the rock, and the structure site would be covered with blasting mats to keep the rock and debris loosened by the blast from scattering over a wide area. Following the blast, the blasting mats and loosened debris would be removed, and the drilling rig would be used to auger through the broken rock until the appropriate depth is reached.

Figure 2.4-10. Foundation excavation using an auger in dry upland soils.

Figure 2.4-11. Structure location in a wetland—matted work platform, foundation, spoil pile (to be removed), and erosion control.

2.4.3.2 FOUNDATION INSTALLATION

The installation method used and the diameter and depth of the foundations for the C-HC Project would vary depending on the soil characteristics and structure loadings. Excavation would be required for all structures, whether they are directly embedded or use reinforced concrete foundations.

For directly embedded structures (i.e., where no concrete foundation would be required), a hole would be excavated to the appropriate depth. The integrity of the hole might be protected with the installation of a permanent culvert. The base of the structure would be placed into the excavated hole or, if soils are unstable, into a culvert, and the area around the structure would be backfilled with clean granular fill.

For structures requiring a reinforced concrete foundation, the required hole would be excavated, and a rebar cage and anchor bolts would be placed into the excavation. The excavation would then be filled with concrete to cover the rebar cage and anchor bolts, except for a typical 1- to 2-foot reveal of the foundation abovegrade with exposed threaded anchor bolts. The complete caisson would be allowed to cure. Typical equipment for this phase of construction would include dump trucks, drill rigs, cranes, vacuum trucks, concrete mixers, and tanker trucks.

2.4.3.3 STRUCTURE ERECTING AND CONDUCTOR STRINGING

The structure sections would be transported to the foundation sites from a staging site in the C-HC Project area, where they would have been initially stored. Steel transmission structures are erected in sections. Cranes would be used to lift the structure sections into place (Figure 2.4-12). First, the lower section would be lifted into place and bolted onto the concrete foundation. The upper sections of the structure, with the arms already attached, would then be lifted onto the lower structure section. Sometimes insulators and large pulleys that facilitate wire stringing would also be attached to the structure arms before they are raised into position. Alternatively, the pulleys could be attached after structure erection is completed.

In areas where ground-based cranes would not be suitable due to soft or wet ground, steep terrain, or environmentally protected areas, helicopters could be used to transport and erect the steel structures (Figure 2.4-13). Heavy-lift helicopters might be used to transport equipment and materials, including the tower components, to remote locations. Helicopters can provide a low-impact alternative for almost all phases of construction. In some difficult locations, their use might reduce required construction time, allow work in remote or inaccessible locations, eliminate the need for extensive road building, reduce the construction footprint considerably, and reduce environmental impacts.

Large reels of rope then would be staged on the C-HC Project ROW, and individual ropes would be drawn through pulleys from structure to structure. The conductors would then be attached to the ropes and pulled into place (Figure 2.4-14). Pulling sites would be spaced about 10,000 feet apart. The pulleys then would be removed, and the conductors would be attached to the insulators and properly tensioned. If the conductors are double bundled, spacers might be inserted at appropriate distances along the conductors. In some situations, implosives could be used to splice the conductors. Light-duty helicopters might be used along the entire length of the C-HC Project ROW in stringing operations, including the installation of conductors, shield wires, and bird diverters.

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

Figure 2.4-12. Installing the top section of a structure with a crane.

Figure 2.4-13. Installing a structure on a foundation with a helicopter.

Figure 2.4-14. Pulling the conductor through the structure arms.

2.4.3.4 SUBSTATION CONSTRUCTION

Construction activities at the proposed Hill Valley Substation would include site preparation, clearing and grading, foundation installation, and equipment installation. Site preparation would include installing erosion control BMPs, stripping topsoil, and hauling in structural fill to build up the subgrade for the substation pad. Spoil disposal could include transferring the material to an adjacent landowner or other user who needs fill material. The Utilities' standard practice is to avoid disposing of clean soil in a landfill, if possible.

Clearing and grading would be required for the new substation site. The area would be graded to level the substation site and install stormwater facilities and the driveway. The Utilities estimate that grading the site would result in approximately 80,000 cubic yards of earth cutting over 8.5 acres. This soil would then be used on-site to fill about 7 acres of areas with lower elevations. Soils would be imported onto or exported from the site.

Construction within the newly created substation pad would consist of drilled pier foundations ranging in size from 3 to 7 feet in diameter and 10 to 25 feet deep. The foundations would be installed to support transmission line dead-end structures, static masts, and bus and equipment support structures. Slabs-on-grade 9 × 32 feet and up to 3 feet thick would be used for 345-kV circuit breakers, and 8-foot-square × 2 feet thick would be used for 138-kV circuit breakers. The control building would be supported by a perimeter wall up to 5 feet deep set on a spread footer with pier supports. Transformer and reactor secondary oil containment would be a concrete-lined pot filled with stone. Conduit for control and communication cables and grounding conductor would be installed prior to the placement of the final layer of crushed rock surfacing. The ground grid would be installed 18 inches below the subgrade surface throughout the substation pad and extend 5 feet outside the substation security wall.

Construction also includes installation of stormwater facilities. Facilities would be designed in accordance with State of Wisconsin long-term stormwater management performance requirements and erosion controls, as stated in WAC Chapters NR 216 and NR 151. For sites containing up to 40% connected impervious areas, 90% of the pre-development infiltration volume would be infiltrated. In addition, BMPs would be implemented so that no more than 5 tons per acre per year of the sediment load carried in runoff would be discharged from initial grading to final stabilization.

Once the substation pad is built to the subgrade, all areas would be restored, and the site would be ready for use.

2.4.3.5 SITE RESTORATION

Site restoration, including revegetation where necessary, would be completed as soon as practical and as allowed by seasonal conditions. The need for and approach to site restoration and revegetation would be based on the degree of disturbance caused by construction activities and the ecological setting of each site, and would comply with the easement agreements previously established with the landowners.
If the landowners permit it, the Utilities would prefer to leave leveled areas and working pads in place for future C-HC Project maintenance activities. Otherwise, the sites would be graded back to their original conditions as much as possible, and all imported fill would be removed and hauled to an approved disposal site.

The excavated topsoils would be replaced and spread in a thin layer on surrounding upland areas around the structure sites and stabilized, to ensure optimal conditions for revegetation. If construction and access in any particular location could be accomplished without creating appreciable soil disturbance, restoration might not require active revegetation efforts. In some cases, where it is reasonable to allow the natural ground cover to reestablish itself, the underlying perennial vegetation would usually reestablish within one growing season. Annual grasses might also be sown to minimize the potential for erosion while reestablishment is occurring. In cases where there is no sign of regrowth of preexisting vegetation species in the first month of the subsequent growing season, an assessment would be made, and if necessary, an appropriate seed mix, consistent with the surrounding vegetation, would be brought in and properly applied.

New topsoil would be brought in and spread on agricultural lands where it was lost or seriously mixed with subsoils. Compacted agricultural soils would be decompacted to return the soil structure to its original condition. Any drainage tiles or other agricultural features that were damaged by construction activities would be repaired or replaced, or the landowner would be compensated.

Areas where crops are not present, such as roadsides, pastures, old fields, upland woods, and wetlands, would be seeded with native seed mixes or other appropriate, non-invasive or non-nuisance seed mixes approved by the landowner, and then weed-free mulch would be laid down. In wetlands, excavated surface soils or the organic layer containing the plant parts and rootstocks of native wetland vegetation could be spread around the disturbed areas to enhance the reestablishment of the original wetland vegetation, if deemed appropriate by the necessary Clean Water Act permits.

The matting, temporary bridges, and construction-related materials would be removed at the completion of each stage of construction. Most of the new or improved C-HC Project access roads would be restored to preconstruction conditions and weed-free mulch would be spread evenly so that it does not hinder revegetation. However, some of the access roads might be retained for long-term maintenance and operation of the C-HC Project transmission line, and others might be left in place to comply with landowner easements. Following completion of restoration and reestablishment of vegetation within the ROW, all temporary restoration erosion control devices not designed to be left in place (e.g., sediment logs and silt fencing) would be removed and properly disposed.

In residential and urban areas where all vegetation has been removed, negotiated easements might require replacing vegetation with landscaping and low-growing shrubs and grasses. Species used for vegetation replacement would be similar to the vegetation in the surrounding area and would not be nuisance or invasive species, according to applicable state and Federal lists. These plantings would have to comply with the Utilities' vegetation management plans, however, and must not impede maintenance activities for the new line. Any driveways, curbs, or roads damaged during the construction of the line would need to be repaired or replaced.

Restoration of disturbed areas would comply with Wisconsin Department of Natural Resources (WDNR) Technical Standards/BMPs (WDNR 2018a) or Iowa Department of Natural Resources (IDNR) BMPs (IDNR 2006). During active construction and ROW restoration, revegetation and restoration activities would be inspected, and written documentation of the inspection would be maintained describing the revegetation progress and corrective measures taken, if applicable. Site restoration activities would be implemented, monitored, and remedial measures applied (as necessary) until established restoration goals are achieved, as required by regulatory permits obtained for the C-HC Project. The Utilities would adhere to the environmental commitments enumerated in Table 3.1-4 and to the BMPs listed in Appendix D. During restoration, erosion and sediment control measures, including measures for stabilization of disturbed areas during and at the completion of construction, would be implemented as defined in the Stormwater Pollution Prevention Plan (SWPPP) developed for the C-HC Project. Areas where ground disturbance occurs would be monitored until 70% revegetation has been established. In non-agricultural area where ground disturbance occurs, the area would be monitored until the ground cover has been reestablished to at least 70% of the vegetation type, density, and distribution that was documented in the area prior to construction. In areas that were previously forested, disturbed areas would be revegetated consistent with the non-invasive herbaceous vegetation that occurs in the area.

2.4.4 *Operation and Maintenance Activities*

NERC has established reliability standards for transmission line ROW vegetation management on transmission line systems. These standards apply to all transmission line owners in North America. NERC is also responsible for compliance review and enforcement. Because of the NERC reliability standards, the type of vegetation allowed to regrow in the new C-HC Project ROW would be based on its potential to interfere with the conductors and each landowner's easement contract.

The Utilities would also be required to maintain their ROW and clearances in accordance with the adoption of the National Electrical Safety Code by Iowa and Wisconsin.

NERC generally requires the pruning or removal of interfering trees, to minimize the risk of vegetation-related outages. Otherwise, there would be an increased potential for fires or electrical or mechanical damages to the electrical equipment.

Thus, during C-HC Project operation, the Utilities would be required to maintain the ROW so that vegetation is kept at safe distances from the conductors. This would be accomplished by performing routine vegetation maintenance. The ROW under the conductors (sometimes referred to as the wire zone), and any additional ROW width that is deemed necessary for conductor maintenance and repair, would be maintained in low-growing, non-woody plants and grasses. Other incompatible vegetation would be removed off-site or chipped and mulched within the ROW.

In the remaining ROW width (sometimes referred to as the border zone), from the wire zone to the edge of the ROW, the Utilities might decide to allow low-growing and minimally dense woody vegetation. But anything located in the border zone could be removed, if it is not specified in the easement contract or if there is a change to the operation or maintenance requirements of the electrical facilities. Easement rights vary depending on the language used in the contract. The Utilities reserve the right to trim and remove all trees and shrubs for the full width of the easement. To the extent practicable, the Utilities would attempt to conduct routine maintenance in threatened and endangered avian species habitat outside of the migratory bird nesting season. The Utilities' maintenance crews are trained to identify and avoid active nests during vegetation-clearing activities.

Outside of the C-HC Project ROW, the Utilities might complete additional tree trimming or removal. Under WAC Public Service Commission (PSC) 113.0512, transmission owners are required to trim or remove other trees that could pose a threat to the transmission line even if those trees occur outside the border zone and the project ROW. These are classified as "hazard" trees, which pose an unacceptable risk of falling and contacting the transmission line before the next ROW maintenance cycle. If identified, these hazard trees must be topped, pruned, or felled so that they no longer pose a hazard. In Iowa, the 200-foot ROW would accommodate all necessary vegetation management, including the removal of hazard trees, to occur only within the ROW to protect the transmission line.

2.5 Connected Actions

Connected actions are those that are closely related to the proposed project and should therefore be discussed in the same impact statement (40 CFR 1508.25). CEQ defines connected actions as those actions that:

(i) Automatically trigger other actions which may require EISs;

(ii) Cannot or will not proceed unless other actions are taken previously or simultaneously;

(iii) Are interdependent parts of a larger action and depend on the larger action for their justification.

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

1 The retirement of Dairyland's 69-kV transmission line (referred to as the N-9 transmission line in this DEIS) that crosses the Refuge in Iowa and is shown in Figure 2.5-2.

2 The installation of minor equipment at one of two substations in Wisconsin, depending on the selected alternative.

Both connected actions are described in greater detail below.

2.5.1 *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 at the Stoneman Substation, in Cassville, Wisconsin then crossing the Mississippi River and ending approximately 0.2 mile north of the Turkey River Substation in Clayton County, Iowa (Figure 2.5-1). A new segment of the N-9 transmission line would be built to connect the existing N-9 transmission line with the Turkey River Substation (Figure 2.5-2). This new segment would be approximately 0.2 miles long and cross private and public property. Dairyland is proposing to decommission the N-9 transmission line in the winter months. It is anticipated that the connected action would take approximately 2 months (decommission the existing transmission line and building the new connection with the Turkey River Substation).

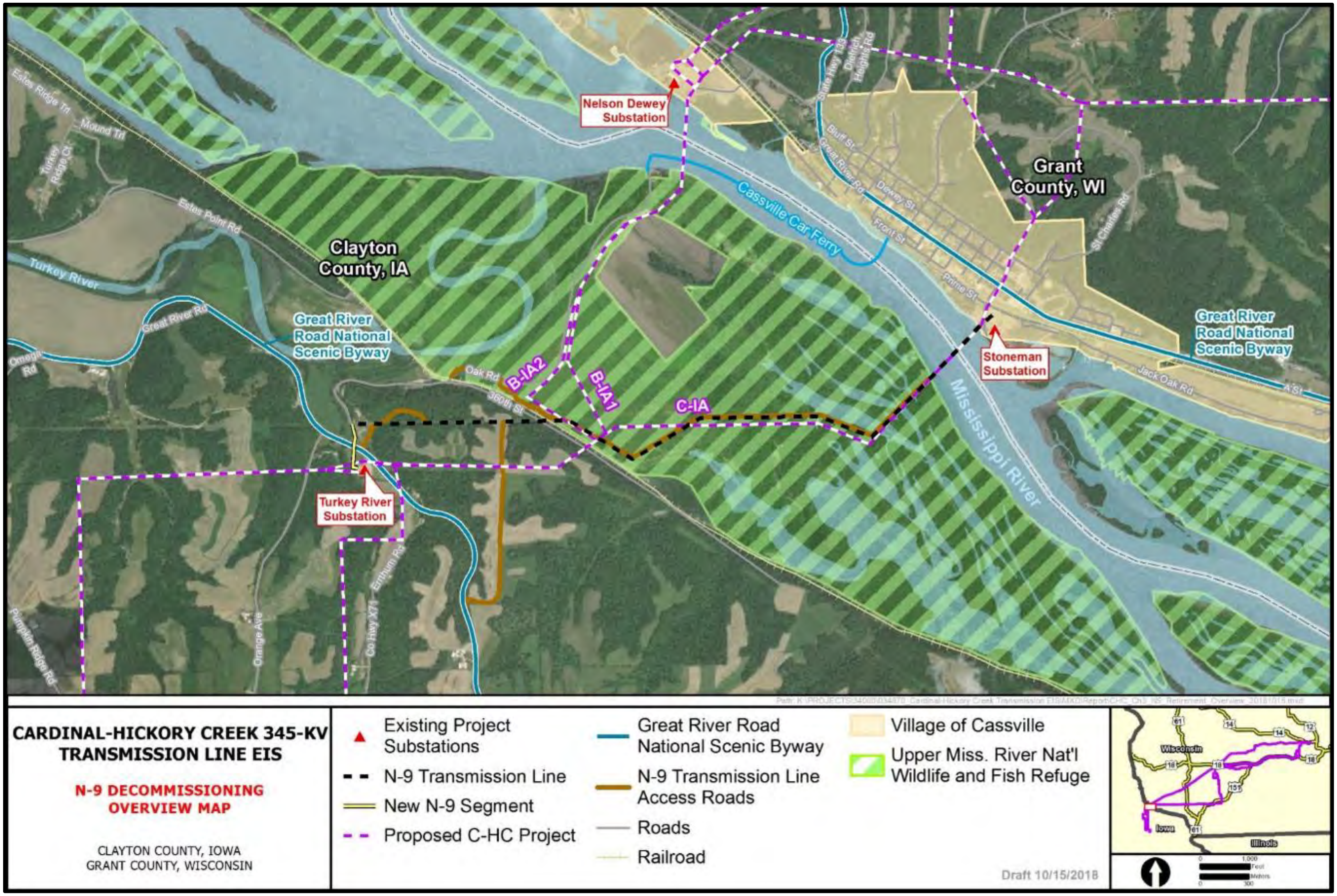

Figure 2.5-1. N-9 transmission line overview map.

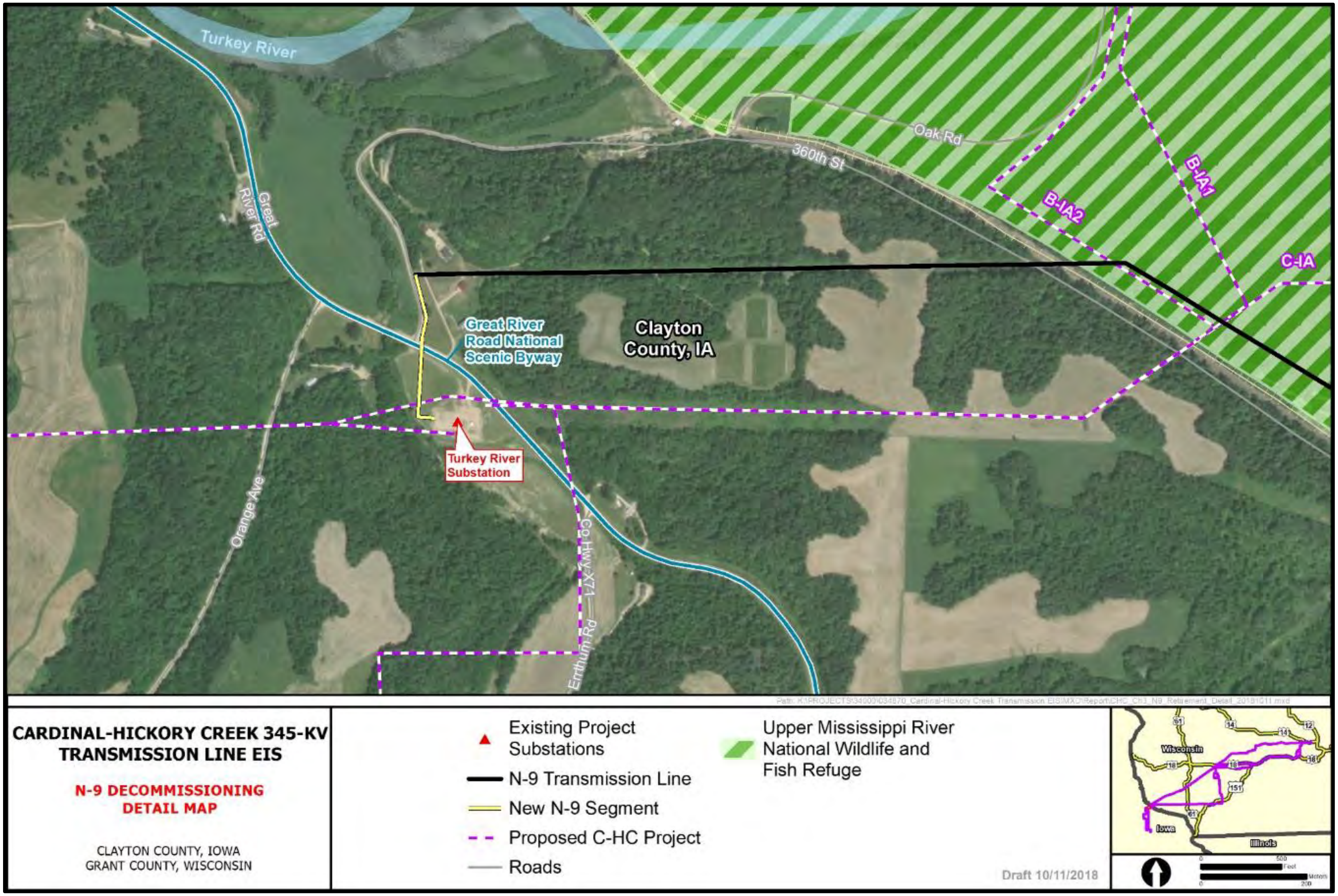

Figure 2.5-2. New connection between N-9 transmission line and Turkey River Substation.

The majority of the structures to be removed are single wood pole H-frame structures. The 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 located would be filled. In wetlands, all of the structures may be cut off at ground level to minimize impacts to the wetlands.

Within the Refuge, there are four river crossing lattice structures requiring a crane for removal. Once the structures have been dismantled the material will be recycled. The foundations would be removed 4 feet below the ground surface and the remaining foundation would be covered with clean fill.

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 located 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.

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 be constructed and/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.

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.

Dairyland's 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 (Figure 2.5-2).

2.5.2 *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 selected route. The equipment would be needed to use the optical ground wire that would be part of the C-HC Project. The cost of the equipment installation is not included in the C-HC Project. No ground disturbance would occur outside either of the existing substation footprints for the connected action.

2.6 Comparison of Alternatives

Table 2.6-1 presents a summary comparison of potential impacts to resources analyzed in Chapter 3 for each action alternative. There are a few key pieces of information that are important for the reader to keep in mind while reviewing this summary table. The reader is referred to Chapter 3 for a definition of the area of analysis for each resource. Although several of the resources analyzed in Chapter 3 assess potential impacts to areas extending beyond the transmission line ROW, the impacts presented for comparison here are limited to just those impacts that will occur within the transmission line ROW as these impacts account for the majority of impacts from the C-HC Project. See Chapter 3 for additional detail on potential impacts assessed beyond the transmission line ROW, as well as impacts common to all alternatives for each resource. Lastly, there are a few common impact indicators that are used to assess impacts to several resources. For example, wetlands and prime farmland are used as impact indicators for geology and soils, vegetation, land use, and socioeconomics. In these cases, the impact indicator (such as prime farmland) is presented in the primary resource (such as land use) but may also be mentioned in another resource group. These instances are not intended to confuse the reader or to appear as if the resource was analyzed more than once with varying results. For clarification and additional detailed discussion on how the impact analysis was conducted, the reader is referred to Chapter 3.

Table 2.6-1. Comparison Summary for Action Alternatives

(MiT = minor temporary; MoT = moderate temporary; MiP = minor permanent; MoP = moderate permanent; MaP = major permanent)

Resource Group	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Geology and Soils	MoT impacts to 149 acres of shallow soils; 93 acres of wet soils; 173 acres of steep slope soils; and severe erosion potential for 1,265 acres; MiP impacts to 63,000 cubic yards of displaced subsurface soils and ≤24 acres of sensitive soils	MoT impacts to 141 acres of shallow soils; 104 acres of wet soils; 171 acres of steep slope soils; and severe erosion potential for 1,352 acres; MiP impacts to 66,000 cubic yards of displaced subsurface soils and ≤24 acres of sensitive soils	MoT impacts to 159 acres of shallow soils; 106 acres of wet soils; 171 acres of steep slope soils; and severe erosion potential for 1,284 acres; MiP impacts to 73,000 cubic yards of displaced subsurface soils and ≤24 acres of sensitive soils	MoT impacts to 155 acres of shallow soils; 81 acres of wet soils; 96 acres of steep slope soils; and severe erosion potential for 1,111 acres; MiP impacts to 80,000 cubic yards of displaced subsurface soils and ≤24 acres of sensitive soils	MoT impacts to 165 acres of shallow soils; 91 acres of wet soils; 92 acres of steep slope soils; and severe erosion potential for 1,238 acres; MiP impacts to 85,000 cubic yards of displaced subsurface soils and ≤24 acres of sensitive soils	MoT impacts to 144 acres of shallow soils; 73 acres of wet soils; 82 acres of steep slope soils; and severe erosion potential for 1,092 acres; MiP impacts to 70,000 cubic yards of displaced subsurface soils and ≤24 acres of sensitive soils
Vegetation	MoT and MoP impacts to 228 acres of grassland, 524 acres of forest, and 10 acres of shrubland	MoT and MoP impacts to 249 acres of grassland, 530 acres of forest, and 9 acres of shrubland	MoT and MoP impacts to 302 acres of grassland, 504 acres of forest, and 10 acres of shrubland	MoT and MoP impacts to 433 acres of grassland, 236 acres of forest, and 16 acres of shrubland	MoT and MoP impacts to 454 acres of grassland, 245 acres of forest, and 8 acres of shrubland	MoT and MoP impacts to 355 acres of grassland, 252 acres of forest, and 17 acres of shrubland
Wetlands	MoT impacts to 72 acres; MoP impacts to 38 acres	MoT impacts to 69 acres; MoP impacts to 52 acres	MoT impacts to 58 acres; MoP impacts to 49 acres	MoT impacts to 54 acres; MoP impacts 16 acres	MoT impacts to 61 acres; MoP impacts 5 acres	MoT impacts to 63 acres; MoP impacts 7 acres
Special Status Plants	Minor impacts	Same impact as Alternative 1	Same impact as Alternative 1	Same impact as Alternative 1	Same impact as Alternative 1	Same impact as Alternative 1
Wildlife	MiT impacts to 228 acres of grassland habitat, 110 acres of wetlands, and 15 acres of open water; MoP impacts to 524 acres of forest habitat	MiT impacts to 249 acres of grassland habitat, 121 acres of wetlands, and 13 acres of open water; MoP impacts to 530 acres of forest habitat	MiT impacts to 302 acres of grassland habitat, 107 acres of wetlands, and 11 acres of open water; MoP impacts to 504 acres of forest habitat	MiT impacts to 433 acres of grassland habitat, 69 acres of wetlands, and 11 acres of open water; MoP impacts to 236 acres of forest habitat	MiT impacts to 454 acres of grassland habitat, 66 acres of wetlands, and 10 acres of open water; MoP impacts to 245 acres of forest habitat	MiT impacts to 203 acres of grassland habitat, 72 acres of wetlands, and 14 acres of open water; MoP impacts to 252 acres of forest habitat
Special Status Species	May affect, not likely to adversely affect the Iowa Pleistocene snail; MoT impacts to 76 acres of high-potential and 954 acres low-potential rusty patched bumble bee habitat	Same impact as Alternative 1 to Iowa Pleistocene snail; MoT impacts to 86 acres of high-potential and 958 acres low-potential rusty patched bumble bee habitat	Same impact as Alternative 1 to Iowa Pleistocene snail; MoT impacts to 77 acres of high-potential and 1,003 acres low-potential rusty patched bumble bee habitat	Same impact as Alternative 1 to Iowa Pleistocene snail; MoT impacts to 51 acres of high-potential and 995 acres low-potential rusty patched bumble bee habitat	Same impact as Alternative 1 to Iowa Pleistocene snail; MoT impacts to 45 acres of high-potential and 937 acres low-potential rusty patched bumble bee habitat	Same impact as Alternative 1 to Iowa Pleistocene snail; MoT impacts to 55 acres of high-potential and 948 acres low-potential rusty patched bumble bee habitat
Water Resources	MiT impacts to 8 impaired waterways, 3 outstanding and exceptional waters, and 12 trout streams	MiT impacts to 8 impaired waterways, 3 outstanding and exceptional waters, and 11 trout streams	MiT impacts to 5 impaired waterways, 10 outstanding and exceptional waters, and 9 trout streams	MiT impacts to 8 impaired waterways, 8 outstanding and exceptional waters, and 7 trout streams	MiT impacts to 9 impaired waterways, 8 outstanding and exceptional waters, and 7 trout streams	MiT impacts to 6 impaired waterways, 6 outstanding and exceptional waters, and 10 trout streams
Floodplains	MiT impacts to 14 crossings > 1,000 feet, 43,661 linear feet of floodplains, and 9,901 linear feet of floodway	MiT impacts to 14 crossings > 1,000 feet, 40,100 linear feet of floodplains, and 8,620 linear feet of floodway	MiT impacts to 10 crossings > 1,000 feet, 28,310 linear feet of floodplains, and 8,620 linear feet of floodway	MiT impacts to 8 crossings > 1,000 feet, 21,150 linear feet of floodplains, and 8,620 linear feet of floodway	MiT impacts to 7 crossings > 1,000 feet, 21,051 linear feet of floodplains, and 9,091 linear feet of floodway	MiT impacts to 11 crossings > 1,000 feet, 35,091 linear feet of floodplains, and 9,091 linear feet of floodway

Resource Group	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Air Quality	MiT impacts	Same impact as Alternative 1	Same impact as Alternative 1	Same impact as Alternative 1	Same impact as Alternative 1	Same impact as Alternative 1
Noise	MiT impacts to 2 sensitive noise receptors	MiT impacts to 3 sensitive noise receptors	MiT impacts to 4 sensitive noise receptors	MiT impacts to 10 sensitive noise receptors	MiT impacts to 2 sensitive noise receptors	MiT impacts to 8 sensitive noise receptors
Transportation	MiT impacts to 2,381 roadway segments; MoT impacts to 1 major river and 24 railroad segments; MoP impacts to 5 airport/heliport facilities	MiT impacts to 2,408 roadway segments; MoT impacts to 1 major river and 24 railroad segments; MoP impacts to 5 airport/heliport facilities	MiT impacts to 2,658 roadway segments; MoT impacts to 1 major river and 30 railroad segments; MoP impacts to 6 airport/heliport facilities	MiT impacts to 3,024 roadway segments; MoT impacts to 1 major river and 26 railroad segments; MoP impacts to 9 airport/heliport facilities	MiT impacts to 3,070 roadway segments; MoT impacts to 1 major river and 26 railroad segments; MoP impacts to 10 airport/heliport facilities	MiT impacts to 2,765 roadway segments; MoT impacts to 1 major river and 20 railroad segments; MoP impacts to 8 airport/heliport facilities
Cultural and Historic Resources	9 NRHP-listed, determined eligible, or assumed eligible resources could be impacted	8 NRHP-listed, determined eligible, or assumed eligible resources could be impacted	15 NRHP-listed, determined eligible, or assumed eligible resources could be impacted	21 NRHP-listed, determined eligible, or assumed eligible resources could be impacted	25 NRHP-listed, determined eligible, or assumed eligible resources could be impacted	11 NRHP-listed, determined eligible, or assumed eligible resources could be impacted
Land Use	See impacts to land cover classes under Vegetation	See impacts to land cover classes under Vegetation	See impacts to land cover classes under Vegetation	See impacts to land cover classes under Vegetation	See impacts to land cover classes under Vegetation	See impacts to land cover classes under Vegetation
Agriculture	MiT impacts to 1,096 acres of agriculture land cover type, 399 acres of prime farmland, and 553 acres of farmland of statewide importance; MaP impacts to 11 acres of prime farmland and 11 acres of farmland of statewide importance	MiT impacts to 1,146 acres of agriculture land cover type, 375 acres of prime farmland, and 630 acres of farmland of statewide importance; MaP impacts to 22 acres of prime farmland	MiT impacts to 1,299 acres of agriculture land cover type, 636 acres of prime farmland, and 661 acres of farmland of statewide importance; MaP impacts to 22 acres of prime farmland	MiT impacts to 1,361 acres of agriculture land cover type, 872 acres of prime farmland, and 725 acres of farmland of statewide importance; MaP impacts to 22 acres of prime farmland	MiT impacts to 1,534 acres of agriculture land cover type, 935 acres of prime farmland, and 815 acres of farmland of statewide importance; MaP impacts to 11 acres of prime farmland and 11 acres of farmland of statewide importance	MiT impacts to 1,167 acres of agriculture land cover type, 649 acres of prime farmland, and 612 acres of farmland of statewide importance; MaP impacts to 11 acres of prime farmland and 11 acres of farmland of statewide importance
Recreation	MiT impacts to 4 recreational areas and MoT impacts to 1 recreational area; MiP impacts to 1 recreational area and MoP impacts to 2 recreational areas	MiT impacts to 4 recreational areas and MoT impacts to 1 recreational area; MiP impacts to 2 recreational area and MoP impacts to 1 recreational areas	MiT impacts to 5 recreational areas and MoT impacts to 1 recreational area; MiP impacts to 1 recreational area and MoP impacts to 2 recreational areas	MiT impacts to 4 recreational areas and MoT impacts to 1 recreational area; MoP impacts to 3 recreational areas	MiT impacts to 3 recreational areas and MoT impacts to 2 recreational area; MoP impacts to 4 recreational areas	MiT impacts to 2 recreational areas and MoT impacts to 2 recreational area; MiP impacts to 1 recreational area and MoP impacts to 3 recreational areas
Visual Quality and Aesthetics	MiP impacts at the overall project level; MaP impacts to 2 residences; MaP impacts, as well as beneficial impacts to the Refuge; MiP impacts to the Great River Road National Scenic Byway	MiP impacts at the overall project level; MaP impacts to 2 residences; MiP impacts to the Refuge; MaP to the Great River Road National Scenic Byway	MiP impacts at the overall project level; MaP impacts to 3 residences; MiP impacts to the Refuge; MaP impacts to the Great River Road National Scenic Byway	MiP impacts at the overall project level; MaP impacts to 9 residences; MiP impacts to the Refuge; MaP impacts to the Great River Road National Scenic Byway	MiP impacts at the overall project level; MaP impacts to 2 residences; MaP impacts, as well as beneficial impacts to the Refuge; MiP impacts to the Great River Road National Scenic Byway	MiP impacts at the overall project level; MaP impacts to 8 residences; MaP impacts, as well as beneficial impacts to the Refuge; MiP impacts to the Great River Road National Scenic Byway

Resource Group	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
Socioeconomics	MiT positive impacts to employment and income with $480,937,254 of temporary spending and $948,105 annual spending; MoT and MiP impacts to property values for 2 residences	MiT positive impacts to employment and income with $494,675,522 of temporary spending and $954,541 annual spending; MoT and MiP impacts to property values for 2 residences	MiT positive impacts to employment and income with $544,948,945 of temporary spending and $1,119,447 annual spending; MoT and MiP impacts to property values for 3 residences	MiT positive impacts to employment and income with $557,603,250 of temporary spending and $1,154,985 annual spending; MoT and MiP impacts to property values for 9 residences	MiT positive impacts to employment and income with $568,612,262 of temporary spending and $1,210,366 annual spending; MoT and MiP impacts to property values for 2 residences	MiT positive impacts to employment and income with $490,301,721 of temporary spending and $844,933 annual spending; MoT and MiP impacts to property values for 8 residences
Public Health and Safety	MiP exposure to EMF for 2 residences	MiP exposure to EMF for 1 school and 2 residences	MiP exposure to EMF for 1 school and 3 residences	MiP exposure to EMF for 1 school and 9 residences	MiP exposure to EMF for 2 residences	MiP exposure to EMF for 8 residences
The Refuge	*Segment B-IA1* Permanent impacts to a total of 23 acres in the ROW of the restoration area within the Refuge, 0.1 acre of wetlands, and 0 acres of forest removal within ROW; Temporary impacts to 39 acres of sensitive soils, 38 acres of wetlands *Segment B-IA2* Permanent impacts to a total of 27 acres in the ROW of the restoration area within the Refuge, 1 acre of wetlands, and 1 acre of forest removal within ROW; Temporary impacts to 44 acres of sensitive soils, 35 acres of wetlands	Permanent impacts to a total of 0 acres in the ROW of the restoration area within the Refuge, 12 acre of wetlands and 0 acres of forest removal within ROW; Temporary impacts to 44 acres of sensitive soils, 35 acres of wetlands	Same impact as Alternative 2	Same impact as Alternative 2	Same impact as Alternative 1	Same impact as Alternative 1

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CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Introduction

This chapter describes the existing environmental and human resource conditions that could be impacted by the C-HC Project and the potential impacts that the alternatives presented in Chapter 2 would have on those resources. The affected environment and environmental consequences (also referred to interchangeably as impacts or effects) were determined through desktop research, field surveys along portions of the action alternatives, input from the public scoping period, and ongoing coordination with agencies.

3.1.1 *General Project Setting*

The C-HC Project would be primarily on private land in Wisconsin and Iowa. The C-HC Project would cross the Upper Mississippi River National Wildlife and Fish Refuge (Refuge), which is public land administered by the USFWS with supporting management by the USACE related to specific rights not granted to the USFWS (USFWS 2006a). The eastern termini of the C-HC Project is in Dane County, Wisconsin. The western termini of the C-HC Project is in Dubuque County, Iowa. Counties that would be crossed by one or more of the action alternatives also include Dane County, Iowa County, Grant County, and Lafayette County, Wisconsin; and Clayton County and Dubuque County, Iowa. The proposed Hill Valley Substation would be constructed near Montfort, Wisconsin, either in western Grant County or eastern Iowa County. Figure 3.1-1 shows the six action alternatives, with key resources that will be discussed in subsequent sections of this chapter.

3.1.2 *Resource Topics Analyzed in Detail*

Based on RUS's review of the public scoping comments and ongoing coordination with agencies, the following resources have been identified as potentially being affected by the alternatives carried forward for detailed analysis from Chapter 2:

- Geology and Soils (Section 3.2)
- Vegetation, including Wetlands and Special Status Plants (Section 3.3)
- Wildlife, including Special Status Species (Section 3.4)
- Water Resources and Quality (Section 3.5)
- Air Quality (Section 3.6)
- Noise (Section 3.7)
- Transportation (Section 3.8)
- Cultural and Historic Resources (Section 3.9)
- Land Use, including Agriculture and Recreation (Section 3.10)
- Visual Quality and Aesthetics (Section 3.11)
- Socioeconomics and Environmental Justice (Section 3.12)
- Public Health and Safety (Section 3.13)
- Upper Mississippi River National Wildlife and Fish Refuge (Section 3.14)

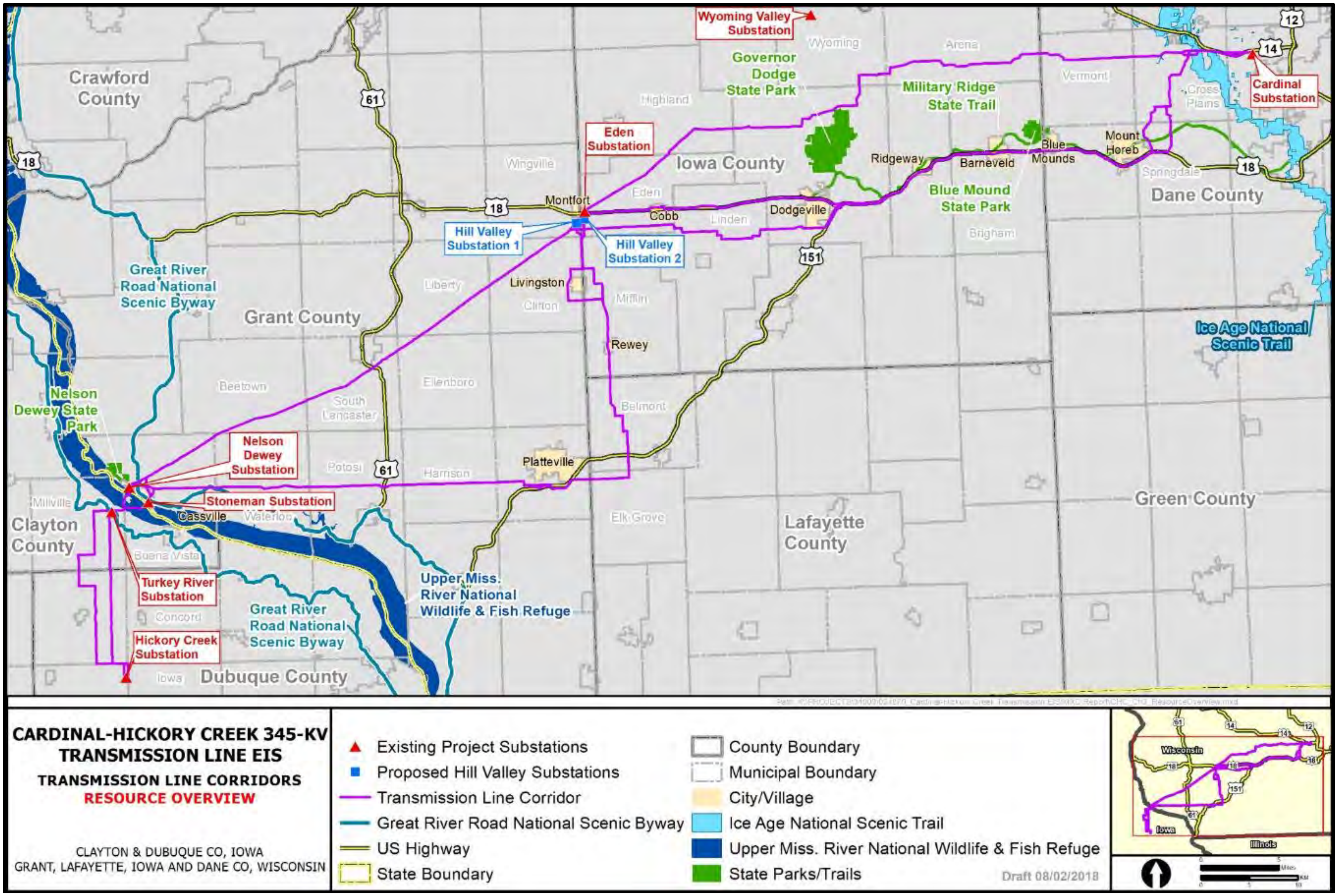

Figure 3.1-1. Resource overview map.

3.1.2.1 AFFECTED ENVIRONMENT

NEPA requires that the environment of the area to be affected by the alternatives under consideration is sufficiently described (40 CFR 1502.15). The Affected Environment section describes the resources that could be affected by the implementation of the alternatives carried forward for detailed analysis from Chapter 2. The resource descriptions provided in the affected environment sections serve as the baseline from which to evaluate the potential impacts of the alternatives.

3.1.2.2 ENVIRONMENTAL CONSEQUENCES

The Environmental Effects section analyzes both beneficial and adverse impacts that would result from implementing any of the alternatives. NEPA requires agencies to assess the direct, indirect, and cumulative impacts the alternatives carried forward for detailed analysis. Direct and indirect impacts are discussed for each resource immediately following the characterization of each resource's affected environment in this chapter of the DEIS. Cumulative impacts are discussed in Chapter 4 of this DEIS.

A direct impact is an effect on a resource that is caused by the proposed action and occurs at the same time and in the same place.

An indirect impact is an effect that is caused by the proposed action and is later in time or farther removed in distance, but is still reasonably foreseeable. Indirect impacts remain consistent within the temporal and spatial boundaries of analysis established for the resource.

To properly and meaningfully evaluate the potential impacts of each alternative, the impacts of each action alternative are measured against the impacts projected to occur under the No Action Alternative. The No Action Alternative is the baseline for purposes of comparison of the alternatives to one another.

Table 3.1-1 summarizes the calculations and spatial dimensions that were used to estimate the ground disturbance that would be caused by the various components of the C-HC Project and compares disturbance calculations by temporary and permanent impacts. Temporary disturbance is classified as disturbance during the construction period only, whereas permanent disturbance is for the lifetime of the project. For more information on project components, refer to Section 2.4.1.

Table 3.1-1. Ground Disturbance Assumptions for Project Components

Project Components	Units	Temporary Disturbance	Permanent Disturbance
Foundation ground disturbance	Per structure	100 feet by 100 feet (0.23 acre)	Up to 12 feet in diameter (0.003 acre)
Foundation depths	Per structure	Up to 60 feet deep 3,000 cubic feet	Up to 60 feet deep 3,000 cubic feet
Conductor pulling sites	Per site	40 feet by 300 feet (0.28 acre)	None
Access roads	Per road	14 to 20 feet wide	None
Laydown yards	Total	213 acres	None
Substation ground disturbance	Total	22 acres	22 acres

In order to determine whether an alternative 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. 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 proposed action. Context in terms of duration of impact are estimated as either short term or long term

(Table 3.1-2). The definitions of intensity are specific to each resource evaluated, and general intensity thresholds are provided in Table 3.1-3. Impact assessment methods, including impact indicators and impact duration definitions, are provided for each resource as part of the environmental consequences presentation.

Table 3.1-2. Impact Duration Definitions

Duration	Description
Short-term	During the construction period through two growing seasons after construction is completed, 1 to 3 years
Long-term	Operational life of the C-HC Project, 3 to 50 years

Table 3.1-3. 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.

Impact analysis for each resource also assumes successful implementation of the environmental commitments that are proposed as part of any action alternative (Table 3.1-4).

Table 3.1-4. Environmental Commitments Common to All Action Alternatives

Resource	Environmental Commitment
General	• Regulatory agencies may require independent third-party environmental monitors related to permitted aspects of the C-HC Project. The Utilities use trained staff members or contractors as monitors for special resource conditions as a standard practice
Geology and Soils	• An erosion control plan, coordinated with the IDNR and WDNR, would be prepared once a route is approved, and BMPs would be employed near aquatic features (wetlands, streams, waterbodies) to minimize the potential for erosion and to prevent any sediments from entering the aquatic features. • Erosion controls would be regularly inspected and maintained throughout the construction phase of a project until exposed soil has been adequately stabilized.
Vegetation, including Wetlands and Special Status Plants	**General Vegetation** • During restoration, erosion and sediment control measures, including measures for stabilization of disturbed areas during and at the completion of construction, would be implemented as defined in the SWPPP developed for the C-HC Project. Areas where ground disturbance occurs would be monitored until 70% revegetation has been established. • In non-agricultural area where ground disturbance occurs, the area would be monitored until ground cover is reestablished to at least 70% of the vegetation type, density, and distribution that was documented in the area prior to construction. • In areas that were previously forested, disturbed areas would be revegetated consistent with non-invasive herbaceous vegetation that occurs in the area. **Algific Talus Slopes** • Upon final route selection and after landowner permission is obtained, additional habitat assessments and algific talus slope surveys will be completed along the final route selected in Iowa. • Geotechnical surveys at the proposed pole locations will be completed along the final route selected in Iowa to determine whether caves or cavities exist in bedrock that could be connected to algific talus slopes within or adjacent to the action area. • Should any algific talus slopes be identified during habitat assessments, or any caves or cavities be detected in the bedrock during geotechnical surveys, they will be avoided by construction. • Pole locations and construction access roads will be adjusted to avoid algific talus slopes, if present. • If algific talus slopes are identified, vegetation removal on steep slopes would be minimized to only the amount necessary to maintain conductor clearances. • Broadcast spraying of herbicides will be avoided and careful spot spraying will be used in suitable algific talus slope habitat areas.

Resource	Environmental Commitment

	Woodlands
	• To minimize the spread of oak wilt, the cutting or pruning of oak trees between April 15 and July 1 for maintenance would be conducted in accordance with WAC PSC 113.051.
	• 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 would be employed, which 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 Agriculture, Trade, and Consumer Protection [ATCP] 21.17). Where ash wood products cannot be left on-site, alternative plans would be developed to meet the requirements.
	• Standard practices used in the quarantine area to avoid the spread of gypsy moth damage include inspections by trained staff 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.
	Wetlands
	• Impacts to wetlands would be minimized by one or more of the following measures:
	  o Conducting construction activities when wetland soils and water are frozen or stable and vegetation is dormant.
	  o Use of equipment with low ground-pressure tires or tracks.
	  o Placement of construction matting to help minimize soil and vegetation disturbances and distribute axle loads over a larger surface area, thereby reducing the bearing pressure on wetland soils.
	• Access roads through wetlands will not require permanent fill.
	• Erosion control BMPs will be installed where needed to prevent soil erosion into and within wetlands.
	• Any spoils will be removed from wetlands to non-sensitive upland areas or other approved location. Cleaning of construction equipment and mats, per the Wisconsin Council on Forestry's "Invasive Species Best Management Practices: Rights-of-Way" guidance to mitigate the spread of invasive species (Appendix D). Where necessary to ameliorate minor impacts, such as rutting and vegetation disturbance due to equipment operation and mat placement in wetlands, site restoration activities will be implemented, monitored, and remedial measures applied until established restoration goals are achieved, as required by regulatory permits obtained for the C-HC Project.
	Invasive Species
	• The Utilities would follow the Wisconsin Council on Forestry's "Invasive Species Best Management Practices: Rights-of-Way" guidance to mitigate the spread of invasive species (see Appendix D).
	• Work below the ordinary high-water mark (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 WAC NR 329.04(5)).
	• Uninfested natural areas, such as high-quality wetlands, forests and prairies will 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.
	  o The WDNR or IDNR, as applicable, would be consulted to determine the best methods for control of encountered invasive species.
	• The Utilities will employ a Certified Pesticide Applicator for all herbicide applications within the C-HC Project. The Certified Pesticide Applicators will only use herbicides registered and labeled by the USEPA and will follow all herbicide product label requirements. Herbicides approved for use in wetland and aquatic environments will be used in accordance with label requirements, as conditions warrant.

Wildlife, including Special Status Species	• In accordance with WDNR avoidance and minimization measures, reptile exclusion fencing would be installed in areas during the appropriate season where habitat is likely to support rare turtles, snakes, or salamanders. • The Utilities will develop a project-specific Avian Protection Plan for the C-HC Project. An eagle management plan will be included as part of the Avian Protection Plan. • Bird flight diverters 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. • Design standards for this project will meet avian-safe guidelines as outlined by the Avian Powerline Interaction Committee for minimizing potential avian electrocution risk. • The Utilities will identify locations, in coordination with USFWS, IDNR, and WDNR, where the installation of bird flight diverters will be recommended to minimize the potential for avian collisions. If an eagle nest occurs near the ROW, the Utilities will coordinate with the USFWS to determine if and where bird flight diverters are needed to minimize collision risk.

Resource	Environmental Commitment
	• The Utilities will coordinate with the USFWS, IDNR, and WDNR on eagle nest surveys to occur before construction activities to identify eagle nests within 0.5 mile on either side of the ROW. The surveys would occur preferably in the winter or spring before leaf-on when nests are the most visible. • The Utilities will coordinate with the USFWS if an eagle nest occurs within 660 feet of the edge of the ROW to determine if and which permits are recommended or if mitigation measures are appropriate to minimize impacts. • The Utilities will work with the IDNR and the 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. • Prior to tree clearing during migratory bird nesting season, the Utilities will complete a field review of the final ROW to identify existing stick nests. Tree clearing crews will also be trained to stop work and notify Environmental staff if they encounter an unanticipated nest. • Vegetation clearing within threatened and endangered avian species habitat will be avoided during migratory bird nesting season. **<u>Iowa Pleistocene Snail</u>** • Upon final route selection and after landowner permission is obtained, additional habitat assessments and algific talus slope surveys will be completed along the final route selected in Iowa. • Geotechnical surveys at the proposed pole locations will be completed along the final route selected in Iowa to determine whether caves or cavities exist in bedrock that could be connected to algific talus slopes within or adjacent to the action area. • Should any algific talus slopes be identified during habitat assessments, or any caves or cavities be detected in the bedrock during geotechnical surveys, they will be avoided by construction. • Pole locations and construction access roads will be adjusted to avoid algific talus slopes, if present. • Vegetation removal that occurs on steep slopes along the proposed ROW in Iowa will be the minimum amount necessary to maintain conductor clearances. • All seed mixes used for restoration and revegetation in areas of algific talus slope habitat will be free of neonictinoids. • The use of BMPs during construction and vegetation management activities to prevent the spread of invasive species will help to maintain greater plant diversity along the cleared transmission corridors. **<u>Northern Long-eared Bat</u>** • Tree removal activities will be avoided during the northern long-eared bat "pup season" (June 1 to July 31) to avoid potential direct impacts to pups at roosts. • Northern long-eared bat surveys will be performed between the two proposed corridors within the Upper Mississippi River National Wildlife and Fish Refuge per the USFWS's most recent Range-wide Indiana Bat/Northern Long-eared Bat Summer Survey Guidelines (USFWS 2018a). • Northern long-eared bat surveys may be performed along other portions of project segments per the most recent survey guidelines to determine northern long-eared bat presence or probable absence. Areas having survey results of probable absence would not be subject to tree removal restrictions during the pup season. **<u>Rusty Patched Bumble Bee</u>** • Prior to construction, areas within High Potential Zones preliminarily screened as low-quality habitat or questionable habitat will be evaluated and documented using the *Rusty Patched Bumble Bee Habitat: Assessment Form and Guide* (Xerces Society for Invertebrate Conservation 2017). • Areas determined to contain suitable habitat within High Potential Zones per the *Rusty Patched Bumble Bee Habitat: Assessment Form and Guide (*Xerces Society for Invertebrate Conservation 2017) will be surveyed for rusty patched bumble bee no more than 1 year prior to construction per the Survey Protocols for the Rusty Patched Bumble Bee (USFWS 2018b). Additional surveys may be performed more than 1 year prior to construction to guide project planning. • Where the rusty patched bumble bee is confirmed to be present, disturbance and vegetation clearing conducted between March 15 and October 14 will be minimized to the extent possible along edges of woodlots and in open areas with abundant floral resources where nesting habitat is more likely to be found. • Seed mixes containing a diversity of native flowering plants will be used to reseed existing suitable habitat areas that require revegetation/restoration within High Potential Zones, as well as opportunity areas for expanding suitable habitat within known High Potential Zones. • All seed mixes used for restoration and revegetation will be free of neonicotinoids. • The use of BMPs during construction and vegetation management activities to prevent the spread of invasive species will help to maintain greater plant diversity along the cleared transmission corridors.

Resource	Environmental Commitment
	• Herbicide application where used for vegetation management purposes in suitable habitat within High Potential Zones will be targeted to limit the effects of the herbicide beyond the targeted species. • To avoid or minimize impacts in areas documented by surveys to be occupied by rusty patched bumble bee, activities within occupied habitat will be sequenced with seasonal time frames as much as is feasible (i.e., late spring/summer work in woodlands to avoid overwintering queens, late fall/winter work in open areas to avoid foraging and nesting sites).
Water Resources and Water Quality	• An erosion control plan, coordinated with the IDNR and WDNR, will be prepared once a route is ordered/approved, and BMPs would be employed near aquatic features (wetlands, streams, waterbodies) to minimize the potential for erosion and to prevent any sediments from entering the aquatic features. • Erosion controls would be regularly inspected and maintained throughout the construction phase of a project until exposed soil has been adequately stabilized. • Waterway crossings would require a temporary clear span bridge (TCSB) to avoid the necessity of driving construction equipment through streams. 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 stream bank. If there are waterways that are too wide to clear span, a temporary bridge with in-stream support would be designed and constructed. • 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. • No structures would be located below the OHWM. • Any dewatering within the project area during construction would be discharged to a non-sensitive upland site to facilitate re-infiltration to the aquifer. • Nearby waterways could be used as a water source during project construction. The Utilities would attempt to avoid water withdrawals during spawning seasons. The Utilities would coordinate water withdrawals with the IDNR and WDNR.
Air Quality	• Contractors will clean up any dirt or mud that may be tracked onto the road by equipment daily. • Tracking pads may be constructed at frequently used access points to minimize mud being tracked onto public roads. Road sweeping will be used as needed to minimize dust. • A water truck will be available on-site to spray areas of the laydown yards and ROW that are creating excessive dust.
Noise	• When undertaking construction activities around residences, the Utilities and their contractors will be cognizant of the residents and will limit work hours in that area, specifically during the early morning hours. • If helicopters are used on the project, the Utilities will use various forms of outreach to notify the affected communities and landowners of when the helicopters will be in operation. • The Utilities and their contractors plan to generally work during daylight hours Monday through Friday, with an average workday to be approximately 11 hours.
Transportation	• Traffic control plans will be developed and implemented during construction to minimize traffic impacts and comply with permit requirements. • The Utilities will minimize the number of vehicles and the amount of time they are parked on the roads. • If a driveway is needed to access the ROW, the driveways may be protected using composite mats or other low-profile protection systems. Commercial or industrial driveways will be evaluated prior to use as surface protection may not be required. • Any damage caused by construction access will be repaired as needed. • The Utilities and their contractors will not block any residence driveways with equipment unless agreed upon with the landowner or resident.

Resource	Environmental Commitment
Cultural and Historic Resources	• Consultation between the Iowa and/or Wisconsin State Historic Preservation Offices (SHPOs), RUS, the Utilities, and affected Tribal groups, among others would be required under Section 106 of the NHPA. This consultation must be completed prior to the start of construction activities. • The Utilities would develop an Unanticipated Discoveries Plan detailing the process for addressing the identification of previously unidentified potential historic properties such as archaeological sites, historic features, or unidentified human remains during the course of construction. Such a plan would include steps for preventing further harm to previously unidentified sites and notifying consulting parties in order to address impacts to potential historic properties. • If unanticipated archaeological resources or human remains are encountered 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 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.
Land Use, including Agriculture and Recreation	• Where possible, siting in agricultural areas would be along fence lines or between fields or along public road 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. • 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. • Where appropriate, minimization techniques, such as topsoil replacement and deep tilling, may be used. • Construction vehicles may be cleaned before entering the organic farm parcels, in accordance with input from the landowner. • During the easement negotiation, landowners can decline the use of herbicides for vegetation management activities once the line is in operation. Therefore, no herbicides would be applied within portions of the ROW on which the landowner wishes not to introduce it. • If construction activity occurs during wet conditions and soils are rutted, ruts will be repaired as soon as conditions allow to reduce the potential for impacts. • 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. • Prior to and during construction, the Utilities will coordinate with land managers regarding public notification about construction activities and temporary closures of public areas. • See more detailed BMPs for agricultural lands in Appendix D.
Visual Quality and Aesthetics	• Steel monopoles with a weathered finish will be used at visually sensitive locations to minimize the visual impacts to the landscape.
Socioeconomics and Environmental Justice	• Short-term impacts to agricultural lands would be mitigated by providing compensation to producers and by restoring agricultural lands to the extent practicable.
Public Health and Safety	• If the proposed transmission lines parallel or cross distribution lines, appropriate measures can be taken to address any induced voltages.
Upper Mississippi River National Wildlife and Fish Refuge	• For the portion of the C-HC Project within the Refuge, preliminary low-profile structures are proposed with a design height to match the existing tree cover within the Refuge (approximately 75 feet) to reduce the potential 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. • Construction on the Refuge would need to occur outside the eagle nesting season (typically January 15 to June 15) or outside a 660-foot exclusion zone to avoid disturbance to nesting adult, chick, and fledgling eagles. • For the alternatives that cross the Mississippi River at the Nelson Dewey Substation (alternatives 1, 5, and 6), additional minimization steps are proposed:

Resource	Environmental Commitment
	o The Utilities propose to mitigate adverse impacts to forest resources in the Refuge through restoration and enhancement of forest resources both within and off Refuge lands. A restoration plan would be developed in consultation with the USFWS and USACE. The restoration plan would supplement existing USFWS efforts to restore bottomland hardwood forest within the Refuge, specifically on the floodplain of the Turkey River. Mitigation may also include the reestablishment and/or expansion of mature woodlands near the Nelson Dewey Substation and/or other non-Refuge locations adjacent to Refuge lands. These restoration efforts would mitigate adverse impacts on public lands. • Revegetation within the Refuge would be conducted in concert with USFWS and USACE review and direction and in compliance with applicable NERC-regulated vegetation standards. As with the design of the project, the Utilities would work closely with the USACE and 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 environmental commitments outlined above and other mitigation to be developed with the USFWS and USACE, as part of the USACE and USFWS permit application processes, the Utilities would develop a project-specific mitigation plan. This plan would need to be deemed acceptable by USACE and USFWS prior to the issuance of permits.

3.1.3 *Analysis Area*

For this DEIS, RUS identified a 300-foot analysis area that encompasses the proposed ROW along each action alternative. As discussed in Chapter 2, the proposed ROW for the C-HC Project would typically range from 150 feet wide in Wisconsin, to 200 feet wide in Iowa, and to 260 feet wide in the Refuge. The purpose of the 300-foot analysis area is to allow for minor reroutes along portions of the action alternatives, if the need arises, without triggering a reevaluation of all environmental impacts. Therefore, this EIS presents impacts for resources within the ROW and for the area outside the ROW and within the 300-foot analysis area.

As presented in the resource sections below, some resources warranted a review of existing conditions beyond the 300-foot analysis area to adequately identify and characterize resources that would be indirectly impacted by the C-HC Project. In those cases, this DEIS also refers to the resource evaluation area, which extends beyond the 300-foot analysis area. Table 3.1-5 identifies the spatial extent that was reviewed for existing conditions and analyzed, by resource.

In the following sections of Chapter 3, current conditions are characterized for either the resource evaluation area or the analysis area, depending on the data available for a specific resource. The analysis areas were determined to allow routing flexibility for final design, and to allow adequate geographic coverage for where direct and indirect impacts would occur.

For presentation of resource impact under the Environmental Consequences section for each resource, the analysis area was used to help convey the direct and indirect impacts of the proposed project within and immediately adjacent to the ROW.

Table 3.1-5. Conditions and Analyze Direct and Indirect Impacts

Resource	Resource Evaluation Area Used to Characterize the Affected Environment	Analysis Area Used to Inform Resource Impacts
Geology and Soils	Same as analysis area	300-foot -wide area, which extends outside the proposed ROW for each action alternative
Vegetation	300-foot-wide area, which extends outside the proposed ROW for each action alternative plus information provided by USFWS, WDNR, and IDNR about species that could occur in the general vicinity of the action alternatives	300-foot -wide area, which extends outside the proposed ROW for each action alternative

Resource	Resource Evaluation Area Used to Characterize the Affected Environment	Analysis Area Used to Inform Resource Impacts
Wildlife	300-foot-wide area, which extends outside the proposed ROW for each action alternative plus information provided by USFWS, WDNR, and IDNR about species that could occur in the general vicinity of the action alternatives	300-foot -wide area, which extends outside the proposed ROW for each action alternative
Water Resources and Quality	Same as analysis area	300-foot-wide area, which extends outside the proposed ROW for each action alternative
Air Quality	Same as analysis area	The air quality analysis area extends 5 miles in all directions from ROW for the action alternatives
Noise	Same as analysis area	300-foot-wide area, which extends outside the proposed ROW for each action alternative
Transportation	Same as analysis area	5-mile area surrounding the proposed action alternatives
Cultural and Historic Resources	Same as analysis area, referred to as area of potential effects (APE) for this resource	Direct APE is a 300-foot-wide area, which extends outside the proposed ROW for each action alternatives Indirect APE is a 2,000-foot-wide area that extends outside the ROW for each action alternative
Land Use	Counties crossed by the action alternatives	300-foot-wide area, which extends outside the proposed ROW for each action alternative
Visual Quality and Aesthetics	Same as analysis area	Upwards of 2 miles from the action alternatives
Socioeconomics and Environmental Justice	Same as analysis area	Counties crossed by the action alternatives
Public Health and Safety	Same as analysis area	300-foot-wide area, which extends outside the proposed ROW for each action alternative
Refuge	Mississippi River Miles 606 to 608	300-foot-wide area, which extends outside the proposed ROW for each action alternative

This DEIS has been developed based on available information deemed adequate to characterize expected impacts to the extent that the intensity, context, magnitude, and duration are understood for each affected resource.

3.2 Geology and Soils

This section describes the geologic and soil resources occurring within the 300-foot analysis area corridor. Geologic resources include both the unconsolidated materials at the surface including soil types and consolidated bedrock deposits. This section also describes mined mineral deposits, sensitive soils, and unique physiographic features.

3.2.1 *Affected Environment*

The geology and soils of the analysis area formed in what is called the “Driftless Area,” an isolated area of land that was not directly affected by glaciation, but from the glacial outwash and wind-blown silts as nearby glacial lobes retreated (U.S. Geological Survey [USGS] 2003; USGS and NPS 2000). This area through much of Southwest Wisconsin and a small portion of Northeast Iowa, includes gently to moderately rolling farmland and woodlands in the east portion of the analysis area, to steep, wooded, and rocky ridges and open, narrow valleys formed by streams and rivers cutting through the bedrock formations near the Mississippi River (Iowa Geologic and Water Survey 2010; University of Wisconsin – Extension 2005). Many of these valleys have significant topographical relief, resulting in very scenic but in many locations, sensitive geologic formations and soils that could be affected by construction of the project. The soils are dominantly the result of wind-blown silts or loess that covered the area after retreat of the glaciers, creating soils that are rich for cultivation of crops and support dense woodlands. The silty soils are also prone to erosion, due to wetness from seeps and high water tables and shallow depths where they are exposed to rain and wind on steep slopes.

Many of the soils throughout the analysis area are rich, prime farmland that are prone to erosion, wetness, and potential compaction. Where there are slopes, erosion is the primary concern. In addition, talus slopes are in the analysis area in deposits of shale and rock that once formed at the toe of steep slopes and reflect geologically sensitive areas. Algific talus slopes are unique, very sensitive ecologies that have formed in this area that are protected because of the rarity of their existence (Iowa Geologic and Water Survey 2010; University of Wisconsin – Extension 2005).

3.2.1.1 GEOLOGY

The surface geologic features of the analysis area, including the ridges and valleys present, are a result of millions of years of erosion and drainage to the Mississippi River. The analysis area is within the Driftless Area, which is distinguished by hilly uplands and plateaus deeply dissected by streams. The Driftless Area is also characterized by the lack of glacial drift deposits (often described as till), meaning the area was not covered by ice sheets in the last glacial period. Even without thick deposits of glacial drift, the effects of glaciation are present. Loess deposits derived from the nearby glacial deposits blanket much of the area. Loess is a sediment formed by the accumulation of wind-blown silts and clays (often described as dust). Glacial outwash deposits composed of sands and gravels are present in a small portion of the analysis area, in the northeast near the Wisconsin River.

The bedrock geology within the area consists mostly of Paleozoic era dolomites and sandstones, with some limestone and shale deposited during the Ordovician period (USGS 2003; USGS and NPS 2000). These shallow marine deposits represent multiple periods of sea level rise and fall. Sediments eroded by waves along the shoreline and by rivers draining the land were deposited in the sea to form sandstone and shale. Carbonate precipitating organisms and other calcareous deposits formed layers and reefs of calcium carbonate in shallow marine environments that are mostly dolomite now.

In the analysis area, a landscape described as “karst” is created where water dissolves the limestone and dolomite rocks (Iowa Geologic and Water Survey 2010; University of Wisconsin – Extension 2005). 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.

There are two geologic mineral resources mined in southwest Wisconsin. Sand, especially sand used for petroleum extraction called “frac sand,” and iron ore. According to the Wisconsin Geological and Natural History Survey, currently there were no active mines within the analysis area (WDNR 2016a; Wisconsin Geological and Natural History Survey 2018).

3.2.1.2 SOILS

The analysis area is covered in a mantle of silty loess soil ranging in thickness from 1 foot to more than 15 feet thick (U.S. Department of Agriculture [USDA] Soil Conservation Service 1962, 1966, 1978, 1982, 1985; WDNR 2015). Soil maps show more than 165 soil series—soils with varying profile characteristics—in the analysis area. The great majority of these soils typically consist of well-drained and moderately well-drained, deep silt loam derived from the wind-blown loess that blanketed most of the area, occasionally with substantial stone content. The silt loam soils are generally underlain by sand or clay weathered from bedrock. Thicker soil profiles are generally found in nearly flat, broad valleys throughout the analysis area. Thinner soil profiles are found on steep slopes and ridgetops, like the areas near the Mississippi River.

According to the USDA Natural Resources Conservation Service (NRCS), a typical soil profile consists of a surface horizon of 4 to 8 inches of dark brown, friable silt loam underlain by 10 to as much as 40 inches of yellowish brown, friable silt loam subsoil (USDA NRCS 2018a). This profile is further underlain by light brown to gray, mottled silt loam to depths greater than 60 inches. Shallower soils, those typically found on the shoulders of steep slopes, will similarly consist of 4 inches of dark brown, friable silt loam underlain by approximately 7 to 12 inches of light brown, friable silt loam over bedrock (USDA NRCS 2018a).

Silt loam soils are considered structurally weak, and therefore more sensitive to erosion, compaction, and deep disturbance, such as rutting when soil strength is not sufficient to support the applied load from vehicle traffic (USDA NRCS 2018a). For the purposes of this analysis, sensitive soils are defined as those soils meeting one of the following characteristics:

1. Prime farmland or farmland of statewide importance
2. Highly erodible soils, as defined using erosion capability classification
3. Hydric soils, as defined by using the wet capability classification
4. Shallow soils, as defined by using the shallow soil capability classification
5. Soils on steep slopes greater than 30% incline

Silt loam soils tend to be very rich and productive, and as a result, there is a preponderance of prime farmland, occupying approximately 75% of the analysis area (USDA NRCS 2018a, 2018b). In addition to prime farmland, farmland of statewide importance is present within the study area, occupying approximately 72% of the analysis area (USDA NRCS 2018a, 2018b). Prime farmland consists of soils having the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. Both prime farmland and farmland of statewide importance are protected under the Farmland Protection Policy Act (FPPA) subtitle I of Title XV, Section 1539-1549. The purpose of the FPPA is to minimize the extent to which federally directed or assisted programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses.

The sensitivity of soils to use—primarily crop production—is rated on a capability classification system (USDA Soil Conservation Service 1962, 1966, 1978, 1982, 1985). In the capability system, soils are generally grouped as capability class and subclass.

Class 1 soils have slight limitations that restrict their use.

Class 2 soils have moderate limitations that require moderate conservation practices.

Class 3 soils have severe limitations that require special conservation practices.

Class 4 soils have very severe limitations that require very careful management.

Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

Capability subclasses are soil groups within each capability class. They are designated by adding a small letter, *e (erosion), w (wetness), s (shallow),* or *c (cold),* to the class numeral. For example, a capability classification of 3e would mean a soil has severe limitations due to erosion. For the analysis area, soils meeting the capability class of 3 or greater may be a concern for the following reasons (USDA Soil Conservation Service 1962, 1966, 1978, 1982, 1985):

1. Erosion (e): While the silt loam soils that dominate the analysis area are ideal for agricultural production, they are also prone to higher rates of erosion. Silt loam soils are typically the most erodible of all soils. The soil particles are easily detached; tend to crust and produce high rates of runoff. The K values (the soil erodibility factor which represents both susceptibility of soil to erosion and the rate of runoff) for these soils tend to be greater than 0.4. Therefore, the primary management concern for soils in the analysis area is erosion. Approximately 56% of the soils in the analysis area have an erosion capability classification greater than 3.
2. Wetness (w): Wet soils typically have poor drainage. These soils often either reflect compacted soil conditions that restrict drainage, or they are hydric soils resulting from a high or perched water table that can then be classified as wetland. Wet soils are a concern in that they are easily damaged and may be difficult to repair. Approximately 3% of the soils in the analysis area have a wet capability classification of 3 or greater. Many of these soils are associated with wetlands and are considered hydric soils.
3. Shallow (s): Shallow soils have limitations from the limited rooting depth they provide plants. The soil limitations include shallowness of rooting zones, stones, low moisture-holding capacity, low fertility difficult to correct, and salinity or sodium. In the analysis area, they are typically on the shoulders of steep slopes and near the bottom of steep drainages. Approximately 7% of the soils in the analysis area have a shallow classification of 3 or greater.

Limitations or complications due to cold soils (c) are unlikely to occur with the analysis area.

In addition to sensitive soils defined by capability classifications, soils on slopes greater than 30% are considered sensitive because of their susceptibility to erosion and the potential for slumping if they are significantly disturbed and not correctly restored (USDA NRCS 2018a, 2018b). Approximately 6% to 7% of the analysis area includes steep slopes (USDA NRCS 2018a, 2018b).

3.2.1.3 TOPOGRAPHY

The topography of the analysis area, both in Iowa and Wisconsin, is described as gently rolling to hilly, with steep slopes along many ridges (USDA Soil Conservation Service 1962, 1966, 1978, 1982, 1985). This area that was generally unaffected by glaciation, encountered millions of years of uninterrupted erosion that have dissected the landscape, creating bluffs and narrow valleys with more than 400 feet of topographic relief. Topography along the Mississippi River and its tributaries is steep, often with limestone outcrops, while the topography farther to the east becomes more gently rolling with broad ridgetops and wide valleys.

3.2.1.4 UNIQUE PHYSICAL FEATURES, INCLUDING ALGIFIC TALUS SLOPES

The analysis area includes portions of the Paleozoic Plateau. The Paleozoic Plateau includes substantial rock outcroppings, a near absence of glacial deposits, and many deep, narrow valleys that contain fast-flowing streams, and thick woodlands (Iowa Geologic Survey 2017). This steep and severe landscape is the result of erosion through rock strata of Paleozoic age. The bedrock-dominated terrain shelters unusually diverse flora and fauna, including some species normally found in cooler, more northern climates.

Associated with the Paleozoic Plateau are 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 (Iowa Geologic Survey 2017; WDNR 2015). These features are associated with sinkholes and subterranean ice caves. Generally, air flowing through the fractures of rock shelves and sinkholes and into the talus can escape through vents at the base of the talus pile during the spring and summer. These vents create a micro-climate that support unique and rare wildlife and vegetation. The valleys in which they occur tend to be very steep, and often have dense forest cover. In Wisconsin, algific talus slopes are known to exist in western Grant County within a few miles of the Mississippi River, however, none of these slopes are found in the analysis area. In Iowa, there are four potential algific talus slope locations within the analysis area. Algific talus slopes are discussed in greater detail in Section 3.3, Vegetation, including Wetlands and Special Status Plants.

The Mississippi River also occurs within the analysis area. The Mississippi River floodplain is an ancient river valley filled with alluvial material (mud, sand, and gravel) carried and deposited by surface water. Underlying sedimentary rock formations (dolomite, sandstone, and shale) accumulated under inland seas during the early Paleozoic Era about 400 to 600 million years ago. In more recent geologic times, the river valley has taken shape due to the presence (and absence) of glacial action. Several episodes of flushing sediment and filling with sand and gravel of the river valley have occurred. Sand terraces that presently flank the river valley are remnants of ancestral floodplains not scoured during the most recent postglacial floods. The analysis area occurs within a region that has minimal amounts of glacial deposits known as “drift” and is therefore known as the Driftless Area. This landscape features a combination of steep, exposed bluffs that rise 100 to 600 feet above the river valley and eroded ravines that bound the wide floodplain of the Upper Mississippi River (USFWS 2006a).

3.2.2 *Environmental Consequences*

This section discusses potential impacts to the geology, soils, and prime farmlands within the region as a direct result of the construction and operation of the C-HC Project, including the six alternatives and the No Action Alternative.

3.2.2.1 DATA SOURCES, METHODS, AND ANALYSIS ASSUMPTIONS

The following impact indicators were considered when analyzing potential impacts to geology and soils:

- Acres of surface disturbance.
    - Temporary – construction activities.
    - Permanent – structure locations and substations.
- Acres of disturbance to sensitive soils.
- Acres of disturbance to steep slopes.

Data from the NRCS Web Soil Survey and Soil Survey Geographic Database (SSURGO) were used to assess soil conditions and determine the extent that project activities will affect soils (USDA NRCS 2018a, 2018b). The USDA NRCS Web Soil Survey and SSURGO provide the most comprehensive and localized information about soil conditions in the analysis area. Data from the SSURGO database for soil characteristics include the soil classifications used to map and quantify sensitive soils potentially affected by the C-HC Project. From these databases, sensitive soils were considered to be:

1. Prime farmland and farmland of statewide importance, as determined by NRCS (USDA NRCS 2018a, 2018b).
2. Soils on steep slopes. Steep slopes are considered those slopes of greater than 30% grade. Soils on these slopes have higher chances for erosion and instability due to the drainage of water both above and below ground.
3. Soil with severe erosion potential, as determined by the soil capability classification for erodible soils as described in Section 3.2.1.2. Typically soils with a high potential for erosion have a capability classification and subclassification of 3e or greater. This corresponds to a K factor greater than 0.4 as used in the Universal Soil Loss Equation (USDA Soil Conservation Service 1962, 1966, 1978, 1982, 1985).
4. Soil that is limited by shallow depth, as determined by using the soil capability classification for shallow soils as described in Section 3.2.1.2. Shallow soils are susceptible to mechanical damage that may leave insufficient soil for plants, as well as higher erosion potential.
5. Soil that is limited by wetness, as determined by using the soil capability classification for wet soils as described in Section 3.2.1.2. Wet soils have a capability classification and subclassification of 3w or greater. These soils are typically wet or often have hydric characteristics that also render them prone to compaction and/or rutting (deep disturbance of the soil that may result from tracked or wheeled equipment or vehicles).

Impacts to these sensitive soil resources were quantified both within the ROW, outside the ROW but within the 300-foot analysis area, and for any permanent project facilities such as structures or substations. Impacts were then quantified for each sensitive soil category potentially impacted by the C-HC Project as follows:

- Permanent Impacts—The permanent impact to soil and geology due to the displacement during construction of structure foundations was calculated using the estimated number of structures along each alignment, the estimated amount of soil and rock that could be disturbed for construction of the foundation boreholes, and the footprint of the proposed Hill Valley Substation.

- Temporary Impacts—The temporary impacts to soil and geology within the ROW and adjacent 300-foot analysis corridor crossed by the C-HC Project were calculated for the areas that would not contain permanent project facilities. These areas are expected to be temporarily impacted due to land disturbance activities associates with project construction, such as removal of vegetation and surface grading, equipment operation resulting in minor rutting or soil displacement, spoiling of soils and rock, equipment storage, temporary work areas, and access roads. It is assumed that soils at these locations would be restored, and that long-term permanent impacts would not occur due to the implementation of appropriate environmental commitments, restoration, avoidance, and erosion and sediment control measures.

Table 3.2-1 shows the geology and soils impact threshold definitions used to assess the severity of impacts to geology and soil resources by the C-HC Project.

Table 3.2-1. Impact Threshold Definitions for Geology and Soils

	Minor Impact	Moderate Impact	Major Impact
Geology and Soils	Disturbances to geology or soils from construction and operation would be detectable but localized and discountable. Erosion and/or compaction would occur from construction and operation in localized areas and be quickly repaired.	Disturbances would occur over a relatively wide area from construction and operation of the C-HC Project or with sufficient impairment in localized areas that could result in wider areas if not repaired. Impacts to geology or soils would be readily apparent and result in short-term changes to the soil character or local geologic characteristics. Erosion and compaction impacts would occur over a wide area.	Disturbances would occur over a large area from construction and operation of the C-HC Project. Impacts to geology or soils would be readily apparent and would result in short- and long-term changes to the characteristics of the geology or soils over a large area, both in and out of the project boundaries or within limited areas of sensitive environments that would affect vegetation, wildlife, and geological processes. Erosion and compaction would occur over a large area.

3.2.2.2 NO ACTION

Under the No Action Alternative, the C-HC Project would not be built, and there would be no impacts to soils and geology.

3.2.2.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

The impacts to soils and geology described in this section are common to all action alternatives. Direct impacts to soil resources resulting from construction activities include the loss of soil productivity due to the disturbance and compaction of soils during construction of access roads, installation of transmission line structures, and construction of the Hill Valley Substation. Clearing of vegetation as well as grading would disturb topsoil, which would result in newly exposed, disturbed soils that could be subject to accelerated soil erosion by wind and water. Access roads and use of heavy equipment in the ROW would cause soil compaction. Impacts to soils could range from short-term to long-term depending on the amount of ground disturbance at a particular location. Some areas may be able to revegetate quickly, and impacts to soils would be short term. In areas with more intense equipment use and construction activities, soil compaction and erosion could have longer impacts. Any soil removal associated with the final footprint of the structure foundations and the substation would be long-term.

Adverse impacts to agriculture, including prime farmland and farmland of statewide importance, is also discussed in Section 3.10, Land Use. As impacts relate to sensitive soils, adverse impacts would include disruption to farm productivity by compaction and erosion of soils in crop fields on prime farmland and farmland of statewide importance. Soil compaction would occur along access roads, both during construction, and along any access roads that could be left in place after construction. Compaction reduces the ability of water to infiltrate into and percolate through soils, and reduces the ability for plant roots to grow into the soil where they can access nutrients and water. As a result, crop growth and grain production in impacted areas could be impaired, resulting in reduced agricultural productivity. Erosion resulting from compaction and soil disturbance could extend beyond the immediate area where soil compaction occurs.

Most wet soils impacted by the project are related to wetlands. Impacts to wetland vegetation is addressed in Section 3.3, Vegetation. Use of construction equipment in wet soils could result in greater compaction and rutting, affecting the wetland hydrology and connection to groundwater as well as affecting wetland plant growth. As discussed above, compaction to soil impairs the ability for water to infiltrate and percolate into the soil while also reducing the ability for plant roots to grow. Impacts to wet soils would likely be localized to the relatively small areas in which they occur. The use of timber matting and temporary bridges over wet areas and streams would help mitigate impacts to wet soils.

Shallow soils can be heavily compacted, affecting potential plant growth, as well as easily dislodged from underlying rock or shelves. Generally, shallow soils have limited depth for root growth and water-holding capacity. They often occur on slopes or the shoulders of ridges along rock lines or on rock shelves.

Soils on steep slopes, slopes greater than 30%, have a high risk of damage resulting from the project, although the area of steep slopes impacted by the project is limited. Construction and maintenance equipment may be required to traverse steep slopes to install or inspect transmission line structures. Soils on these slopes ordinarily have higher chances for erosion and instability due to the drainage of water both above and below ground. Steep slopes increase runoff volumes and velocities, increasing the sediment carrying load and therefore the cutting power of water flowing downhill, resulting in increases in erosion. Combined with additional factors, such as soil compaction, the erosive forces on steep slopes are compounded by reducing the amount of stormwater infiltration into the soil and increasing the volume and velocity of water flow even more. Instability of soil on steep slopes increases due to the loss matrix strength inherent in soils in which the soil particles adhere to each other to form a stronger, cohesive mass. If and when the strength of the soil mass is disturbed, the potential for soil erosion increases on the slope.

Indirect impacts to soils would include loss of soil structure and stability, loss of plant productivity or health due to reduction in nutrient availability, a reduction in oxygen in the soil reducing plant function, and increased stormwater runoff emanating from compacted soils. The potential for soil erosion increases not only in the affected area, but erosion could increase in area as rills and gullies are formed and stormwater runoff is channelized across broad areas of land. Expansive erosion will substantially reduce soil productivity and could result in extensive repairs necessary to restore soil condition for agricultural production and native habitat. Erosion will also ultimately impact water quality in streams with increased sediment loads. The Utilities would develop an erosion control plan prior to construction to identify methods for preventing and mitigating soil erosion within the C-HC Project area.

The potential impacts to geology from construction include drilling, blasting, excavation, equipment movement/hauling, and other ground-disturbing activities during construction. Direct impacts resulting from the construction of all action alternatives on geologic resources consists of the displacement of soil and rock during construction of structure foundations. Regarding the impacts to karst, the karst features would not be expected to be directly impacted with any of the proposed alternatives. Karst features such as sinkholes and caverns would be identified and stationing between structures can be adjusted to position the structures a sufficient distance away from any karst features. This will ensure that drainage patterns and unstable soil and rock conditions that are associated with karst conditions would be avoided.

Borings for transmission line structure foundations would extend approximately 20 to 80 feet below the surface and up to 120 feet below ground surface in unique locations. Using an average depth of 60 feet and an average diameter of 8 feet, the average volume of displaced soil and rock would be approximately 3,000 cubic feet per structure location. For each action alternative, the volume of displaces soil and rock is estimated and is described in the following six sections. This displaced soil and rock would be used for backfilling around structure foundations with excess material removed from the site to locations directed by landowner or disposed of at another location. The use of heavy-duty vehicles and earthmoving equipment required for structure foundations and structure placement would result in short-term moderate impacts on local surface geology (soils) as a result of compaction, rutting, and the potential for localized rill erosion near unimproved roadbeds and on sensitive landscapes.

3.2.2.4 ALTERNATIVE 1

Table 3.2-2 summarizes the acreage of sensitive soils that could be temporarily impacted by Alternative 1. The potential for severe erosion occurs along 67% of the ROW and is the largest potential impact to soils under Alternative 1. The severe erosion potential is not just limited to steep slopes. The total acreage potentially prone to severe erosion includes less-steep slopes as well as farmland.

Table 3.2-2. Alternative 1 Temporary Sensitive Soil Impacts

	Within ROW (acres)	Outside ROW within 300-foot Corridor (acres)	Access Roads (acres)
Total Analysis Area	1,891	1,699	204
Sensitive Soil Type			
Prime Farmland	372	301	27
Farmland of Statewide Importance	510	426	43
Steep Slopes	173	169	8
Severe Erosion Potential	1,265	1,155	146
Shallow Soils	149	152	10
Wet Soils	93	49	6

The adverse impacts to sensitive soils under Alternative 1 would be moderate and long-term if not immediately repaired. With repair, adverse impacts would be moderate, short term, and generally limited to the impact area.

Table 3.2-3 summarizes permanent impact to sensitive soils and geologic resources due to structures and substations associated with Alternative 1. Permanent impacts to sensitive soils due to structures and substations are expected to result in no more than 24 acres of combined impact. The geologic impacts during drilling to prepare foundation holes would be limited to minimal disturbances of subsurface rock. For Alternative 1, an estimate 566 structures would be constructed. The volume of displaced soil and rock during drilling is estimated at approximately 63,000 cubic yards. The adverse permanent impacts to sensitive soils and geologic resources under Alternative 1 would be minor.

Table 3.2-3. Alternative 1 Permanent Sensitive Soil and Geology Impacts

	Rock and Soil Displaced (cubic yards)	Sensitive Soil (acres)
Structures (subsurface impacts)	63,000	–
Structures (surface impacts)	–	≤ 2
Hill Valley Substation	–	≤ 22

3.2.2.5 ALTERNATIVE 2

Table 3.2-4 summarizes the acreage of sensitive soils that could be impacted by Alternative 2. The potential for severe erosion occurs over 67% of the project ROW and is the largest potential impact to soils under Alternative 2. Similar to Alternative 1, severe erosion potential is high in nearly all areas. Additional areas prone to severe erosion include less-steep slopes as well as farmland.

Table 3.2-4. Alternative 2 Temporary Sensitive Soil Impacts

	Within ROW (acres)	Outside ROW within 300-foot Corridor (acres)	Access Roads (acres)
Total Analysis Area	2,008	1,766	210
Sensitive Soil Type			
Prime Farmland	349	307	26
Farmland of Statewide Importance	587	467	43
Steep Slopes	171	169	8
Severe Erosion Potential	1,352	1,204	152
Shallow Soils	141	149	10
Wet Soils	104	55	7

The adverse impacts to sensitive agricultural soils under Alternative 2 would be moderate and long term if not immediately repaired. With repair, adverse impacts would be moderate, short term, and generally limited to the impact area.

Table 3.2-5 summarizes permanent impact to sensitive soils and geologic resources due to structures and substations associated with Alternative 2. Permanent impacts to sensitive soils due to structures and substations are expected to result in no more than 24 acres of combined impact. The geologic impacts during drilling to prepare foundation holes would be limited to minimal disturbances of subsurface rock. For Alternative 2, an estimate 596 structures would be constructed. The volume of displaced soil and rock is estimated at approximately 66,000 cubic yards. The adverse permanent impacts to sensitive soils and geologic resources under Alternative 2 would be minor.

Table 3.2-5. Alternative 2 Permanent Sensitive Soil and Geology Impacts

	Rock and Soil Displaced (cubic yards)	Sensitive Soil (acres)
Structures (subsurface impacts)	66,000	–
Structures (surface impacts)	–	≤ 2
Hill Valley Substation	–	≤ 22

3.2.2.6 ALTERNATIVE 3

Table 3.2-6 summarizes the acreage of sensitive soils that could be impacted by Alternative 3. Impacts to sensitive soils from Alternative 3 follow the same general pattern as Alternatives 1 and 2: with the potential for severe erosion being the most prevalent environmental consequence, affecting 58% of the project ROW.

Table 3.2-6. Alternative 3 Temporary Sensitive Soil Impacts

	Within ROW (acres)	Outside ROW within 300-foot Corridor (acres)	Access Roads (acres)
Total Analysis Area	2,210	2,016	157
Sensitive Soil Type			
Prime Farmland	614	573	22
Farmland of Statewide Importance	616	514	45

	Within ROW (acres)	Outside ROW within 300-foot Corridor (acres)	Access Roads (acres)
Steep Slopes	171	172	6
Severe Erosion Potential	1,284	1,178	117
Shallow Soils	159	165	9
Wet Soils	106	62	6

The adverse impacts to sensitive agricultural and sensitive soils under Alternative 3 would be moderate and long term if not immediately repaired. With repair, adverse impacts would be moderate, short term, and generally limited to the impact area.

Table 3.2-7 summarizes permanent impact to sensitive soils and geologic resources due to structures and substations associated with Alternative 3. Permanent impacts to sensitive soils due to structures and substations are expected to result in no more than 24 acres of combined impact. The geologic impacts during drilling to prepare foundation holes would be limited to minimal disturbances of subsurface rock. For Alternative 3, an estimate 658 structures would be constructed. The volume of displaced soil and rock is estimated at approximately 73,000 cubic yards. The adverse permanent impacts to sensitive soils and geologic resources under Alternative 3 would be minor.

Table 3.2-7. Alternative 3 Permanent Sensitive Soil and Geology Impacts

	Rock and Soil Displaced (cubic yards)	Sensitive Soil (acres)
Structures (subsurface impacts)	73,000	–
Structures (surface impacts)	–	≤ 2
Hill Valley Substation	**–**	**≤ 22**

3.2.2.7 ALTERNATIVE 4

Table 3.2-8 summarizes the acreage of sensitive soils that could be impacted by Alternative 4. Alternative 4 shows an increase of potential environmental impacts affecting prime farmland and farmland of statewide importance as compared to Alternatives 1, 2, and 3. Similar to other alternatives, severely erodible soils remain the most prevalent environmental consequence, affecting 49% of the ROW acreage.

Table 3.2-8. Alternative 4 Temporary Sensitive Soil Impacts

	Within ROW (acres)	Outside ROW within 300-foot Corridor (acres)	Access Roads (acres)
Total Analysis Area	2,246	2,083	116
Sensitive Soil Type			
Prime Farmland	855	839	17
Farmland of Statewide Importance	685	589	40
Steep Slopes	96	86	5
Severe Erosion Potential	1,111	1,024	84
Shallow Soils	155	156	10
Wet Soils	81	36	2

As shown in Alternatives 1, 2, and 3, the adverse impacts to sensitive and agricultural soils under Alternative 4 would be moderate and long term if not immediately repaired. With repair, adverse impacts would be moderate, short term, and generally limited to the impact area.

Table 3.2-9 summarizes permanent impact to sensitive soils and geologic resources due to structures and substations associated with Alternative 4. Permanent impacts to sensitive soils due to structures and substations are expected to result in no more than 24 acres of combined impact. The geologic impacts during drilling to prepare foundation holes would be limited to minimal disturbances of subsurface rock. For Alternative 4, an estimate 721 structures would be constructed. The volume of displaced soil and rock is estimated at approximately 80,000 cubic yards. The adverse permanent impacts to sensitive soils and geologic resources under Alternative 4 would be minor.

Table 3.2-9. Alternative 4 Permanent Sensitive Soil and Geology Impacts

	Rock and Soil Displaced (cubic yards)	Sensitive Soil (acres)
Structures (subsurface impacts)	80,000	–
Structures (surface impacts)	–	≤ 2
Hill Valley Substation	–	≤ 22

3.2.2.8 ALTERNATIVE 5

Table 3.2-10 summarizes the acreage of sensitive soils that could be impacted by Alternative 5. Environmental consequences for Alternative 5 are similar to those presented for Alternative 4, reflecting a similar proportion of sensitive soil types that will be affected by the project. As compared to other alternatives, Alternative 5 potentially impacts the highest acreage of prime farmland and farmland of statewide importance. Severe erosion remains the most common potential environmental consequence, with 50% of the Alternative 5 ROW crossing areas with severe erosion potential.

Table 3.2-10. Alternative 5 Temporary Sensitive Soil Impacts

	Within ROW (acres)	Outside ROW within 300-foot Corridor (acres)	Access Roads (acres)
Total Analysis Area	2,431	2,230	129
Sensitive Soil Type			
Prime Farmland	916	880	19
Farmland of Statewide Importance	773	654	42
Steep Slopes	97	92	5
Severe Erosion Potential	1,238	1,111	94
Shallow Soils	165	170	9
Wet Soils	91	39	3

The adverse impacts to sensitive and agricultural soils under Alternative 5 would be moderate and long-term if not immediately repaired. With repair, adverse impacts would be moderate, short term, and generally limited to the impact area.

Table 3.2-11 summarizes permanent impact to sensitive soils and geologic resources due to structures and substations associated with Alternative 5. Permanent impacts to sensitive soils due to structures and substations are expected to result in no more than 24 acres of combined impact. The geologic impacts during drilling to prepare foundation holes would be limited to minimal disturbances of subsurface rock. For Alternative 5, an estimated 764 structures would be constructed. The volume of displaced soil and rock is estimated at approximately 85,000 cubic yards. The adverse permanent impacts to sensitive soils and geologic resources under Alternative 5 would be minor.

Table 3.2-11. Alternative 5 Permanent Sensitive Soil and Geology Impacts

	Rock and Soil Displaced (cubic yards)	Sensitive Soil (acres)
Structures (subsurface impacts)	85,000	–
Structures (surface impacts)	–	≤ 2
Hill Valley Substation	**–**	**≤ 22**

3.2.2.9 ALTERNATIVE 6

Table 3.2-12 summarizes the acreage of sensitive soils that could be impacted by Alternative 6. Similar to other alternatives, soils with severe erosion potential are the most prevalent sensitive soil, affecting 56% of the Alternative 6 ROW. Impacts to prime farmland and farmland of statewide importance, would occur, but would be less than Alternatives 4 and 5. Overall, Alternative 6 impacts fewer sensitive soils—severely erodible soil, shallow soil, and wet soil—than the other alternatives.

Table 3.2-12. Alternative 6 Temporary Sensitive Soil Impacts

	Within ROW (acres)	Outside ROW within 300-foot Corridor (acres)	Access Roads (acres)
Total Analysis Area	1,936	1,773	163
Sensitive Soil Type			
Prime Farmland	626	578	23
Farmland of Statewide Importance	575	499	37
Steep Slopes	95	82	6
Severe Erosion Potential	1,092	999	113
Shallow Soils	144	143	10
Wet Soils	73	30	3

The adverse impacts to sensitive and agricultural soils under Alternative 6 would be moderate and long term if not immediately repaired. With repair, adverse impacts would be moderate, short term, and generally limited to the impact area.

Table 3.2-13 summarizes permanent impact to sensitive soils and geologic resources due to structures and substations associated with Alternative 6. Permanent impacts to sensitive soils due to structures and substations are expected to result in no more than 24 acres of combined impact. The geologic impacts during drilling to prepare foundation holes would be limited to minimal disturbances of subsurface rock. For Alternative 6, an estimated 630 structures would be constructed. The volume of displaced soil and rock is estimated at approximately 70,000 cubic yards. The adverse permanent impacts to sensitive soils and geologic resources under Alternative 6 would be minor.

Table 3.2-13. Alternative 6 Permanent Sensitive Soil and Geology Impacts

	Rock and Soil Displaced (cubic yards)	Sensitive Soil (acres)
Structures (subsurface impacts)	70,000	–
Structures (surface impacts)	–	≤ 2
Hill Valley Substation	–	≤ 22

3.2.3 *Summary of Impacts*

Table 3.2-14 summarizes the expected temporary impacts to sensitive soils for each alternative. Overall, Alternative 6 impacts the fewest acres of soils with severe erosion potential, shallow soils, wet soils, and steep slopes.

Table 3.2-14. Summary of Temporary Impacts to Sensitive Soils

Alternative	Severe Erosion Potential (acres)		Shallow Soil (acres)		Wet Soil (acres)		Steep Slopes (acres)	
	Within ROW	Outside ROW within 300-foot Corridor	Within ROW	Outside ROW within 300-foot Corridor	Within ROW	Outside ROW within 300-foot Corridor	Within ROW	Outside ROW within 300-foot Corridor
Alternative 1	1,265	1,155	149	152	93	49	173	169
Alternative 2	1,352	1,204	141	149	104	55	171	169
Alternative 3	1,284	1,178	159	165	106	62	171	172
Alternative 4	1,111	1,024	155	156	81	36	96	86
Alternative 5	1,238	1,111	165	170	91	39	97	92
Alternative 6	1,092	999	144	143	73	30	95	82

Assuming that all impacts would be repaired immediately following construction, temporary impacts to sensitive soils are generally expected to be moderate and short term for each alternative. The greatest potential temporary impact to soils and geology from the C-HC Project is severe erosion. Soils with severe erosion potential are abundant throughout each alternative ROW, accounting for 49% (1,111 acres in Alternative 4) to 67% (1,352 acres in Alternative 2) of the overall ROW acreage. Steep slopes within the analysis area present very sensitive environments that can result in severe erosion in a relatively small (95 to 173 acres) portion of the project area. While the relative extent of impacts due to steep slopes are less than severe erosion alone (steep slopes likely include severe erosion potential), construction damages to steep slopes could have major environmental consequences if not repaired immediately. Other sensitive soil impacts, such as shallow and wet soils, are likely to be more localized and have moderate impacts. The C-HC Project includes environmental commitments and BMPs that are intended to minimize soil erosion and other impacts to soils from construction activities (see Table 3.1-4. in Section 3.1).

The project is also expected to temporarily impact prime farmland and farmland of statewide importance. Table 3.2-15 summarizes temporary impacts to farmland for each alternative. Temporary impacts to prime farmland and farmland of statewide importance typically includes those impacts that involve erosion and wet soils that would be affected by compaction and rutting. Alternative 2 temporarily impacts the fewest prime farmland and farmland of statewide importance acres. Assuming impacted areas would be repaired and restored, temporary impacts to prime farmland and farmland of statewide importance are expected to moderate and of short duration for all alternatives.

Table 3.2-15. Summary of Temporary Farmland Impacts

Alternative	Prime Farmland (acres)		Farmland of Statewide Importance (acres)	
	Within ROW	Outside ROW within 300-foot Corridor	Within ROW	Outside ROW within 300-foot Corridor
Alternative 1	372	301	510	426
Alternative 2	349	307	587	467
Alternative 3	614	573	616	514
Alternative 4	855	839	685	589
Alternative 5	916	880	773	654
Alternative 6	626	578	575	499

Access roads used for construction of the project account for approximately 7.5% to 11.5% of the ROW acreage, varying by alternative. Access road impacts to sensitive soils with severe erosion potential range from 84 to 152 acres (Table 3.2-16). Table 3.2-16 shows that Alternative 4 access roads would have the least impact to sensitive soils. Assuming impacted areas will be repaired and restored, temporary impacts to all sensitive soil types due to access roads are expected to be moderate and of short duration for each alternative.

Table 3.2-16. Summary of Temporary Access Road Impacts to Sensitive Soils

Alternative	Impacts within 30-foot Access Road ROW				
	Severe Erosion Potential (acres)	Shallow Soil (acres)	Wet Soil (acres)	Prime Farmland (acres)	Farmland of Statewide Importance (acres)
Alternative 1	146	10	6	27	43
Alternative 2	152	10	7	26	43
Alternative 3	117	9	6	22	45
Alternative 4	84	10	2	17	40
Alternative 5	94	9	3	19	42
Alternative 6	113	10	3	23	37

Table 3.2-17 summarizes permanent impact to sensitive soils and geologic resources due to structures and substation construction associated with each alternative. Permanent impacts to sensitive soils due to structures and substations are expected to result in no more than 24 acres of combined impact for each alternative. The geologic impacts during drilling to prepare foundation holes would be limited to minimal disturbances of subsurface rock. The adverse permanent impacts to sensitive soils and geologic resources for each alternative would be minor.

Table 3.2-17. Summary of Permanent Sensitive Soil and Geology Impacts

Alternative	Rock and Soil Displaced (cubic yards)	Sensitive Soils (acres)	
		Transmission Line Structures	Hill Valley Substation
Alternative 1	63,000	≤ 2	≤ 22
Alternative 2	66,000	≤ 2	≤ 22
Alternative 3	73,000	≤ 2	≤ 22
Alternative 4	80,000	≤ 2	≤ 22
Alternative 5	85,000	≤ 2	≤ 22
Alternative 6	70,000	≤ 2	≤ 22

3.3 Vegetation, including Wetlands and Special Status Plants

This section describes natural vegetation communities, special status species (i.e., federally and state-listed) and invasive species that occur across the C-HC Project. Most of the data used to characterize the vegetative communities in the affected environment section was obtained by reviewing resource data within 300 feet of each action alternative (also known as the analysis area). Vegetation information was also obtained from WDNR Natural Heritage Inventory (NHI), and these data were provided for an area larger than the 300-foot analysis area (WDNR 2018b). Therefore, the term resource evaluation area is used below to reflect the geographic extent of all data used to characterize vegetation, including wetlands and special status plants.

3.3.1 *Affected Environment*

The eastern terminus of the project lies in the Southeastern Wisconsin Till Plains Level III ecoregion – Southeastern Wisconsin Savannah and Till Plain Level IV ecoregions. Moving west, the majority of the C-HC Project area lies in the Driftless Area Level III Ecoregion, in both the Coulee and Savanna Sections Level IV Ecoregions. The Driftless Area is characterized by broad, level ridgetops and narrow, steep-sided valleys with southern-flowing streams. Land use within this region is a mixture of cropland and pasture, interspersed with small areas of woodland and scattered residences. The potential natural vegetation of this region is a mosaic of oak forests, savannas, and prairie (Dairyland 2016b). Many flatter valleys and ridges have been converted to agricultural use; wetlands occur frequently along the rivers and streams.

The C-HC Project's western terminus occurs in the Western Corn Belt Plains Level III ecoregion, in the Eastern Iowa and Minnesota Drift Plains Level IV ecoregion. This area is a glaciated region with gently rolling terrain, and it is characterized by a mosaic of agriculture, woodlots, and wetlands. Vegetation includes oak forests, oak savanna, prairie, and sedge meadows. Much of the original vegetation has been converted to agricultural uses and scattered residences are common throughout the area.

3.3.1.1 VEGETATION COMMUNITIES

Coordination with the WDNR indicated 14 natural communities would be crossed by the C-HC Project. In addition, the USFWS notes that two areas of algific talus slopes occur in the vicinity of the C-HC Project. A brief description of these natural communities, including wetlands, and the characteristic vegetation of each, follows (WDNR 2018b).

3.3.1.1.1 ALGIFIC TALUS SLOPES

Algific talus slopes are a globally rare community that occurs where air circulation over underground ice produces a constant stream of moist cool air through vents onto an adjacent hillside. In the Driftless Area, algific talus slopes are found along limestone bluffs with steep north- or east-facing slopes covered in fractured rock, rubble, and leaflitter. These slopes create a suitable microclimate for northern monkshood (*Aconitum noveboracense*) (RUS 2018; WDNR 2018c). The overstory is often sparse, composed of scattered, small black ash (*Fraxinus nigra*) and paper birch (*Betula papyrifera*). The mountain maple (*Acer spicatum*) northern shrub may be frequent, and extensive beds of bulblet bladder fern (*Cystopteris bulbifera*) and mosses are characteristic (WDNR 2018b).

Based on USFWS information, algific talus slopes, an ideal habitat for northern monkshood, have been identified along Bluebell Creek in Iowa. Additionally, two algific talus slope sites have been recorded along both C-HC Project routes within the Refuge. No algific talus slopes have been identified within the Wisconsin portion of the resource evaluation area (RUS 2018).

The RUS Biological Assessment (BA) contains a detailed description of the algific talus slope occurrences within the C-HC Project's vicinity (RUS 2018). These occurrences are summarized below:

- Segments B-IA1 and B-IA2. The Iowa terminal of the Cassville Car Ferry is to the west of the site, and the site is within the Mississippi River floodplain. No bluffs or algific talus slopes occur at or within the proposed ROW for Segment B-IA1 or B-IA2. At this location, the relatively level floodplain of the Mississippi River consists of an emergent wetland dominated by reed canary grass (*Phalaris arundinacea*) with scattered black willow (*Salix nigra*) and eastern cottonwood (*Populus deltoides*). This area is affected by the Mississippi River water level and is seasonally flooded.
- Segment C-IA. The algific talus slope recorded site along Segment C-IA occurs along an existing overhead transmission line corridor that crosses the Mississippi River floodplain in the Refuge. No bluffs or algific talus slopes occur at or within the proposed ROW of route Segment C-IA. At this location, the existing overhead transmission line corridor consists of an emergent wetland dominated by reed canary grass. Forested wetlands are present adjacent to the existing overhead transmission line corridor and include black willow, silver maple (*Acer saccharinum*), and eastern cottonwood trees with reed canary grass present in the understory. This area is affected by the Mississippi River water level and is seasonally flooded.
- Segments A-IA and D-IA. Two recorded algific talus slope sites are approximately 3,375 feet west of route Segment A-IA and 6,130 feet east of route Segment D-IA. Based on aerial photography, both Segments A-IA and D-IA cross-wooded slopes and bluffs associated with Bluebell Creek and tributaries to the Mississippi River. These two sites are outside the potential extent of disturbance for all action alternatives.

3.3.1.1.2 DRY CLIFFS

Dry cliffs are characterized by dry, vertical bedrock exposures that can occur on various rock types. Scattered pines, oaks, or shrubs often occur. Characteristic plants are ferns, common polypody (*Polypodium vulgare*) and rusty woodsia (*Woodsia ilvensis*). Herb species include columbine (*Aquilegia canadensis*), harebell (*Campanula rotundifolia*), pale corydalis (*Corydalis sempervirens*), juneberry (*Amelanchier* spp.), bush-honeysuckle (*Diervilla lonicera*), and rock spikemoss (*Selaginella rupestris*). Dry cliffs also frequently are colonized by crustose lichens (WDNR 2018b).

3.3.1.1.3 DRY PRAIRIES

The dry prairie grassland community occurs on dry, steep south- or west-facing slopes. The community also occurs at river bluff summits with sandstone or dolomite near the surface. Dominant species are short to medium-sized prairie grasses, including little bluestem (*Schizachyrium scoparium*), side-oats grama (*Bouteloua curtipendula*), hairy grama (*B. hirsuta*), and prairie dropseed (*Sporobolus heterolepis*). Common shrubs and forbs include lead plant (*Amorpha canescens*), silky aster (*Aster sericeus*), flowering spurge (*Euphorbia corollata*), purple prairie-clover (*Petalostemum purpureum*), cylindrical blazing-star (*Liatris cylindracea*), and gray goldenrod (*Solidago nemoralis*) (WDNR 2018b).

3.3.1.1.4 DRY-MESIC PRAIRIES

The dry-mesic prairie grassland community occurs on slightly less-dry sites, compared with the dry prairie community. Dry-mesic prairies are composed of many grasses also found in dry prairie communities; however, dominant dry-mesic prairie grassland community species include taller species such as big bluestem (*Andropogon gerardii*) and Indian-grass (*Sorghastrum nutans*). Needle grass (*Stipa spartea*) also may occur. The herb component is diverse. Soils are often somewhat sandy, either loamy sands or sandy loams. The landscape associations that support the dry-mesic prairie grassland community include large river valley margin terraces, sandy outwash deposits, gravelly moraines, and lower slopes of Driftless Area bluffs (WDNR 2018b).

3.3.1.1.5 EASTERN RED-CEDAR THICKETS

The eastern red-cedar thicket is a savanna community that occurs on steep, dry sandstone, quartzite, rhyolite, or dolomite bluffs. In addition, the community may occur on dry, gravelly slopes on south- or west-facing morainal ridges or on coarse-textured, sandy terraces along major rivers. Dominant tree species is eastern red cedar (*Juniperus virginiana*). The eastern red cedar may occur as scattered trees and shrubs or in thickets interspersed with openings. Other species that may occur are red maple (*Acer rubrum*), paper birch, black oak (*Quercus velutina*) and bur oak (*Q. macrocarpa*) (WDNR 2018b).

3.3.1.1.6 MESIC PRAIRIES

The mesic prairie is a grassland community occurring on rich, moist, well-drained soils. The dominant plant is big bluestem. Little bluestem, Indian-grass, porcupine grass (*Stipa spartea*), prairie dropseed, and tall switchgrass (*Panicum virgatum*) are common. The forb layer is diverse and common species include prairie docks (*Silphium spp*.), lead plant, heath aster (*Aster ericocides*), smooth aster (*A. laevis*), sand coreopsis (*Coreopsis palmata*), prairie sunflower (*Helianthus laetiflorus*), rattlesnake-master (*Eryngium yuccifolium*), flowering spurge, beebalm (*Monarda fistulosa*), prairie coneflower (*Ratibida pinnata*), and spiderwort (*Tradescantia ohioensis*) (WDNR 2018b).

3.3.1.1.7 MOIST CLIFFS

The moist cliff community occurs on shaded, moist to seeping, mossy, vertical exposures, typically of sandstone and dolomite. This community may be shaded due to a cool (e.g., north-facing) aspect, or due to associated tree canopy. Moist cliffs often are very restricted in their spatial extent. Common vascular plants include columbine, fragile ferns (*Cystopteris bulbifera* and *C. fragilis*), wood ferns (*Dryopteris* spp.), rattlesnake-root (*Prenanthes alba*), and wild sarsaparilla (*Aralia nudicaulis*). Rare flora of these cliffs varies substantially across the state. Moist cliff communities in the Driftless Area may support the federally threatened northern monkshood (WDNR 2018b).

3.3.1.1.8 PINE RELICTS

Isolated stands of white pine (*Pinus strobus*), red pine (*P. resinosa*), and less commonly, jack pine (*P. banksiana*) occur on sandstone outcrops or in thin soils over sandstone. The understories typically are characterized by species with northern affinities including blueberries (*Vaccinium* spp.), huckleberry (*Gaylussacia baccata*), wintergreen (*Gaultheria procumbens*), pipsissewa (*Chimaphila umbellata*), and partridge-berry (*Mitchella repens*). Herbs typically found in southern Wisconsin's oak forests and prairies may be present (WDNR 2018b).

3.3.1.1.9 SOUTHERN DRY FORESTS

The southern dry forest community is dominated by white oak (*Quercus alba*) and black oak on upland, dry sites. Northern red oak (*Quercus rubra*), bur oak, and black cherry (*Prunus serotina*) may be present. Brambles (*Rubus* spp.), gray dogwood (*Cornus racemosa*), and American hazelnut (*Corylus americana*) are commonly found in the well-developed shrub layer. Herbaceous species include wild geranium (*Geranium maculatum*), false Solomon's-seal (*Maianthemum racemosum*), hog-peanut (*Amphicarpaea bracteata*), and rough-leaved sunflower (*Helianthus strumosus*). This southern dry forest community intergrades to oak woodland, a community that has similar canopy composition and a relatively more open forest floor due to frequent fire (WDNR 2018b).

3.3.1.1.10 SOUTHERN DRY-MESIC FORESTS

This community occurs on loamy soils of glacial till plains and moraines, and on erosional topography. Dominant tree species is commonly red oak. White oak, American basswood (*Tilia americana*), sugar maple (*Acer saccharum*), red maple, white ash (*Fraxinus americana*), shagbark hickory (*Carya ovata*), and wild black cherry are also common. The diverse herbaceous understory flora is often characterized by jack-in-the-pulpit (*Arisaema triphyllum*), enchanter's-nightshade (*Circaea lutetiana*), large-flowered bellwort (*Uvularia grandiflora*), interrupted fern (*Osmunda claytoniana*), lady fern (*Athyrium filix femina*), tick-trefoils (*Desmodium* spp.), hog-peanut, and several other species also found in the southern dry forest community (WDNR 2018b).

3.3.1.1.11 SOUTHERN MESIC FORESTS

The southern mesic forest community occurs on rich, well-drained loamy soils, mostly on glacial till plains or loess-capped sites. Sugar maple is the dominant tree species; American basswood, may be co-dominant. Other trees characteristic of this community are walnuts (*Juglans* spp.), ironwood (*Carpinus caroliniana*), northern red oak, red maple, white ash, and slippery elm (*Ulmus rubra*). The understory is typically open and sometimes brushy with gooseberry (*Ribes* spp.) occurring in areas historically grazed. Herb species include spring-beauty (*Claytonia virginica*), trout-lilies (*Erythronium* spp.), trilliums (*Trillium* spp.), violets (*Viola* spp.), bloodroot (*Sanguinaria canadensis*), blue cohosh (*Caulophyllum thalictroides*), may-apple (*Podophyllum peltatum*), and Virginia waterleaf (*Hydrophyllum virginianum*) (WDNR 2018b).

3.3.1.1.12 FLOODPLAIN FORESTS

This hardwood forest community occurs along large rivers, most of which originate in northern Wisconsin and flow southward, getting larger as the volume of carried water increases. As the stream gradients diminish, floodplains broaden. The community is adapted to periodic flooding. Silt deposition and microtopography development during flood events supports tree germination and establishment, and floods carry seeds and propagules. The most extensive occurrences of floodplain forest occur along large rivers in southern Wisconsin (WDNR 2018b).

The largest “ribbon” of floodplain forest in the analysis area occurs along the Mississippi River. Floodplain forests are declining in the Upper Mississippi River System due to anthropogenic and natural forces and the forests that remain are changing in composition from a diversity of species to a monotypic forest dominated by silver maple and herbaceous openings. Floodplain forests are important to the biological integrity of the Upper Mississippi River System as they provide a rich habitat for wildlife, reduce soil erosion, improve water quality, and provide a scenic and recreational landscape (USFWS 2006a).

3.3.1.2 WETLANDS

Wetlands are unique natural systems defined as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions” (33 CFR 328). Wetlands are biologically diverse and highly productive when compared to other ecosystem types, supporting a wide variety of plant and animal life. Furthermore, wetlands are beneficial in that they can function to improve water quality, store floodwater, provide groundwater recharge, provide fish and wildlife habitat, store carbon, naturally control and limit erosion within floodplains, shorelines, and along stream channels, and are typically found to be aesthetically pleasing. In the broadest sense, wetlands are classified marshes, swamps, bogs, and fens depending upon dominant vegetation types, landscape positions, and hydrology source.

Natural wetland communities occur within the resource evaluation area and are characterized in the following section based on coordination with WDNR NHI (WDNR 2018b).

3.3.1.2.1 EMERGENT MARSHES

Emergent marshes are wetland communities typically dominated by robust emergent wetland plant species. Common dominant species within these communities include cattails (*Typha* spp.), bulrushes (particularly *Scirpus acutus*, *S. fluviatilis*, and *S. validus*), bur-reeds (*Sparganium* spp.), giant reed (*Phragmites australis*), pickerel-weed (*Pontederia cordata*), water- plantains (*Alisma* spp.), arrowheads (*Sagittaria* spp.), certain species of spike-rush (such as *Eleocharis smallii*), and wild rice (*Zizania* spp.). These wetland plant communities may exist as monodominant stands or diverse species assemblages depending upon the extent and range of inundation. Emergent marsh can occur in a wide variety of settings, including river floodplains and backwaters, shallow topographic basins, protected inland lake and Great Lake bays areas, impoundments, and along the margins of ponds (Epstein 2017).

3.3.1.2.2 SOUTHERN SEDGE MEADOWS

Southern sedge meadows are herbaceous wetland communities dominated by graminoids such as tussock sedge (*Carex stricta*), common lake sedge (*Carex lacustris*), water sedge (*Carex aquatilis*), Sartwell’s sedge (*Carex sartwellii*), lesser panicled sedge (*Carex diandra*), bristly sedge (*Carex comosa*), and bottlebrush sedge (*Carex hystericina*). Although typically sedge dominated (*Carex* spp.), high-quality southern sedge meadow communities typically include a diverse group of forbs, including marsh bellflower (*Campanula aparinoides*), marsh wild-timothy (*Muhlenbergia glomerata*), American water horehound (*Lycopus americanus*), panicled aster (*Symphyotrichum lanceolatum*), swamp aster (*Symphyotrichum puniceum*), blue flag (*Iris versicolor*), spotted Joe-Pye weed (*Eutrochium maculatum*), marsh fern (*Thelypteris palustris*), and swamp milkweed (*Asclepias incarnate*). Disturbed and low-quality sites often become dominated by reed canary grass at the exclusion of virtually all other species (Epstein 2017).

3.3.1.2.3 PALUSTRINE

Wetlands documented within the resource evaluation area are generally classified as Palustrine. Palustrine wetlands are nontidal, bound by upland areas, and dominated by trees, shrubs, or persistent emergent plants. Palustrine wetlands within the resource evaluation area include Palustrine Emergent (PEM), Palustrine Scrub-Shrub (PSS), and Palustrine Forested (PFO) wetland types (Cowardin et al. 1979). These wetlands are most commonly associated with floodplains of major waterways, riparian corridors of smaller tributaries, and depressions. Open water wetland features include small farm ponds likely excavated for agricultural or recreational purposes and classified as PUB (Palustrine Unconsolidated Bottom) or PAB (Palustrine Aquatic Bed) (Cowardin et al. 1979). Other open-water areas include backwater and side channels within the Mississippi River floodplain.

The majority of wetlands within the resource evaluation area are composed entirely or in part of degraded wet meadow, shallow marsh, farmed wetland, hardwood swamp, and shrub carr communities (Eggers and Reed 1997). These degraded wetland communities are characterized by low plant diversity and dominance by various invasive species, most commonly reed canary grass and invasive cattails, and disturbance-tolerant native species, such as box elder (*Acer negundo*) and Eastern cottonwood. Some higher quality wetland communities occur within the resource evaluation area and are generally associated with extensive and intact riparian complexes such areas near East Branch Blue Mounds Creek (Iowa County, Wisconsin) and Black Earth Creek (Dane County, Wisconsin). These higher-quality wetland communities are composed of fairly intact native wetland vegetation. Higher quality wetland types include some sedge meadow, wet prairie, shrub carr, hardwood swamp, shallow marsh, deep marsh, and shallow, open-water communities (Eggers and Reed 1997). Other higher quality wetlands include those making up the Refuge (see Figure 3.1-1), which is a Wetland of International Importance (Ramsar Sites Information Service 2010).

Acreages of wetlands types found within the resource evaluation area, grouped by Cowardin classification (Cowardin et al. 1979) and Eggers and Reed community types (Eggers and Reed 1997), can be found in Table 3.3-1.

Table 3.3-1. Wetlands Types within the Resource Evaluation Area

Cowardin Classification[1]	Acreage	Community Type Descriptions[2]
PEM	157	Wet Meadows, Sedge Meadows, Farmed Wetlands, Shallow Marsh, Emergent Marsh, Wet Prairie
PSS	15	Scrub/Shrub Deciduous Wetlands, Shrub Carr
PFO	21	Forested Deciduous Wetlands, Hardwood Swamp
PEM/PSS complex	6	Wet Meadow/Shallow Marsh/Farmed Wetland with Shrub Carr
PEM/PFO complex	63	Farmed Wetlands/Wet Meadow/Sedge Meadow/Shallow Marsh with Hardwood Swamp
PSS/PFO complex	2	Shrub Carr with Hardwood Swamp
PEM/PSS/PFO complex	22	Wet Meadow/Farmed Wetlands with Shrub-carr and Hardwood Swamp
Palustrine/Open Water complex	6	Wet Meadow/Shallow Marsh/Deep Marsh/Hardwood Swamp with Open Water
Open Water (PAB/PUB/L)	4	Lakes, Open Water Ponds
Other	13	N/A
Total	**309**	

[1] PEM = Palustrine Emergent, PSS = Palustrine Scrub Shrub, PFO = Palustrine Forested, PUB = Palustrine Unconsolidated Bottom, PAB = Palustrine Aquatic Bed, L = Lacustrine

[2] As defined in Eggers and Reed (1997).

Wetlands are a federally regulated resource under the Clean Water Act (CWA) (33 U.S.C. 1251) and Executive Order (EO) 11990, Protection of Wetlands (42 Federal Register 26961). EO 11990 requires Federal agencies to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. It also requires that agencies avoid construction in wetlands to the extent practicable (44 CFR 26951). Section 404 of the CWA (33 U.S.C. 1344) established a program to regulate the discharge of dredged or fill material in waters of the U.S. (WUS), including wetlands. Activities in WUS regulated under this program include fill for development, water resource projects, and infrastructure development. Section 404 requires a permit before dredged or fill material may be discharged into WUS. In general, the USACE regulates impacts on wetlands or other WUS through its Section 404 Permit program. As part of the Section 404 permit program, the IDNR and WDNR also reviews projects for compliance with water quality standards pursuant to Section 401 of the CWA (33 U.S.C. 1341). Additional state permits for wetland impacts also would be required from the WDNR (s.281 Wisconsin Statutes) and IDNR (571 Iowa Administrative Code [IAC] Chapter 13).

3.3.1.3 SPECIAL STATUS PLANT SPECIES

Several state and/or federally listed plant species have the potential to occur in counties crossed by the C-HC Project. Appendix E provides a list of these species. Targeted plant inventories have not been completed for the project.

3.3.1.3.1 FEDERALLY LISTED SPECIES

Five federally listed plant species, all listed as threatened, were identified during the project’s USFWS Information for Planning and Consultation (IPaC) review as having potential to occur in the project area: Mead's milkweed (*Asclepias meadii*), prairie bush clover (*Lespedeza leptostachya*), eastern prairie fringed orchid (*Platanthera leucophaea*), western prairie fringed orchid (*Platanthera praeclara*), and northern monkshood (see Appendix E).

Mead’s Milkweed

This species occurs in tallgrass prairies (WDNR 2018b). Coordination with USFWS indicated no known species records within or near the proposed project segments (RUS 2018). The species was not detected during wetland delineation and field habitat assessment fieldwork completed by the Utilities within portions of the project area in 2017 (RUS 2018).

Prairie Bush Clover

This species occurs in sandy or gravelly hillside prairies with dry, sandy or gravelly soils (WDNR 2018b). Coordination with USFWS indicated no known species records within or near the proposed project segments (RUS 2018). The species was not detected during wetland delineation and field habitat assessment fieldwork completed by the Utilities within portions of the project area in 2017 (RUS 2018).

Eastern Prairie Fringed Orchid

This species occurs in mesic to wet tallgrass prairies and has been observed in sedge meadows, marsh edges, and bogs. The species prefers grassy habitat with little or no woody encroachment, and also has been observed in old field and roadside ditches (USFWS 2018c; WDNR 2018b). Coordination with USFWS indicated no known species records within or near the proposed project segments (RUS 2018). The species was not detected during wetland delineation and field habitat assessment fieldwork completed by the Utilities within portions of the project area in 2017 (RUS 2018).

Western Prairie Fringed Orchid

This species occurs in mesic to wet tallgrass prairies. The species also has been observed in old field and roadside ditches (USFWS 2018c; WDNR 2018b). Coordination with USFWS indicated no known species records within or near the proposed project segments (RUS 2018). The species was not detected during wetland delineation and field habitat assessment fieldwork completed by the Utilities within portions of the project area in 2017 (RUS 2018).

Northern Monkshood

Northern monkshood generally is found on shaded to partially shaded cliffs, near the base of sandstone or limestone cliffs with northern or eastern exposure, algific talus slopes, or along coldwater streams. These habitat settings result in cool, moist conditions with a cool soil environment. Coordination with USFWS indicated no known species records within or near the proposed project segments (RUS 2018). The species was not detected during wetland delineation and field habitat assessment fieldwork completed by the Utilities within portions of the project area in 2017 (RUS 2018).

3.3.1.3.2 STATE-LISTED SPECIES

Many state-listed species have potential to occur in the counties crossed by the project segments where suitable habitat for these species occurs (Appendix E). The WDNR NHI reports that 5 endangered, 5 threatened, 28 special concern plant species, and 1 lichen species have been recorded within 1 to 2 miles of the project and could be present in suitable habitat areas along portions of the C-HC Project summarized in Appendix E.

The IDNR completed a records search for rare species and significant natural communities in the project area and found no site-specific records that would be impacted by this project (Moore 2017).

3.3.1.3.3 INVASIVE SPECIES

General location and composition of dominant invasive species present within the ROW were identified and recorded during wetland delineations and vegetation mapping evaluations conducted in 2017. The 2017 fieldwork did not include targeted surveys to identify all invasive species (Dairyland 2016b).

Twenty-five invasive plant species were recorded. All but one of these species are in the “Restricted” category of WAC Chapter NR 40. The most commonly observed “Restricted” plant species were honeysuckle (*Lonicera* spp.), common buckthorn, multiflora rose, and wild parsnip. Observed “Restricted” species include the following:

- Garlic mustard *(Alliaria petiolata)*
- Japanese barberry *(Berberis thunbergii)*
- Spiny plumeless thistle *(Carduus acanthoides)*
- Oriental bittersweet *(Celastrus orbiculatus)*
- Spotted knapweed *(Centaurea maculosa)*
- Canada thistle *(Cirsium arvense)*
- Poison hemlock *(Conium maculatum)*
- Crown vetch (*Securigaria varia)*
- Russian olive (*Elaeagnus angustifolia*)

- Autumn olive *(Elaeagnus umbellata*)
- Leafy spurge (*Euphorbia esula*)
- Dame's rocket (*Hesperis matronalis*)
- Bell's honeysuckle *(Lonicera x bella)*
- Amur honeysuckle *(Lonicera mackii)*
- Tartarian honeysuckle *(Lonicera tatarica)*
- White mulberry *(Morus alba)*
- Wild parsnip *(Pastinaca sativa)*
- Curly-leaf pondweed *(Potamogeton crispus)*
- Common buckthorn *(Rhamnus cathartica)*
- Black locust *(Robinia pseudoacacia)*
- Multiflora rose *(Rosa multiflora)*
- Japanese hedgeparsley *(Torilis japonica)*
- Narrow-leaved cattail *(Typha angustifolia)*
- Hybrid cattail *(Typha x glauca).*

Eurasian manna grass (*Glyceria maxima*) was the only "Prohibited" species observed during 2017 surveys (Dairyland 2016b).

3.3.2 *Environmental Consequences*

This section describes impacts to vegetation associated with the construction, operation, and maintenance of the C-HC Project. Impacts to vegetation are discussed in terms of impacts to vegetation communities, special status plants, and invasive species.

3.3.2.1 DATA SOURCES, METHODS, AND ANALYSIS ASSUMPTIONS

The following impact indicators were considered when analyzing potential impacts to vegetation, including wetlands and special status plants:

- Acres, both permanent and temporary, of disturbance resulting from construction and maintenance activities; and
- Effects to special status species, including the loss of any population of special status plant species that would jeopardize the continued existence of that population.

Comprehensive vegetation community surveys and mapping has not been completed for the project. The description of Affected Environment above, and the Environmental Consequences analysis below, rely on desktop evaluations, agency coordination, and GIS analysis of land use and land cover data obtained from USGS National Land Cover Dataset (NLCD) (USGS 2011). 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 (Homer et al. 2012). Acreage of land cover by classification was calculated for both the ROW and the analysis area for each action alternative. As described above, the analysis area for each alternative is defined by a 300-foot area surrounding each action alternative presented in Chapter 2. The analysis area is sufficient to identify vegetation resources that could be directly and indirectly affected by the C-HC Project.

Generally, the vegetation communities described above in Section 3.3.1 exist within the broader NLCD classifications as shown below in Table 3.3-2. To support evaluation of impacts to vegetation communities from the C-HC Project, RUS cross-referenced the vegetation communities that occur in the vicinity of the C-HC Project with the NLCD classifications. Impacts from the C-HC Project were then estimated by evaluating 1) acreage of surface impacts to grassland, forest, shrubland, and wetland land cover, and 2) potential effects to special status species that may occur within those land cover types.

Table 3.3-2. Land Cover Classifications and Natural Vegetation Communities Present in the C-HC Project Area

	Grassland	Forest	Shrubland	Wetland	Other
Algific Talus Slope	-	-	-	-	Algific talus slopes are found on limestone bluffs and are not associated to one NLCD land cover type.
Dry Prairie	X	-	-	-	-
Dry-mesic Prairie	X	-	-	-	-
Eastern Red-cedar Thicket	-	-	X	-	-
Mesic Prairie	X	-	-	-	-
Moist Cliff	-	-	-	-	Moist cliffs are found on steep, sandstone and dolomite slopes and are not associated to one specific NLCD land cover type.
Pine Relict	-	X	-	-	-
Southern Dry Forest	-	X	-	-	-
Southern Dry-mesic Forest	-	X	-	-	-
Floodplain Forest	-	X	-	-	-
Wetlands	-	-	-	X	-

To estimate impacts to wetlands, RUS used the wetland delineation data provided by the Utilities and wetland fill estimates provided in the Wisconsin Public Service Commission application. The Utilities also provided wetland fill estimates for the Iowa portion of C-HC Project based on preliminary structure locations.

The Utilities completed wetland delineations from May through July 2017 using methods outlined in the USACE Wetland Delineation Manual (USACE 1987) and the Midwest Region and Northcentral and Northeast Region Supplements (USACE 2010, 2012). Field access was limited to the existing ROW, including ATC and Dairyland transmission lines, and public roads along alternative routes. For areas extending outside the existing right-of-way, wetland boundaries conservatively were estimated based on field observations and through aerial photograph interpretation (2015 National Agriculture Imagery Program and 2016 photographs viewed in Pictometry), soil survey data, National Wetlands Inventory (NWI) maps (USFWS 2016), Wisconsin Wetlands Inventory (WWI) maps (WDNR 2016b), and additional wetland signatures described by the WDNR Surface Water Data Viewer – Wetlands and Wetland Indicators (WDNR 2016c). In areas without direct access, wetlands were identified based on field observations made from publicly accessible locations and using desktop resources listed above. Field views from public access points crossing or near the alignments such as roads, public lands, parks, and other accessible locations were used to confirm the results of the desktop analysis (if possible) and identify new wetland resources.

Using these data and assumptions, potential impacts to wetlands are quantified as follows:

- Total number wetlands crossed – An estimated quantity of individual wetland communities delineated or identified within the analysis area (300-foot corridor) that may be directly and indirectly affected by the project.
- Total acreage of filled wetlands (permanent impact) – A measure of the estimated permanent wetland impacts due to filling activities associated with the placement of transmission line structures within wetlands.
- Total forested wetland acreage within the ROW (permanent impact) – A measure of the estimated total acreage of forested wetlands within proposed ROW (150- to 260-foot corridor depending upon location). Total forested wetlands within the ROW represents the expected quantity of forested to non-forested wetland conversion required for each alternative, representing a permanent impact.
- Total non-forested wetland acreage within the ROW (temporary impact) – A measure of the estimated total acreage of non-forested wetlands within proposed ROW, used to evaluate the potential extent of temporary wetland impacts for each alternative.
- Total wetland acreage outside the ROW in the analysis area (indirect impacts) – A measure of all wetlands outside, but potentially adjacent to the ROW, used to evaluate the potential extent of indirect wetland impacts for each alternative. This includes both forested and non-forested wetlands.

The following sections provide an effects evaluation by alternative based of the above impact indicators. An overall classification (minor, moderate, major) of impacts is assigned to each alternative. Definitions of the impact threshold for each classification are provided in Table 3.3-3 below.

Table 3.3-3. Impact Thresholds and Descriptions for Vegetation, including Wetlands and Special-Status Plants

	Minor Impact	Moderate Impact	Major Impact
Vegetation, including Wetlands and Special Status Plants	Impacts on native vegetation would be detectable but discountable and would not alter natural conditions measurably.Infrequent disturbances to individual plants could be expected, but without affecting local or range-wide population stability. Infrequent or insignificant one-time disturbances to local populations could occur, but sufficient habitat would remain functional at both the local and regional scales to maintain the viability of the species. Opportunities for the increased spread of noxious weeds would be detectable but discountable. There would be some minor potential for an increased spread of noxious weeds.	Impacts on native vegetation would be detectable and/or measurable. Occasional disturbances to individual plants could be expected. These disturbances could affect local populations negatively but would not be expected to affect regional population stability. Some impacts might occur in key habitats, but sufficient local habitat would remain functional to maintain the viability of the species both locally and throughout its range. Opportunities for increased spread of noxious weeds would be detectable and/or measurable. There would be some moderate potential for the increased spread of noxious weeds.	Impacts on native vegetation would be measurable and extensive. Frequent disturbances of individual plants would be expected, with negative impacts to both local and regional population levels. These disturbances could negatively affect local populations and could affect range-wide population stability. Some impacts might occur in key habitats, and habitat impacts could negatively affect the viability of the species both locally and throughout its range. Opportunities for the increased spread of noxious weeds would be measurable and extensive. There would be a major potential for the increased spread of noxious weeds.

3.3.2.2 NO ACTION

Under the No Action Alternative, the proposed Project would not be built, and there would be no impacts on vegetation, including wetlands and special status species.

3.3.2.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

3.3.2.3.1 VEGETATION COMMUNITIES

The primary direct and indirect impacts to vegetation during construction and operation and maintenance of the proposed Project associated with all action alternatives would be associated with:

- removal and/or crushing of natural, native species–dominated vegetation communities or associations;
- decreased plant productivity as a result of fugitive dust; and
- plant community fragmentation.

All action alternatives would involve the removal of vegetation during construction activities resulting in the direct loss of plant communities. Forest and shrub vegetation would be cleared within the ROW and in areas where access roads are required. Permanent impacts on vegetation would be limited to conversion of forested cover to non-forest cover within the ROW, and loss of vegetation resulting from permanent conversion of undeveloped areas to new, developed areas, including the footprint of the C-HC Project (such as structures) and the Hill Valley Substation site.

Vegetation removal could affect vegetation communities by changing community structure and composition and altering soil moisture or nutrient regimes. The degree of impact depends on the type and amount of vegetation affected, and, for short-term impacts, the rate at which vegetation would regenerate following construction. These direct and indirect effects could reduce or change the functional qualities of vegetation, including as wildlife habitat (see Section 3.4).

Temporary impacts on vegetation would include the removal of non-forested vegetation that would be restored upon completion of construction. The degree of these impacts depends on the type and amount of vegetation affected, and the rate at which vegetation would regenerate following construction. Fugitive dust resulting from construction and maintenance traffic has the potential to affect photosynthetic rates and decrease plant productivity.

Vegetation removal also would expose soils to potential wind and water erosion. This could result in further loss of soil and vegetation, and potentially to increased sediment into water resources. There would also be indirect effects resulting from the fragmentation of connected vegetation types. Edge areas have different microclimatic conditions and structure, which could lead to different species composition than interior area. The introduction and colonization of disturbed areas by invasive exotic plant species also could lead to changes in vegetation communities. Other indirect impacts to vegetation may result from dust accumulation immediately adjacent to roads, soil compaction at temporarily impacted areas, which could result in lowered individual plant vigor or changes in plant abundance and/or species. However, these impacts would be reduced by implementing environmental commitments (see Table 3.1-4) and BMPs (see Appendix D). Operation and maintenance activities are expected to result in minimal impact to vegetation resources.

Minimal vegetation management activities would be required to maintain the operating transmission line. Operation and maintenance activities would include vegetation trimming within the ROW, aerial inspections, ground inspections, and repairs. Vegetation trimming would result in the removal of limited, target vegetation, including non-native species. Aerial inspections would not affect vegetation. Ground inspections, where vehicles are confined to existing roadways, are unlikely to have any additional direct or indirect impacts on vegetation. Repairs to the transmission structures and conductors could have minor direct and indirect impacts on vegetation resources within areas disturbed by this activity. Impacts would be reduced by implementing BMPs.

Wetlands

Potential impacts to wetlands from the C-HC Project would include fill activities from transmission line structure construction, tree clearing within the ROW, and construction of access roads and staging areas. Wetland fill activities due to the placement of transmission line structures within wetlands, and associated grading and construction activities, are considered permanent impacts resulting in wetland loss.
No permanent fill in any wetlands for access road construction is proposed. Furthermore, it is anticipated that no wetlands will be permanently impacted due to construction of the Hill Valley Substation or at any proposed lay down yards. Construction activities and modifications at existing substations would be confined to current footprint of the facilities.

Forested wetlands crossed by the alternatives would require trees to be removed during construction and maintained in a non-forested state for the life of the C-HC Project. Tree clearing within forested wetlands would generally not be considered a wetland fill activity; however, conversion of a forested wetland to a non-forested wetland type (shrub/scrub or emergent) would be considered a permanent wetland impact as the wetland type and wetland function would be permanently altered.

Wetland impacts may result from temporary wetland crossings for construction equipment and/or materials along the proposed ROW and adjacent areas. Timber mats and other impact minimization techniques and BMPs would be used to prevent soil compaction and earth disturbance at temporary crossings. Wetlands temporarily impacted by construction access, staging areas, and access roads would be restored to original contours and reseeded with a site-appropriate mix of native wetland species.

Wetland areas both within the ROW and adjacent areas may be indirectly impacted by project construction, operation, and maintenance activities. In this instance, indirect impacts generally refer to changes in wetland quantity or quality that are reasonably foreseeable due to the direct, or permanent impact to wetlands (e.g., permanent fill; tree clearing in forested wetlands). Furthermore, indirect impacts are often removed in time and space from the direct impacts of project construction (i.e., involve a lag time; are outside the project footprint). In this respect, the indirect impacts of the C-HC Project are likely to include increased sediment deposition in nearby wetlands, alteration of long-term wetland hydrology, and residual effects resulting from the fragmentation of wetland habitats that span the ROW. Fragmenting wetland habitats can affect adjacent areas by increasing edge habitat and altering light regimes, ultimately driving changes in wetland species composition and function. With respect to species composition, noxious weeds and other invasive species would also potentially be introduced and spread through ground disturbances and transfer by equipment. Precautions would be implemented during construction and reclamation to minimize the long-term magnitude of these potential indirect impacts. Precautions include revegetation of disturbed areas using certified seed and mulch that contain no viable noxious weed seeds, restoration of construction areas to predisturbance contours, and the use of standard BMPs during construction and revegetation practices within disturbed areas, as discussed in Section 3.1, Table 3.1-4.

Potential impacts to wetlands are assumed to be minimized by a number of environmental commitments described in Section 3.1, Table 3.1-4. Any unavoidable impacts to wetlands, whether temporary or permanent, will be discussed with the USACE, IDNR, and WDNR prior to construction to determine the permitting requirements and conditions necessary for construction activities involving wetland impacts.

3.3.2.3.2 SPECIAL STATUS PLANT SPECIES

Federally Listed Species

As described in Section 3.3.1, five federally listed threatened plant species have potential to occur in the C-HC Project vicinity. A "No Effect" determination was made for the eastern prairie fringed orchid, Mead's milkweed, prairie bush clover, and western prairie fringed orchid in the RUS BA developed during the Section 7 consultation process for the C-HC Project (Table 3.3-4). Due to a lack of presence within the ROW based on known records, no effects to Mead's milkweed, prairie bush clover, eastern prairie fringed orchid, or western prairie fringed orchid are anticipated to occur as a result of implementation of any action alternative. Table 3.3-4 summarizes the effects determination for these species as described in the BA (RUS 2018).

Table 3.3-4. Federally Listed Species with Potential to Occur in the C-HC Project and the Effect Determinations for Each in the RUS BA

Species	Federal Status	Effect Determination from RUS BA
Eastern prairie fringed orchid	Threatened	No effect
Mead's milkweed	Threatened	No effect
Northern monkshood	Threatened	May Affect, Not Likely to Adversely Affect
Prairie bush clover	Threatened	No effect
Western prairie fringed orchid	Threatened	No effect

Source: RUS (2018)

The RUS BA determined that the project "May Affect, but is Not Likely to Adversely Affect" the northern monkshood. Suitable habitat for the species may be present within the ROW. However, under all action alternatives, the following BMPs would be implemented to ensure activities do not adversely affect the species (RUS 2018):

- Suitable habitat or individual plants/populations that may be identified along Segments A-IA or D-IA locations would be mapped to assist in avoiding direct disturbance, identifying buffer distances, and/or use of BMPs.
- Broadcast herbicide application would be avoided in areas where suitable habitat and/or where individual plants/populations are present.
- Known individual plant/population locations would be avoided and Project activities if needed in area of known presence would be conducted when least likely to affect individual plants, such as during frozen, snow-covered ground conditions or in dry soil areas late in the growing season.
- Pole locations and construction access roads would avoid areas of steep slopes and cliffs.
- BMPs would be used during construction, maintenance, and vegetation management activities to prevent the spread of invasive species.
- Disturbances to hydrology, including soil disturbance from rutting, would be avoided in areas where suitable habitat and/or where individual plants/populations are present.

Due to implementation of these BMPs, effects to the northern monkshood under any action alternative is expected to be minor.

State-Listed Species

Precise locations, if present, within the ROW of state-listed species are not known. The WDNR NHI reports that 39 state-listed species have been recorded within 2 miles of the C-HC Project and could be present in suitable habitat areas along portions of the C-HC Project, including within off-ROW access paths and/or laydown yards. The IDNR completed a records search for rare species and significant natural communities in the project area and found no site-specific records that would be impacted by the C-HC Project.

The Utilities would implement recommended avoidance and impact minimization measures where state-listed species or their habitat are verified to occur. For example, if preliminary research and field assessments indicate that rare species or natural communities may be present in the C-HC Project area, specific, appropriately timed surveys may be conducted prior to construction. The need for and timing of these surveys would be identified by WDNR or IDNR through coordination with the Utilities. Pre-construction surveys may be used to identify whether a particular species is present in the affected area or to what extent suitable habitat for a species is present within the project area. If a threatened or endangered species is observed during the surveys, measures such as flagging or fencing the location of protected plant species and avoiding those areas during construction would be implemented. Because such measures would avoid or minimize impacts to special status plant populations, the action alternatives are expected to have no, or only minor, impacts to these species.

3.3.2.3.3 INVASIVE SPECIES

Invasive species could be introduced and spread as a result of construction of the C-HC Project, through ground disturbances and transfer by equipment. BMPs would be implemented during construction and reclamation to minimize the potential for introduction and spread of invasive species.

The C-HC Project would directly affect noxious weeds through soil and native vegetation disturbance. Noxious weeds typically are able to effectively compete with native plants and can relatively quickly invade disturbed or fragmented areas. Therefore, disturbance of vegetative cover could facilitate the introduction, spread and proliferation of invasive species, which in turn could alter plant community composition, reduce native plant species cover and biodiversity, alter soils and hydrology, and produce monocultures.

As described in Section 3.3, several species of invasive plants were documented in the C-HC Project during project-specific surveys. However, additional invasive species may be present in the vicinity of the project but not occur in the ROW or analysis area. The use of vehicles and machinery from outside the analysis area could facilitate noxious weed introduction into the project footprint.

Several BMPs, including those in *Rights-of-Way Best Management Practices for Invasive Species*, would be implemented to avoid and minimize effects to vegetation as a result of the introduction or proliferation of invasive species as a result of implementing any of the Action Alternatives (Appendix D).

3.3.2.4 ALTERNATIVE 1

Alternative 1 would result in the temporary or permanent removal, degradation, or alteration of vegetation as shown in Table 3.3-5.

Approximately 524 acres of forest, 228 acres of grassland, 110 acres of wetlands, and 10 acres of shrubland would be directly impacted, either permanently (e.g., removed) or temporarily (disturbed and restored), by construction and maintenance of the project within the ROW, access roads, and laydown yards.

Approximately 496 acres of forest, 153 acres of grassland, 59 acres of wetland, and 6 acres of shrubland would be indirectly affected outside the ROW and within the analysis area (e.g., as a result of fugitive dust). Within these acres, effects described under Impacts Common to All Action Alternatives would be expected to occur.

Impacts to forest, grassland, and wetlands would be considered moderate. The alteration or removal of vegetation would be measurable and would affect individual plants and local populations. Effects would not be expected to affect regional populations as they would be limited to discrete footprints within the project. Impacts to shrubland would be considered minor. The alteration or removal of 10 acres of shrubland, and indirect effects to approximately 6 acres of shrubland, would be detectable but discountable, and is not expected to affect natural shrubland communities on the regional landscape.

Table 3.3-5. Acreages of Impacts to Vegetation as a Result of Alternative 1

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Total Analysis Area	**1,891**	**1,699**	**22**	**204**	**213**
Land Cover Class					
Grassland	228	153	0	40	0
Forest	524	496	0	11	0
Shrubland	10	6	0	0	0
Wetland	110	59	0	4	0

Wetlands

Alternative 1 would cross approximately 113 wetlands totaling approximately 110 acres of wetland within the ROW, and approximately 59 acres of wetland outside the ROW but within the analysis area.

Alternative 1 would permanently impact approximately 38 total acres of wetland due to tree clearing of forested wetland habitats, including 3 acres of PFO wetlands, 23 acres of PEM/PFO wetlands, and 12 acres of PEM/PSS/PFO wetlands. Alternative 1 would also permanently impact <0.1 acre of wetland due to fill activities associated with transmission line structures.

Temporary impacts to wetlands within the ROW are estimated to be approximately 72 acres, including 56 acres of PEM wetlands, 11 acres of PSS wetlands, 3 acres of PEM/PSS wetlands, 2 acres of PEM/open water wetland complexes. Indirect impacts to wetlands outside the ROW but within the analysis area are estimated to be approximately 59 acres, including 1 acre of PFO wetland, <1 acre of PSS wetland, 21 acres of PEM wetlands, 2 acres of PEM/PSS wetlands, 24 acres of PEM/PFO wetlands, 9 acres of PEM/PSS/PFO wetlands, and 2 acres of PEM/open water wetland complexes.

Alternative 1 would cross approximately 42 acres of wetlands within Iowa and 68 acres of wetlands within Wisconsin.

A summary of forested and non-forested wetlands impacts is included in Table 3.3-6.

Table 3.3-6. Alternative 1 Wetland Impacts

Permanent Impacts	Wetland Acres
Forested Wetlands Cleared within ROW	38
Wetland Filled Due to Placement of Structures	<0.1
Total Permanent Impacts	**38**
Temporary or Indirect Impacts	**Wetland Acres**
Non-Forested Wetlands within ROW (Temporary)	72
Wetlands Outside ROW, within Analysis Area (Indirect)	59

Effects on special status plant species, if present, would be considered minor. The Utilities would implement recommended avoidance and impact minimization measures when and where practicable in areas where state-listed species or their habitat are verified to occur. Because such measures would avoid or minimize impacts to special status plant populations, the action alternatives are expected to have no, or only minor, impacts to these species.

Anticipated impacts to invasive species are expected to be moderate, as opportunities for the increased spread of invasive species, including noxious weeds, would be detectable but discountable. There would be a minor potential for an increased spread of noxious weeds.

3.3.2.5 ALTERNATIVE 2

Alternative 2 would result in the temporary or permanent removal, degradation, or alteration of vegetation as shown in Table 3.3-7.

Approximately 530 acres of forest, 249 acres of grassland, 121 acres of wetlands, and 9 acres of shrubland would be directly impacted, either permanently (e.g., removed) or temporarily (disturbed and restored), by construction and maintenance within the ROW, access roads, and laydown yards.

Approximately 500 acres of forest, 171 acres of grassland, 62 acres of wetland, and 5 acres of shrubland would be indirectly affected outside the ROW and within the analysis area (e.g., as a result of fugitive dust). Within these acres, effects described under Impacts Common to All Action Alternatives would be expected to occur.

Impacts to forest, grassland, and wetlands would be considered moderate. The alteration or removal of vegetation would be measurable and would affect individual plants and local populations. Effects would not be expected to affect regional populations as they would be limited to discrete footprints within the project. Impacts to shrubland would be considered minor. The alteration or removal of 9 acres of shrubland, and indirect effects to approximately 5 acres of shrubland, would be detectable but discountable, and is not expected to affect natural shrubland communities on the regional landscape.

Table 3.3-7. Acreages of Impacts to Vegetation as a Result of Alternative 2

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Total Analysis Area	2,008	1,766	22	210	213
Land Cover Class					
Grassland	249	171	0	42	0

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Forest	530	500	0	11	0
Shrubland	9	5	0	0	0
Wetland	121	62	0	3	0

Wetlands

Alternative 2 would cross approximately 116 wetland crossings totaling approximately 121 acres of wetland within the ROW, and approximately 62 acres of wetland outside the ROW but within the analysis area.

Alternative 2 would permanently impact approximately 52 total acres of wetland due to tree clearing of forested wetland habitats, including 15 acres of PFO wetlands, 25 acres of PEM/PFO wetlands, and 12 acres of PEM/PSS/PFO wetlands. Alternative 2 would also permanently impact <0.1 acre of wetland due to fill activities associated with transmission line structures.

Temporary impacts to wetlands within the ROW are estimated to be approximately 69 acres, including 54 acres of PEM wetlands, 8 acres of PSS wetlands, 2 acres of PEM/PSS wetlands, 5 acres of PEM/open water wetland complexes. Indirect impacts to wetlands outside the ROW but within the analysis area are estimated to be approximately 62 acres, including <1 acre of PFO wetland, <0.1 acre of PSS wetland, 24 acres of PEM wetlands, 2 acres of PEM/PSS wetlands, 25 acres of PEM/PFO wetlands, 9 acres of PEM/PSS/PFO wetlands, and 2 acres of PEM/open water wetland complexes.

Alternative 2 would cross approximately 48 acres of wetlands within Iowa and 73 acres of wetlands within Wisconsin.

A summary of forested and non-forested wetlands impacts is included in Table 3.3-8.

Table 3.3-8. Alternative 2 Wetland Impacts

Permanent Impacts	Wetland Acres
Forested Wetlands Cleared within ROW	52
Wetland Filled Due to Placement of Structures	<0.1
Total Permanent Impacts	**52**
Temporary or Indirect Impacts	**Wetland Acres**
Non-Forested Wetlands within ROW (Temporary)	69
Wetlands Outside ROW, within Analysis Area (Indirect)	62

Effects to special status plant species, if present, would be considered minor. Because the Utilities would complete vegetation surveys prior to construction, and BMPs would be implemented to avoid and minimize effects to identified special status plants, any impacts are expected to be minor.

Anticipated impacts to invasive species are expected to moderate, as opportunities for the increased spread of invasive species, including noxious weeds, would be detectable but discountable. There would a minor potential for an increased spread of noxious weeds.

3.3.2.6 ALTERNATIVE 3

Alternative 3 would result in the temporary or permanent removal, degradation, or alteration of vegetation as shown in Table 3.3-9.

Approximately 504 acres of forest, 302 acres of grassland, 107 acres of wetlands, and 10 acres of shrubland would be directly impacted, either permanently (e.g., removed) or temporarily (disturbed and restored), by construction and maintenance within the ROW, access roads, and laydown yards.

Approximately 504 acres of forest, 198 acres of grassland, 55 acres of wetland, and 8 acres of shrubland would be indirectly affected outside the ROW and within the analysis area (e.g., as a result of fugitive dust). Within these acres, effects described under Impacts Common to All Action Alternatives would be expected to occur.

Impacts to forest, grassland, and wetlands would be considered moderate. The alteration or removal of vegetation would be measurable and would affect individual plants and local populations. Effects would not be expected to affect regional populations as they would be limited to discrete footprints within the project. Impacts to shrubland would be considered minor. The alteration or removal of 10 acres of shrubland, and indirect effects to approximately 8 acres of shrubland, would be detectable but discountable, and is not expected to affect natural shrubland communities on the regional landscape.

Table 3.3-9. Acreages of Impacts to Vegetation as a Result of Alternative 3

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Total Analysis Area	2,210	2,016	22	157	213
Land Cover Class					
Grassland	302	198	0	27	0
Forest	504	504	0	12	0
Shrubland	10	8	0	0	0
Wetland	107	55	0	3	0

Wetlands

Alternative 3 would cross approximately 134 wetlands totaling approximately 107 acres of wetland within the ROW and approximately 55 acres of wetland outside the ROW but within the analysis area.

Alternative 3 would permanently impact approximately 49 total acres of wetland due to tree clearing of forested wetland habitats, including 13 acres of PFO wetlands, 23 acres of PEM/PFO wetlands, and 12 acres of PEM/PSS/PFO wetlands. Alternative 3 would also permanently impact <0.1 acre of wetland due to fill activities associated with transmission line structures.

Temporary impacts to wetlands within the ROW are estimated to be approximately 58 acres, including 44 acres of PEM wetlands, 8 acres of PSS wetlands, 2 acres of PEM/PSS wetlands, and 4 acres of PEM/open water wetland complexes. Indirect impacts to wetlands outside the ROW but within the analysis area are estimated to be approximately 55 acres, including <1 acre of PFO wetland, <0.1 acre of PSS wetland, 18 acres of PEM wetlands, 2 acres of PEM/PSS wetlands, 24 acres of PEM/PFO wetlands, 9 acres of PEM/PSS/PFO wetlands, and 2 acres of PEM/open water wetland complexes.

Alternative 3 would cross approximately 48 acres of wetlands within Iowa and 59 acres of wetlands within Wisconsin.

A summary of forested and non-forested wetlands impacts is included in Table 3.3-10.

Table 3.3-10. Alternative 3 Wetland Impacts

Permanent Impacts	Wetland Acres
Forested Wetlands Cleared within ROW	49
Wetland Filled Due to Placement of Structures	<0.1
Total Permanent Impacts	**49**
Temporary or Indirect Impacts	**Wetland Acres**
Non-Forested Wetlands within ROW (Temporary)	58
Wetlands Outside ROW, within Analysis Area (Indirect)	55

Effects to special status plant species, if present, would be considered minor. Because the Utilities would complete vegetation surveys prior to construction, and BMPs would be implemented to avoid and minimize effects to identified special status plants, any impacts are expected to be minor.

Anticipated impacts to invasive species are expected to be moderate, as opportunities for the increased spread of invasive species, including noxious weeds, would be detectable but discountable. There would a minor potential for an increased spread of noxious weeds.

3.3.2.7 ALTERNATIVE 4

Alternative 4 would result in the temporary or permanent removal, degradation, or alteration of vegetation as shown in Table 3.3-11.

Approximately 236 acres of forest, 433 acres of grassland, 69 acres of wetlands, and 16 acres of shrubland would be directly impacted, either permanently (e.g., removed) or temporarily (disturbed and restored), by construction and maintenance within the ROW, access roads, and laydown yards.

Approximately 216 acres of forest, 317 acres of grassland, 18 acres of wetland, and 10 acres of shrubland would be indirectly affected outside the ROW and within the analysis area (e.g., as a result of fugitive dust). Within these acres, effects described under Impacts Common to All Action Alternatives would be expected to occur.

Impacts to forest, grassland, and wetlands would be considered moderate. The alteration or removal of vegetation would be measurable and would affect individual plants and local populations. Effects would not be expected to affect regional populations as they would be limited to discrete footprints within the project. Impacts to shrubland would be considered minor. The alteration or removal of 16 acres of shrubland, and indirect effects to approximately 10 acres of shrubland, would be detectable but discountable, and is not expected to affect natural shrubland communities on the regional landscape.

Table 3.3-11. Acreages of Impacts to Vegetation as a Result of Alternative 4

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Total Analysis Area	2,246	2,083	22	116	213
Land Cover Class					
Grassland	433	317	0	19	0
Forest	236	216	0	7	0
Shrubland	16	10	0	0	0
Wetland	69	18	0	2	0

Wetlands

Alternative 4 would cross approximately 129 wetlands totaling approximately 69 acres of wetland within the ROW, and approximately 18 acres of wetland outside the ROW but within the analysis area.

Alternative 4 would permanently impact approximately 16 total acres of wetland due to tree clearing of forested wetland habitats, including 13 acres of PFO wetlands, <1 acre of PSS/PFO wetland, and 3 acres of PEM/PFO wetlands. Alternative 4 would also permanently impact <0.1 acre of wetland due to fill activities associated with transmission line structures.

Temporary impacts to wetlands within the ROW are estimated to be approximately 54 acres, including 40 acres of PEM wetlands, 9 acres of PSS wetlands, 1 acre of PEM/PSS wetlands, and 4 acres of PEM/open water wetland complexes. Indirect impacts to wetlands outside the ROW but within the analysis area are estimated to be approximately 18 acres, including <1 acre of PFO wetland, <1 acre of PSS wetland, 12 acres of PEM wetlands, 1 acre of PEM/PSS wetlands, 2 acres of PEM/PFO wetlands, 1 acre of PSS/PFO wetland, and 2 acres of PEM/open water wetland complexes.

Alternative 4 would cross approximately 48 acres of wetlands within Iowa and 21 acres of wetlands within Wisconsin.

A summary of forested and non-forested wetlands impacts is included in Table 3.3-12.

Table 3.3-12. Alternative 4 Wetland Impacts

Permanent Impacts	**Wetland Acres**
Forested Wetlands Cleared within ROW	16
Wetland Filled Due to Placement of Structures	<0.1
Total Permanent Impacts	**16**
Temporary or Indirect Impacts	**Wetland Acres**
Non-Forested Wetlands within ROW (Temporary)	54
Wetlands Outside ROW, within Analysis Area (Indirect)	18

Effects to special status plant species, if present, would be considered minor. Because the Utilities would complete vegetation surveys prior to construction, and BMPs would be implemented to avoid and minimize effects to identified special status plants, any impacts are expected to be minor.

Anticipated impacts to invasive species are expected to be moderate, as opportunities for the increased spread of invasive species, including noxious weeds, would be detectable but discountable. There would a minor potential for an increased spread of noxious weeds.

3.3.2.8 ALTERNATIVE 5

Alternative 5 would result in the temporary or permanent removal, degradation, or alteration of vegetation as shown in Table 3.3-13.

Approximately 245 acres of forest, 454 acres of grassland, 66 acres of wetlands, and 8 acres of shrubland would be directly impacted, either permanently (e.g., removed) or temporarily (disturbed and restored), by construction and maintenance within the ROW, access roads, and laydown yards.

Approximately 216 acres of forest, 338 acres of grassland, 27 acres of wetland, and 7 acres of shrubland would be indirectly affected outside the ROW and within the analysis area (e.g., as a result of fugitive dust). Within these acres, effects described under Impacts Common to All Action Alternatives would be expected to occur.

Impacts to forest, grassland, and wetlands would be considered moderate. The alteration or removal of vegetation would be measurable and would affect individual plants and local populations. Effects would not be expected to affect regional populations as they would be limited to discrete footprints within the C-HC Project. Impacts to shrubland would be considered minor. The alteration or removal of 8 acres of shrubland, and indirect effects to approximately 7 acres of shrubland, would be detectable but discountable, and is not expected to affect natural shrubland communities on the regional landscape.

Table 3.3-13. Acreages of Impacts to Vegetation as a Result of Alternative 5

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Total Analysis Area	2,431	2,230	22	129	213
Land Cover Class					
Grassland	454	338	0	22	0
Forest	245	216	0	7	0
Shrubland	8	7	0	0	0
Wetland	66	27	0	2	0

Wetlands

Alternative 5 would cross approximately 158 wetlands totaling approximately 66 acres of wetland within the ROW and approximately 27 acres of wetland outside the ROW but within the analysis area.

Alternative 5 would permanently impact approximately 5 total acres of wetland due to tree clearing of forested wetland habitats, including 2 acres of PFO wetlands, <1 acre of PSS/PFO wetland, and 3 acres of PEM/PFO wetlands. Alternative 5 would also permanently impact <0.1 acre of wetland due to fill activities associated with transmission line structures.

Temporary impacts to wetlands within the ROW are estimated to be approximately 61 acres, including 48 acres of PEM wetlands, 11 acres of PSS wetlands, 1 acre of PEM/PSS wetlands, and 1 acre of PEM/open water wetland complexes. Indirect impacts to wetlands outside the ROW but within the analysis area are estimated to be approximately 27 acres, including 1 acre of PFO wetland, <1 acre of PSS wetland, 17 acres of PEM wetlands, 1 acre of PEM/PSS wetlands, 5 acres of PEM/PFO wetlands, 1 acre of PSS/PFO wetland, and 2 acres of PEM/open water wetland complexes.

Alternative 5 would cross approximately 42 acres of wetlands within Iowa and 24 acres of wetlands within Wisconsin.

A summary of forested and non-forested wetlands impacts is included in Table 3.3-14.

Table 3.3-14. Alternative 5 Wetland Impacts

Permanent Impacts	Wetland Acres
Forested Wetlands Cleared within ROW	5
Wetland Filled Due to Placement of Structures	<0.1
Total Permanent Impacts	**5**
Temporary or Indirect Impacts	**Wetland Acres**
Non-Forested Wetlands within ROW (Temporary)	61
Wetlands Outside ROW, within Analysis Area (Indirect)	27

Effects to special status plant species, if present, would be considered minor. Because the Utilities would complete vegetation surveys prior to construction, and BMPs would be implemented to avoid and minimize effects to identified special status plants, any impacts are expected to be minor.

Anticipated impacts to invasive species are expected to be moderate, as opportunities for the increased spread of invasive species, including noxious weeds, would be detectable but discountable. There would a minor potential for an increased spread of noxious weeds.

3.3.2.9 ALTERNATIVE 6

Alternative 6 would result in the temporary or permanent removal, degradation, or alteration of vegetation as shown in Table 3.3-15.

Approximately 252 acres of forest, 355 acres of grassland, 71 acres of wetlands, and 17 acres of shrubland would be directly impacted, either permanently (e.g., removed) or temporarily (disturbed and restored), by construction and maintenance within the ROW, access roads, and laydown yards.

Approximately 203 acres of forest, 275 acres of grassland, 20 acres of wetland, and 9 acres of shrubland would be indirectly affected outside the ROW and within the analysis area (e.g., as a result of fugitive dust). Within these acres, effects described under Impacts Common to All Action Alternatives would be expected to occur.

Impacts to forest, grassland, and wetlands would be considered moderate. The alteration or removal of vegetation would be measurable and would affect individual plants and local populations. Effects would not be expected to affect regional populations as they would be limited to discrete footprints within the project. Impacts to shrubland would be considered minor. The alteration or removal of 17 acres of shrubland, and indirect effects to approximately 9 acres of shrubland, would be detectable but discountable, and is not expected to affect natural shrubland communities on the regional landscape.

Table 3.3-15. Acreages of Impacts to Vegetation as a Result of Alternative 6

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Total Analysis Area	**1,936**	**1,773**	**22**	**163**	**213**
Land Cover Class					
Grassland	355	275	0	32	0
Forest	252	203	0	6	0
Shrubland	17	9	0	0	0
Wetland	71	20	0	2	0

Wetlands

Alternative 6 would cross approximately 111 wetlands totaling approximately 71 acres of wetland within the ROW and approximately 20 acres of wetland outside the ROW but within the analysis area.

Alternative 6 would permanently impact approximately 7 total acres of wetland due to tree clearing of forested wetland habitats, including 3 acres of PFO wetlands, 1 acre of PSS/PFO wetland, and 4 acres of PEM/PFO wetlands. Alternative 6 would also permanently impact <0.1 acre of wetland due to fill activities associated with transmission line structures.

Temporary impacts to wetlands within the ROW are estimated to be approximately 63 acres, including 49 acres of PEM wetlands, 12 acres of PSS wetlands, 1 acre of PEM/PSS wetlands, and 1 acre of PEM/open water wetland complexes. Indirect impacts to wetlands outside the ROW but within the analysis area are estimated to be approximately 20 acres, including <1 acre of PFO wetland, <1 acre of PSS wetland, 14 acres of PEM wetlands, 1 acre of PEM/PSS wetlands, 2 acres of PEM/PFO wetlands, 1 acre of PSS/PFO wetland, and 2 acres of PEM/open water wetland complexes.

Alternative 6 would cross approximately 42 acres of wetlands within Iowa and 29 acres of wetlands within Wisconsin.

A summary of forested and non-forested wetlands impacts is included in Table 3.3-16.

Table 3.3-16. Alternative 6 Wetland Impacts

Permanent Impacts	Wetland Acres
Forested Wetlands Cleared within ROW	7
Wetland Filled Due to Placement of Structures	<0.1
Total Permanent Impacts	**7**
Temporary or Indirect Impacts	**Wetland Acres**
Non-Forested Wetlands within ROW (Temporary)	63
Wetlands Outside ROW, within Analysis Area (Indirect)	20

Effects on special status plant species, if present, would be considered minor. Because the Utilities would complete vegetation surveys prior to construction, and BMPs would be implemented to avoid and minimize effects to identified special status plants, any impacts are expected to be minor.

Anticipated impacts to invasive species are expected to be moderate, as opportunities for the increased spread of invasive species, including noxious weeds, would be detectable but discountable. There would a minor potential for an increased spread of noxious weeds.

3.3.3 *Summary of Impacts*

Table 3.3-17 provides a summary and comparison of impacts to grassland, forest, and shrubland by Alternative. For all action alternatives, impacts to vegetation would be moderate, impacts to special status species would be minor, and impacts to invasive species would be minor. Alternative 2 would have the greatest impact to forested land cover, while Alternative 6 would have the smallest impact to forested land cover.

Table 3.3-17. Summary of Effects to Vegetation, Expressed in Acres, by Alternative

		Grassland			Forest			Wetland			Shrubland		
	Total Analysis Area	Direct Effects	Indirect Effects	Total Effects	Direct Effects	Indirect Effects	Total Effects	Direct Effects	Indirect Effects	Total Effects	Direct Effects	Indirect Effects	Total Effects
Alt 1	3,591	228	153	**381**	524	496	**1,020**	110	59	**169**	10	6	**16**
Alt 2	3,774	249	171	**420**	530	500	**1,030**	121	62	**183**	9	5	**14**
Alt 3	4,226	302	198	**500**	504	504	**1,008**	107	55	**162**	10	8	**18**
Alt 4	4,329	433	317	**750**	236	216	**542**	69	18	**87**	16	10	**26**
Alt 5	4,661	454	338	**792**	245	216	**461**	66	27	**93**	8	7	**15**
Alt 6	3,709	355	275	**630**	252	203	**455**	71	20	**91**	17	9	**26**

The following summary table (Table 3.3-18) provides summary of the wetland impacts for each project alternative. No alternative avoids impacting wetlands, with permanent wetland impacts ranging from 5 acres (Alternative 5) to 52 acres (Alternative 2), primarily due to clearing forested wetlands within the ROW. Each alternative would likely have moderate impacts to wetlands, as the impacts would be measurable but would not be expected to have significantly impacts on regional habitat abundance or species populations.

Table 3.3-18. Impact Summary Table for Wetlands

Alternative	Permanent Impact		Temporary Wetland Impacts Within ROW (acres)	Indirect Wetland Impacts Outside ROW, Within Analysis Area (acres)
	Wetlands Filled (acres)	Forested Wetlands Cleared (acres)		
Alternative 1	<0.1	38	72	59
	Moderate Impact – Impacts to wetlands would be detectable and measurable. Wetland impacts and disturbances would be localized and are not expected to affect regional population or habitat viability. Impacts and disturbance could increase the spread of noxious weeds and invasive species; however, negative impacts due to noxious weeds and invasive species are expected to be minimal with application of appropriate management and mitigation measures.			
Alternative 2	<0.1	52	69	62
	Moderate Impact – Impacts to wetlands would be detectable and measurable. Wetland impacts and disturbances would be localized and are not expected to affect regional population or habitat viability. Impacts and disturbance could increase the spread of noxious weeds and invasive species; however, negative impacts due to noxious weeds and invasive species are expected to be minimal with application of appropriate management and mitigation measures.			
Alternative 3	<0.1	49	58	55
	Moderate Impact – Impacts to wetlands would be detectable and measurable. Wetland impacts and disturbances would be localized and are not expected to affect regional population or habitat viability. Impacts and disturbance could increase the spread of noxious weeds and invasive species; however, negative impacts due to noxious weeds and invasive species are expected to be minimal with application of appropriate management and mitigation measures.			

Alternative	Permanent Impact		Temporary Wetland Impacts Within ROW (acres)	Indirect Wetland Impacts Outside ROW, Within Analysis Area (acres)
	Wetlands Filled (acres)	Forested Wetlands Cleared (acres)		
Alternative 4	<0.1	16	54	18
	Moderate Impact – Impacts to wetlands would be detectable and measurable. Wetland impacts and disturbances would be localized and are not expected to affect regional population or habitat viability. Impacts and disturbance could increase the spread of noxious weeds and invasive species; however, negative impacts due to noxious weeds and invasive species are expected to be minimal with application of appropriate management and mitigation measures.			
Alternative 5	<0.1	5	61	27
	Moderate Impact – Impacts to wetlands would be detectable and measurable. Wetland impacts and disturbances would be localized and are not expected to affect regional population or habitat viability. Impacts and disturbance could increase the spread of noxious weeds and invasive species; however, negative impacts due to noxious weeds and invasive species are expected to be minimal with application of appropriate management and mitigation measures.			
Alternative 6	<0.1	7	63	20
	Moderate Impact – Impacts to wetlands would be detectable and measurable. Wetland impacts and disturbances would be localized and are not expected to affect regional population or habitat viability. Impacts and disturbance could increase the spread of noxious weeds and invasive species; however, negative impacts due to noxious weeds and invasive species are expected to be minimal with application of appropriate management and mitigation measures.			

3.3.3.1 ADDITIONAL MITIGATION MEASURES

Environmental commitments for avoiding and minimizing wetland impacts are presented in Section 3.1, Table 3.1-4.

Any unavoidable impacts to wetlands, whether temporary or permanent, would be discussed with the USACE or appropriate state agency (IDNR or WDNR) prior to construction to determine the permitting requirements and conditions necessary for construction activities involving wetland impacts. With regards to Section 404 of the CWA (33 U.S.C. 1344), it is anticipated that USACE Nationwide Permit No. 12 or a Utility Regional General Permit, authorizing minor impacts to wetland and channels associated with utility line activities, may be used to permit wetland impacts. Impacts that are greater than minor may require an Individual Permit.

Unavoidable wetland impacts would be mitigated via multiple avenues, depending upon the type of impact, the location of the impact, and mitigation programs available by state or watershed. Conceptually, options for mitigating unavoidable impacts to wetland could include mitigation banks, in-lieu fee (ILF) programs, or permitee-responsible mitigation sites.

Within Wisconsin, the WDNR administers the Wisconsin Wetland Conservation Trust (WWCT). The WWCT is a wetland mitigation ILF program. Through the sale of WWCT credits, the WWCT can satisfy a permittee's wetland mitigation requirement specified by USACE and WDNR permits. WWCT credits are sold based upon the service area where the impact occurs. Service areas are generally aligned with watersheds. Aligning service areas with watershed helps to ensure that wetland restoration, establishment, or creation projects funded by the ILF program occur within reasonable geographic proximity of the impact, helping to maintain the overall health and quality of the impacted watershed. As a result, ILF credits may need to be purchased from multiple service areas, depending upon the location of wetland impacts requiring mitigation. The C-HC Project would cross the Upper Mississippi-Maquoketa-Plum, Lower Wisconsin, and Rock WWCT ILF service areas in Wisconsin. WWCT credits are currently available within each of these service areas if needed. Currently, there is no approved ILF program available in Iowa.

Should an ILF program be insufficient or unavailable, such as in Iowa, credits could be purchased from established and certified wetland mitigation banks. Several public and private wetland mitigation banks include primary or secondary service areas that are crossed by the C-HC Project. Similar to ILF programs, mitigation bank service areas are also determined using a watershed approach, helping to ensure that overall watershed health and quality is maintained. As a result, credits may need to be purchased from multiple banks, depending upon the location of the wetland impacts requiring mitigation. Established wetland mitigation banks with service areas that are crossed by the C-HC Project include Brophy Creek Mitigation Bank (Iowa), Crawford-Dillman Brothers Mitigation Bank (Wisconsin), Sauk-Big Hollow Wetland Bank (Wisconsin), Dane-Willow Drive (Wisconsin), Walworth-Jacobson Parcel (Wisconsin), Rock-Bass Creek (Wisconsin), Monroe-Kreyer Creek West Wetland Bank (Wisconsin), Monroe-Council Creek Wetland Mitigation Bank (Wisconsin), and the Walworth-L.B. Palmer Family Wetland Mitigation Bank (Wisconsin).

Finally, some wetland impacts may not be able to be mitigated using WWCT or established mitigation bank credits due to credit availability or service area restrictions. In these cases, permittee-responsible wetland mitigation sites may be developed. These sites may involve wetland preservation, enhancement, restoration, or creation to offset wetland impacts. Given the linear nature of the project spanning a broad geographic area, multiple permittee-responsible mitigation sites may be needed, as these types of mitigation sites are generally required to be located within the same watershed (8-digit HUC watershed) as the wetland impact.

The quantity of mitigation required would be a function of the types of wetlands impacted (e.g., PEM, PSS, PFO), and the method of mitigation. In general, in-kind creation of PEM wetlands is typically mitigated at a 2:1 ratio (that is, 2 acres of PEM wetland creation for every 1 acre of PEM impact), with PFO wetlands potentially requiring a 4:1 ratio or higher. Mitigation ratios generally vary based upon the type, or functional quality, or wetland impacted, with higher quality wetlands (e.g., PFO wetlands) requiring higher mitigation rations than lower quality wetlands (e.g., PEM wetlands). Furthermore, mitigation ratios vary based upon the method of mitigation. For example, mitigation ratios are generally lower when ILF or wetland banks are used, as these programs offer a high rate of success. Mitigation ratios for permittee-responsible sites are variable based upon the method of mitigation (preservation, enhancement, restoration, or creation), as each method provides different levels of functional wetland replacement based upon the existing conditions of a site and the site’s spatial and ecological context.

Once final impacts are determined, coordination with the USACE, IDNR, and WDNR would occur to properly permit unavoidable wetland impacts and determine mitigation requirements. As part of a permit application, a mitigation plan would be developed that would outline the proposed methods of mitigation for agency review and approval prior to project construction.

3.4 Wildlife, including Special Status Species

This section presents the occurrence and distribution of wildlife species within the analysis area, including, non-special status species, endangered, threatened, candidate, proposed,[2] and state-listed endangered species (collectively referred to as special status species).

In addition to special status wildlife species, this section also documents general wildlife and wildlife habitat known to occur in the vicinity of the C-HC Project.

3.4.1 *Affected Environment*

The analysis area for wildlife and special status species consists of a 300-foot area that encompasses each action alternatives. Species-specific surveys have not been conducted, and therefore the potential

[2] Endangered, threatened, candidate, and proposed species are federally listed species.

for presence of wildlife and special status species has been determined first through coordination with the IDNR, WDNR, and USFWS to identify previously documented occurrences of wildlife and special status species within the analysis area. IDNR and WDNR provided records for occurrences beyond the analysis area: IDNR provided county level records and a review specific to the analysis area and WDNR provided a review of records within 2 miles of the analysis area. USFWS provided its analysis of the proposed action alternatives potential to effect federally listed species based on reviewing preliminary drafts of the Biological Assessment, which defined the project's action area as the proposed ROW and off-ROW areas (RUS 2018). These areas used by IDNR, WDNR, and USFWS are collectively referred to as the resource evaluation area in this section. Records of wildlife and special status species within the resource evaluation area, but not within the analysis area, were cross-referenced with habitat availability based on remote sensing data to assess their potential for occurrence within the analysis area. In some instances, IDNR, WDNR, and USFWS provided information indicating that certain species with occurrence records within the resource evaluation area were not present within the analysis area.

3.4.1.1 HABITAT

The analysis area is within the Paleozoic Plateau or Driftless Area ecoregions of Wisconsin and Iowa (Omernick et al. 2000). The Driftless Area is distinguished by hilly uplands, with much of the region consisting of loess-capped plateaus deeply dissected by streams. Major land uses include livestock and dairy farming. The analysis area's western terminus occurs in the Western Corn Belt Plains Level III ecoregion, in the Eastern Iowa and Minnesota Drift Plains Level IV ecoregion. This area is a glaciated region with gently rolling terrain, and it is characterized by a mosaic of agriculture, woodlots, and wetlands. Vegetation includes oak forests, oak savanna, prairie, and sedge meadows. Much of the original vegetation has been converted to agricultural uses and scattered residences are common throughout the area.

The U.S. Forest Service developed a National Hierarchical Framework of Ecological Units to delineate and described ecosystems at the regional and subregional scale. According to that system, the ecological Province that contains the analysis area is the Eastern Broadleaf Forest (McNab and Avers 1994). The three sections spanned by the analysis area include the Minnesota and northeast Iowa Morainal, Oak Savannah Section; North Central U.S. Driftless and Escarpment Section; and the Southwestern Great Lakes Morainal Section (McNab and Avers 1994).

The western extent of the analysis area lies within the Minnesota and northeast Iowa Morainal, Oak Savannah Section (McNab and Avers 1994). It is characterized by level plains and low, irregular hills resulting from glaciation; till and outwash plains; drumlin fields and morainal ridges; and local occurrences of other features (e.g., kames, eskers, and kettles). Natural land cover includes bluestem prairie with significant maple-basswood forests and lesser amounts of oak savannah, oak-hickory forest, and northern floodplain forest. Current land use is dominated by agriculture, though forest remains in areas preserved for wildlife habitat and recreation, as well as on steep landscapes and adjacent to streams and lakes (McNab and Avers 1994).

The majority of the analysis area lies within the North Central U.S. Driftless and Escarpment Section (McNab and Avers 1994). This section, bisected by the Mississippi River floodplain, is an upland plateau with broad, steep-sided bedrock ridges and mounds up to 500 feet high. Natural land cover includes oak savanna and maple-basswood forest, with some northern floodplain forest along the major rivers found within this section. Current land use is dominated by agriculture, but most of the steeper slopes remain wooded (McNab and Avers 1994).

The eastern extent of the analysis area lies within the Southwestern Great Morainal Section (McNab and Avers 1994). This section is characterized by flat to undulating topography resulting from glaciation:

plains composed of till, outwash, and lacustrine; drumlin fields and morainal ridges; and local occurrences of other features (kames, eskers, kettles, etc.). Natural land cover within this section is primarily oak savanna, with some areas of maple-basswood or bluestem prairie. Current land use is dominated by agriculture as well as urban development near Madison, Wisconsin (McNab and Avers 1994).

3.4.1.2 GENERAL WILDLIFE SPECIES

3.4.1.2.1 MAMMALS

Large mammals historically found in the sections spanned by the analysis area were the bison (*Bison bison*) and elk (*Cervus canadensis*), which occurred in large numbers. The whitetail deer (*Odocoileus virginianus*) was common but apparently not numerous. The major predators were wolf (*Canis lupus*) and black bear (*Ursus americanus*). Smaller mammals included Franklin's ground squirrel (*Poliocitellus franklinii*), and many species adapted to a mixture of prairie, oak savanna, and forested conditions. Today the dominant large mammal is the whitetail deer, which has extended its range into all Sections of the Eastern Broadleaf Forest Province. The bison, elk, and wolf were extirpated by the early to mid-1800s. In Wisconsin, there are approximately 28,000 black bears, with a primary range in the northern part of the state (WDNR 2017a). Iowa does not report a breeding black bear population. Modern commonly observed small mammals include red fox (*Vulpes vulpes*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), cottontail rabbit (*Sylvilagus floridanus*), and both red (*Sciurus vulgaris*) and gray squirrels (*Sciurus carolinensis*) (McNab and Avers 1994). These species are considered habitat generalists and may be present through the habitat types available within the analysis area.

3.4.1.2.2 BIRDS

There are 316 bird species native to Iowa and Wisconsin that may be present year-round, or as migrants. Ten are species considered “at risk” following NatureServe’s Standards and Methods for assessment (Ridgely et al. 2003).

The Migratory Bird Treaty Act (16 U.S.C. 703–712, 709 omitted) protects migratory birds, and EO 13186 was enacted to ensure that environmental evaluations of Federal actions take into account the effects of those actions on migratory birds. The U.S. Department of Interior, Office of the Solicitor recently found that MBTA prohibitions (e.g., pursuing, hunting, taking, capturing, or killing migratory birds, or attempting to do the same) applies “only to direct and affirmative purposeful actions that reduce migratory birds, their eggs, or their nests, by killing or capturing, to human control” (U.S. Department of Interior 2017).

The USFWS and its partner agencies manage for migratory birds based on specific migratory route paths (flyways) within North America (Atlantic, Mississippi, Central, and Pacific) (USFWS 2018d). Waterfowl and other migratory birds use these flyways to travel between nesting and wintering grounds. The study area is within the Mississippi Flyway, which includes Iowa and Wisconsin as well as 12 other states.

According to breeding bird survey results from 2014–2017, common waterfowl and other species dependent on wetland habitat within the analysis area include Canada geese (*Branta canadensis*), mallards (*Anas platyrhynchos*), wood ducks (*Aix sponsa*), sandhill cranes (*Grus canadensis*), and red-winged blackbirds (*Agelaius phoeniceus*). Bird species common to the analysis area that are adapted to forested habitat include red-eyed vireo (*Vireo olivaceus*), indigo bunting (*Passerina cyanea*), northern cardinal (*Cardinalis cardinalis*), and the American robin (*Turdus migratorius*). Bird species common to the analysis that inhabit grassland habitat include dickcissel (*Spiza americana*), killdeer (*Charadrius vociferus*), eastern meadowlark (*Stumella magna*), and the savannah sparrow (*Passerculus* *sandwichensis*). Introduced species such as the house sparrow (*Passer domesticus*) and European starling (*Sturnus vulgaris*) are very common as well. Turkey vultures (*Cathartes aura*) and red-tailed hawks (*Buteo jamaicensis*) are also commonly observed (USGS 2018).

Bald Eagles

The bald eagle (*Haliaeetus leucocephalus*), which has been removed from protection under the ESA, remains protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act (16 U.S.C. 668–668c). Bald eagles feed opportunistically on fishes, injured waterfowl, various mammals and carrion (NatureServe 2011). The USFWS considers the availability of nest sites and food as the limiting factors for raptor population. In areas with limited nesting sites, adults breed only when an existing breeding territory becomes vacant. Bald eagles typically nest within approximately 2.5 miles of water bodies where fish and waterfowl are available for food (NatureServe 2011). In 1991, the total population was estimated at 70,000, with all but 10,000 in Alaska and western Canada (NatureServe 2011). At that time, there were approximately 3,000 nesting sites in the lower 48 states (NatureServe 2011). At the time the bald eagle was removed from the list of endangered and threatened species in 2007, the USFWS estimated approximately 9,800 breeding pairs in the lower 48 states. The WDNR determined that nesting records for the bald eagle are known to occur within the resource evaluation area, and there are records of nesting bald eagles between the two proposed Mississippi River crossing alternatives within the Refuge.

3.4.1.2.3 FISH AND OTHER AQUATIC SPECIES

Northeast Iowa and southwest Wisconsin supports a variety of habitat for a variety of fish and other aquatic species owing to its proximity to the Mississippi River. This habitat consists mostly of large and small river systems, though wetlands and open water habitat is available as well. Common fish species include the northern pike (*Esox lucius*), catfish, largemouth bass (*Micropterus salmoides*), walleye (*Sander vitreus*), carp and sucker (McNab and Avers 1994). Historically, there were 55 species of mussel known in the State of Iowa, though approximately half remain (Cedar Valley Resource, Conservation & Development, Inc. 2002). Similarly, over half of Wisconsin's 51 native mussel species are listed as species of greatest conservation need. Threats like habitat alteration (dams, siltation) and the presence of invasive mussels (zebra mussels) pose major threats to the native mussel populations (Wisconsin Aquatic and Terrestrial Resources Inventory 2018). Commonly observed species include the giant floater (*Pyganodon grandis*), mapleleaf (*Quardrula quadrula*), mucket (*Actinonaias ligamentina*), plain pocketbook (*Lampsilis cardium*), white heelsplitter (*Lasmigona complanata*), and threeridge (*Amblema plicata*) (Cedar Valley Resource, Conservation & Development, Inc. 2002).

3.4.1.2.4 REPTILES AND AMPHIBIANS

There are 55 native species of reptile and amphibians in Wisconsin: 11 turtle species, 21 snake species, 4 lizard species, 12 frog species, and 7 salamander species (WDNR 2018d). Within Clayton and Dubuque Counties, Iowa, there are 8 turtle species, 13 snake species, 2 lizard species, 9 frog species, and 2 salamander species (Reptiles and Amphibians of Iowa 2018a, 2018b). Common turtle species, such as the snapping turtle (*Chelydra serpentine*), painted turtle (*Chrysemys picta*), and common map turtle (*Graptemys geographica*) use wetland and open water habitat. Snake species that are common to the analysis area use grassland, forested, wetland, and open water habitat. The amphibian species common to the analysis area use wetland and open water habitats, as well as adjacent uplands (Reptiles and Amphibians of Iowa 2018a, 2018b; WDNR 2018d).

3.4.1.2.5 WILDLIFE SPECIFIC TO THE UPPER MSSISSIPPI WILDLIFE AND FISH REFUGE

The Refuge is home to unique habitat types which support a variety of wildlife species, including many of those described above. There are 51 mammal species known to occupy the Refuge, including many described above. Mammal species that are more common within the Refuge than the rest of the analysis are species typically dependent on wetland and open water habitat such as muskrat (*Ondatra zibethicus*), mink (*Neovision vison*), beaver (*Castor canadensis*), and river otters (*Lontra canadensis*) (USFWS 2006a).

Owing to its location in the heart of the Mississippi Flyway, many species of bird migrate through or occupy habitat within the Refuge. This includes species dependent on wetland and open water habitat such as the wood duck, mallard, blue-winged teal (*Anas discors*), American wigeon (*Anas americana*), gadwall (*Anas strepera*), northern pintail (*Anas acuta*), green-winged teal (*Anas carolinensis*), canvasback (*Aythya valisineria*), lesser scaup (*Aythya affinis*), common goldeneye (*Bucephala clangula*), ringed-necked duck (*Aythya collaris*), bufflehead (*Bucephala albeola*), ruddy duck (*Oxyrua jamaicensis*), merganser (*Mergus* sp.), belted kingfisher (*Megaceryle alcyon*), Canada goose, and Tundra swan (*Cygnus columbianus*) (USFWS 2006a).

Wetland and open water dependent colonial nesters common to the Refuge include black tern (*Chlidonias niger*), great blue herons (*Ardea herodias*), double-crested cormorants (*Phalacrocorax auritus*), great egrets (*Ardea alba*), and green herons (*Butorides virescens*) (USFWS 2006a).

Over 160 species of songbird have been documented within them Refuge. Species that rely on forested areas and grasslands that are commonly found nesting within the Refuge include the American robin, downy woodpecker (*Picoides pubescens*), great-crested flycatcher (*Myiarchus crinitus*), prothonotary warbler (*Protonotaria citrea*), tree swallow (*Tachycineta bicolor*), yellow-headed blackbird (*Xanthocephalus xanthocephalus*), northern cardinal, and the brown creeper (*Certhia americana*) (USFWS 2006a).

The Refuge also supports nesting pairs of red-shouldered hawks (*Buteo lineatus*) (common to forested areas) and osprey (*Pandion haliaetus*) (who nest near and hunt in the Mississippi River and other large bodies of water), among other raptors that migrate through (USFWS 2006a).

Eleven species of turtle occupy the Refuge, using habitats that range from quiet backwaters (e.g., Blanding's [*Emydoidea blandingii*], painted, snapping, and common map turtles) to the faster-flowing waters of the larger channels (e.g., smooth and spiny softshells [*Apalone mutica* and *Apalone spinifera*], Ouachita and false map turtles [*Graptemys ouachitensis* and *Graptemys pseudogeographica*]). There are nine species of frog and one toad species known in the Refuge. Bullfrogs (*Lithobates catebeianus*), boreal chorus frogs (*Pseudacris maculate*), and spring peepers (*Pseudacris crucifer*) are commonly found in and near wetland and open water habitat (USFWS 2006a).

One-hundred nineteen fish species are known to use the Refuge. These include common sport fish such as walleye, sauger (*Stizotedion canadense*), white bass (*Morone chrysops*), large and smallmouth bass (*Micropterus dolomieu*), channel catfish (*Ictaiurus punctatus*), northern pike, bluegill (*Lepomis macrochirus*), and crappies (*Pomoxis* sp.), as well as non-sport fish such as sturgeon (*Acipenser* sp.) and paddlefish (*Polyodon spathula*). There are 39 species of mussel considered present within the Refuge, with pink papershell (*Potamilus ohiensis*) and giant floater commonly observed species (USFWS 2006a).

3.4.1.3 SPECIAL STATUS SPECIES

The USFWS, IDNR, and WDNR each administer laws or rules that regulate certain actions with regard to designated species (i.e., special status species) that each agency has deemed in need of protection due to threats to their populations. The USFWS administers the ESA (16 U.S.C. 1531 et seq.), Bald and Golden Eagle Protection Act, and Migratory Bird Treaty Act. The IDNR administers Chapter 481B of the Code of Iowa, Endangered Plants and Wildlife Law. The WDNR administers State Statute 29.604, Endangered and Threatened Species Protected.

Each agency keeps records of occurrences of special status species within its jurisdictions and provides analyses of a given project or action and its potential to affect those species or overlap with those occurrences. The information for federally listed species was provided by USFWS through direct coordination with RUS. The IDNR publishes lists of state special status species that may be present within each county (IDNR resource evaluation area) and reviewed the analysis area for occurrence records. The WDNR reviewed all land within 2 miles of the analysis area (WDNR resource evaluation area).

Through the coordination described above with USFWS, IDNR (Moore 2017), and WDNR (WDNR 2018a), it was determined that 117 special status species have been: 1) previously documented, 2) are likely present, or 3) are not known to occur, but for which suitable habitat is present within the resource evaluation area as described for each agency (Table 3.4-1).

Table 3.4-1. Special Status Species Considered Potentially Present within C-HC Project Resource Evaluation Area as Determined through Coordination with USFWS, IDNR, and WDNR

Common Name	Scientific Name	Iowa DNR[1]	Wisconsin DNR[2]	USFWS[3]
Mammals				
Big brown bat	*Eptesicus fuscus*		T	
Eastern pipistrelle	*Perimyotis subflavus*		T	
Franklin’s ground squirrel	*Poliocitellus franklinii*		SC	
Little brown bat	*Myotis lucifugus*		T	
Northern long-eared bat	*Myotis septentrionalis*		T	T
Prairie vole	*Microtus ochrogaster*		SC	
Southern flying squirrel	*Glaucomys volans*	SC		
Spotted skunk	*Spilogale putorius*	E		
Birds				
Acadian flycatcher	*Empidonax virescens*		T	
Bald eagle	*Haliaeetus leucocephalus*	SC		
Barn owl	*Tyto alba*	E		
Bell’s vireo	*Vireo bellii*		T	
Cerulean warbler	*Setophaga cerulea*		T	
Henslow’s sparrow	*Ammodramus henslowii*	T	T	
Hooded warbler	*Setophaga citrina*		T	
Kentucky warbler	*Geothlypis formosa*		T	
King rail	*Rallus elegans*	E		
Long-eared owl	*Asio otus*		SC	
Peregrine falcon	*Falco peregrinus*		E	
Prothonotary warbler	*Protonotaria citrea*		SC	

Common Name	**Scientific Name**	**Iowa DNR**[1]	**Wisconsin DNR**[2]	**USFWS**[3]
Red-shouldered hawk	*Buteo lineatus*	E	T	
Upland sandpiper	*Bartramia longicauda*		T	
Western meadowlark	*Sturnella neglecta*		SC	
Whooping crane	*Grus americanus*			E-NEP
Yellow-breasted chat	*Icteria virens*		SC	
Yellow-throated warbler	*Setophaga dominica*		E	
Amphibians				
Blanchard's cricket frog	*Acris blanchardi*		E	
Mudpuppy	*Necturus maculosus*	T		
Pickerel frog	*Lithobates palustris*		SC	
Reptiles				
Blanding's turtle	*Emydoidea blandingii*	T	SC	
Bullsnake	*Pituophis catenifer sayi*	SC	SC	
Common musk turtle	*Sternotherus odoratus*	T		
Gray ratsnake	*Pantherophis spiloides*		SC	
Lined snake	*Tropidoclonion lineatum*		SC	
North American racer	*Coluber constrictor*		SC	
Ornate box turtle	*Terrapene ornata*	T	E	
Prairie ring-necked snake	*Diadophis punctatus arnyi*		SC	
Timber rattlesnake	*Crotalus horridus*		SC	
Western wormsnake	*Carphophis vermis*		SC	
Fish				
American brook lamprey	*Lampetra appendix*	T		
Black buffalo	*Ictiobus niger*		T	
Black redhorse	*Moxostoma duquesnei*	T		
Blue sucker	*Cycleptus elongatus*		T	
Bluntnose darter	*Etheostoma chlorosoma*	E	E	
Burbot	*Lota lota*	T		
Chestnut lamprey	*Ichthyomyzon castaneus*	T		
Crystal darter	*Crystallaria asprella*		E	
Goldeye	*Hiodon alosoides*		E	
Grass pickerel	*Esox americanus*	T		
Lake chubsucker	*Erimyzon sucetta*		SC	
Lake sturgeon	*Acipenser fulvescens*	E		
Least darter	*Etheostoma microperca*	E		
Mud darter	*Etheostoma asprigene*		SC	
Ozark minnow	*Notropis nubilus*		T	
Paddlefish	*Polyodon spathula*		T	
Pallid shiner	*Hybopsis amnis*		E	
Pugnose minnow	*Opsopoeodus emiliae*	SC		
River redhorse	*Moxostoma carinatum*		T	
Shoal chub	*Macrhybopsis hyostoma*		T	
Weed shiner	*Notropis texanus*	E		
Western sand darter	*Ammocrypta clara*	T		

Common Name	Scientific Name	Iowa DNR[1]	Wisconsin DNR[2]	USFWS[3]
Mussels				
Butterfly	*Ellipsaria lineolata*	T	E	
Creek heelsplitter	*Lasmigona compressa*	T		
Creeper	*Strophitus undulatus*	T		
Cylindrical papershell	*Anodontoides ferussacianus*	T		
Ellipse	*Venustaconcha ellipsiformis*	T	T	
Fawnsfoot	*Truncilla donaciformis*		T	
Higgin's eye pearly mussel	*Lampsilis higginsii*	E	E	E
Mapleleaf	*Quadrula quadrula*		SC	
Monkeyface	*Quadrula metanevra*		T	
Pistolgrip	*Tritogonia verrucosa*	E		
Purple wartyback	*Cyclonaias tuberculata*	T		
Rock pocketbook	*Arcidens confragosus*		T	
Round pigtoe	*Pleurobema sintoxia*	E		
Sheepnose	*Plethobasus cyphyus*	E		E
Slippershell mussel	*Alasmidonta viridis*	E		
Spectacle case mussel	*Cumberlandia monodonta*			E
Wartyback	*Quadrula nodulata*		T	
Washboard	*Megalonaias nervosa*		SC	
Yellow and slough sandshell	*Lampsilis teres*	E	E	
Insects				
A leafhopper	*Attenuipyga vanduzeei*		E	
A leafhopper	*Kansendria kansiensis*		SC	
A leafhopper	*Laevicephalus vannus*		SC	
A planthopper	*Myndus ovatus*		SC	
Abbreviated underwing moth	*Catocala abbreviatella*		SC	
A riffle beetle	*Stenelmis musgravei*		SC	
A water scavenger beetle	*Cymbiodyta toddi*		SC	
An issid planthopper	*Fitchiella robertsonii*		T	
Brilliant granule	*Guppya sterkii*		SC	
Byssus skipper	*Problema byssus*		SC	
Columbine dusky wing	*Erynnis lucilius*	SC	SC	
Gorgone checker spot	*Chlosyne gorgone*		SC	
Gray copper	*Lycaena dione*		SC	
Hine's emerald dragon fly	*Somatochlora hineana*			E
Leadplant flower moth	*Schinia lucens*		SC	
Leonard's skipper	*Hesperia leonardus*	SC		
Ottoe skipper	*Hesperia ottoe*		E	
Red-tailed prairie leafhopper	*Aflexia rubranura*		E	
Regal fritillary	*Speyeria idalia*		E	
Royal river cruiser	*Macromia taeniolata*		SC	
Rusty patched bumble bee	*Bombus affinis*		SC	E
Silphium borer moth	*Papaipema silphii*		E	
Smooth coil	*Helicodiscus singleyanus*		SC	

Common Name	Scientific Name	Iowa DNR[1]	Wisconsin DNR[2]	USFWS[3]
Springwater dancer	*Argia plana*		SC	
Trumpet vallonia	*Vallonia parvula*		SC	
Velvet-striped grasshopper	*Eritettix simplex*		SC	
Whitney's underwing moth	*Catocala whitneyi*		SC	
Wild indigo dusky wing	*Erynnis baptisiae*	SC		
Snails				
Bluff vertigo	*Vertigo meramecensis*	E		
Briarton Pleistocene vertigo	*Vertigo brierensis*	E		
Frigid ambersnail	*Catinella gelida*	E		
Hubricht's vertigo	*Vertigo hubrichti*	T		
Iowa Pleistocene snail	*Discus macclintocki*	E		E
Iowa Pleistocene vertigo	*Vertigo iowaensis*	E		
Midwest Pleistocene vertigo	*Vertigo hubrichti hubrichti*	T		
Variable Pleistocene vertigo	*Vertigo hubrichti variabilis*	T		
Wing snaggletooth	*Gastrocopta procera*		T	

Note: E: Endangered, E-NEP: Endangered, nonessential experimental population T: Threatened; SC: Species of Concern

[1] Species considered potentially present in Clayton and Dubuque Counties, Iowa. IDNR Natural Areas Inventory database review conducted on May 23, 2018.

[2] Wisconsin State-listed species that may be present within the resource evaluation area (WDNR 2018b).

[3] Federally listed species that may be present within the resource evaluation area (RUS 2018).

3.4.1.3.1 FEDERALLY LISTED SPECIES AND CRITICAL HABITAT

RUS, in consultation with the USFWS, identified eight wildlife species that are federally listed as threatened or endangered that may occur in the analysis area: whooping crane (*Grus americanus*), Higgins eye pearly mussel (*Lampsilis higginsii*), sheepnose mussel (*Plethobasus cyphyus*), spectacle case mussel (*Cumberlandia monodonta*), Hine's emerald dragonfly (*Somatochiora hineana*), Iowa Pleistocene snail (*Discus macclintocki*), northern long-eared bat (*Myotis septentrionalis*), and rusty patched bumble bee (*Bombus affinis*) (see Table 3.4-1). No designated critical habitat is found within the study area. RUS prepared a BA addressing federally endangered, threatened, and candidate species (RUS 2018).

Whooping Crane

The whooping crane, North America's tallest bird species, is typically found in wetland habitats such as coastal marshes, estuaries, inland marshes, lakes, ponds, wet meadows, rivers, and agricultural fields (Whooping Crane Eastern Partnership [WCEP] 2018). The species migrates from the southern United States to nesting grounds between March and May and begin migration back to their wintering grounds in September (WCEP 2018). During migration they use stopover habitat along their migration corridor, usually completing migration in 2 to 4 weeks. There are an estimated 383 individuals, with a single remaining self-sustaining wild population: the Aransas-Wood Buffalo National Park population which winters in coastal marshes in Texas and nests in Wood Buffalo National Park in Canada. Attempts to reintroduce a migratory population of whooping cranes in the eastern United States began in 2000, and a final rule establishing the population as a Nonessential Experimental Population was published in the *Federal Register* on June 26, 2001 (USFWS 2001). The WCEP estimated the population size as of May 1, 2018, to be 102 individuals: 47 female, 52 male, and 3 unknown (WCEP 2018). Whooping cranes have been confirmed in 2018 in northeast Iowa, western Wisconsin, and central Wisconsin using wetland stopover habitat (WCEP 2018). However, during coordination with USFWS, it was determined that there are no records of whooping cranes using land within the analysis area or near the Refuge.

Federally Listed Mussel Species

The three endangered mussel species (Higgins eye pearly mussel, sheepnose mussel, and spectacle case mussel) are found in large rivers with clear water and substrates that vary from mud to sand and gravel. Their microhabitat ranges from areas sheltered from the currents to deep, free-flowing runs. Fertilized females store developing larvae (glochidia) until they are mature enough to release. Upon release, larva attach to the gills of host fish for further development. Juvenile mussels then detach from their host fish and settle in the river substrate. Host fish include the sauger, walleye, yellow perch (*Perca flavescens*), largemouth bass, smallmouth bass, and freshwater drum (*Aplodinotus grunniens*) (USFWS 2012a, 2012b, 2012c).

Hine's Emerald Dragonfly

Suitable habitat for the Hine's emerald dragonfly consists of wetlands such as calcareous, spring-fed marshes and sedge meadows overlaying dolomite bedrock (USFWS 2006b). Hine's emerald dragonflies exist in the nymph stage for 2 to 4 years, during which time they subsist on smaller insects. Nymphs shed their skin several times before crawling out of the water for a final time. Adults live for 4 to 5 weeks. Males defend small breeding territories and mate with females who enter those territories (USFWS 2006b).

Iowa Pleistocene Snail

The Iowa Pleistocene snail is a relic of the last glaciation event of North America during the Pleistocene. Currently, the Iowa Pleistocene snail is known to occur at approximately 30 sites in the Driftless Area of Iowa (described in Sections 3.2.1.4 and 3.4.1.1) and Illinois along the Mississippi River and its tributaries. The Iowa Pleistocene snail is found in leaflitter and is dependent on algific talus slopes (described in Sections 3.2.1.4 and 3.4.1.1) that create a cool and humid microclimate for the snail similar to climatic conditions during the Pleistocene. Algific talus slopes occur along limestone bluffs with steep north- or east-facing slopes covered in fractured rock, rubble, and leaflitter. Ice that is trapped within limestone caves and cavities of the bluff and bedrock emits cold moist air from cracks and fissures into fractured rock and rubble, creating a microclimate suitable for the Iowa Pleistocene snail. Iowa Pleistocene snails are typically active from late March to October or until the first hard freeze in fall. Iowa Pleistocene snails are typically less active in August, likely due to increased temperatures and dryer conditions. Observed breeding in the wild occurs from late March or April to August. The Iowa Pleistocene snail is not self-fertilizing, but hermaphroditic with both adults laying eggs and fertilizing each other (Pilsbry 1948). Clutch size varies from two to six, with three being typical. Eggs are laid in moist areas in rock crevices, under logs and bark, and in soil just below ground surface. Hatching occurs approximately 28 days after the eggs are laid (USFWS 1984).

The USFWS provided the locations of four algific talus slopes within the resource evaluation area: one along each route of Segments B-IA1 and B-IA2 (same talus slope for both segments), one along Segment C-IA, and two that are between Segments A-IA and D-IA along Bluebell Creek. These locations were ground-truthed during field survey in 2017, and it was determined that they did not provide suitable Iowa Pleistocene snail habitat (RUS 2018).

Northern Long-Eared Bat

The northern long-eared bat uses a wide variety of forested habitats for roosting, foraging and traveling, and may also use some adjacent and interspersed non-forested habitat such as emergent wetlands and edges of fields over grassland and agricultural land. This species has also been found roosting in human-made structures like barns and sheds (particularly when suitable tree roosts are unavailable). Roosting habitat includes forested areas with live trees and/or snags with a diameter at breast height of at least 3 inches with exfoliating bark, cracks, crevices, and/or other cavities. Trees are considered suitable if they meet those requirements and are within 1,000 feet of the nearest suitable roost tree, woodlot, or wooded fencerow (USFWS 2014). Suitable summer habitat includes roosting habitat, as well as foraging and travel habitat such as adjacent edges of agricultural fields, old fields, pastures, fencerows, riparian forests, and other wooded corridors. Maternity habitat is any portion of suitable summer habitat that is used by juveniles and reproductive females. The summer maternity season in Wisconsin and Iowa is April 1 through September 30 (USFWS 2014). Winter habitat includes underground caves and cave-like structures such as abandoned or active mines and railroad tunnels. These hibernacula typically have high humidity, minimal air current, large passages with cracks and crevices for roosting, and maintain a relatively cool temperature (32 degrees Fahrenheit [°F] to 48°F) (USFWS 2014). It is common for this species to overwinter in sites with other *Myotis* species. No maternity roosts or hibernacula are known to occur within a 0.25-mile radius of the action area.

Rusty Patched Bumble Bee

The rusty patched bumble bee is a generalist forager and is found in a variety of habitats, including prairies, woodlands, wetlands, agricultural landscapes, and residential parks and gardens (Szymanski et al. 2016). The species is one of the first bumble bees to emerge in the spring and is the last to go into hibernation in the fall, generally active from April through September. Due to their long-life cycle, the rusty patched bumble bee requires habitat that supports diverse and abundant flowering plants throughout the bee’s active period (mid-March through mid-October), undisturbed nesting sites near food resources, and overwintering sites for hibernating queens near early spring floral resources. Rusty patched bumble bee colony nests are typically within abandoned rodent dens or other small cavities one to four feet below ground in open areas or near open areas that are not heavily forested or wet. The rusty patched bumble bee will overwinter in loose soil and/or leaf litter a few centimeters below ground. Overwintering habitat includes woodlands or woodland edges that contain spring blooming herbaceous plants, shrubs, and trees (Szymanski et al. 2016; USFWS 2018e). The rusty patched bumble bee forms annual colonies comprised of a single queen, female workers, and males. In the early spring, the solitary queen is responsible for establishing the colony and must find a suitable nest site near ample food resources. She then collects pollen and nectar to support production of her eggs, which are fertilized by sperm stored since mating the previous fall before hibernation (Szymanski et al. 2016). The WDNR has determined that the rusty patched bumble bee has been recorded within 1 mile of the project (WDNR 2018b).

The USFWS has developed a habitat connectivity model for the rusty patched bumble bee based on land cover mapping, which is intended to assess the likelihood of bumble bee movement away from locations of known records (USFWS 2018f). This model was used to develop three types of geographic zones within the historic range of the species that correspond with the likelihood of rusty patched bumble bee presence:

> *High Potential Zones* – centered around records of species occurrence from 2007 to present, the species is considered likely present
>
> *Primary Dispersal Zones or Low Potential Zones* – these areas surround High Potential Zones and encompass the maximum dispersal potential of the species around records from 2007 to present.
>
> *Uncertain Zones* – Zones modeled around occurrence records dating between 2000 and 2006. It is unknown whether the species has been extirpated from these areas or not.

The analysis area crosses multiple High Potential Zones and Low Potential Zones (see Figure 3.4-1).

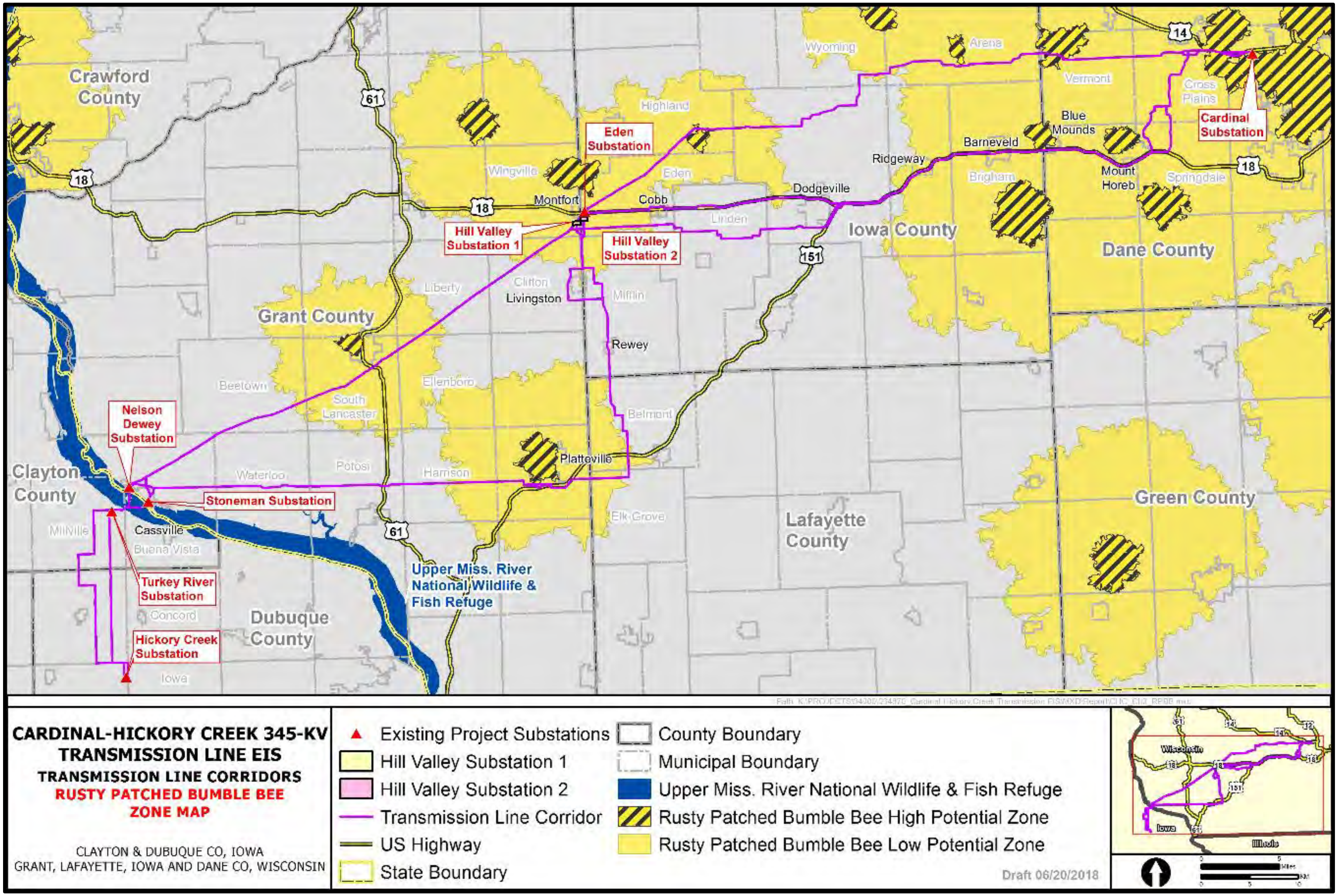

Figure 3.4-1. Rusty patched bumble bee habitat potential zones.

The USFWS also defines suitable habitat as follows:

- *High quality, suitable habitat* – open, vegetated areas with high floral diversity and abundance including prairies, meadows, roadsides, and wetlands with uncompacted soft soils, compost/leaf litter, and rodent burrows within or nearby for nesting and overwintering
- *Low quality, suitable habitat* – similar to high quality habitat, but dominated by grasses or sedges with a low diversity and/or low abundance of flowering plants
- *Poor quality, unsuitable habitat* – areas without a diversity and/or abundance of flowering plants and with compacted soils; such areas include paved areas, open water, permanently flooded areas, mowed lawns, monoculture crop fields, woodlands with invasive shrubs dominant and spring ephemerals absent, and areas mowed too frequently to allow for development of diverse flowering plants (e.g., roadsides)
- *Questionable habitat* – areas that are not clearly determined to be poor quality habitat

Field surveys determined that potential high-quality rusty patched bumble bee foraging or nesting habitat may be present within a portion of the High Potential Zone that intersect portions of the C-HC Project alternatives. Overall, the High Potential Zone areas that are intersected by the C-HC Project can be described as containing a small amount of high-quality foraging and nesting habitat, and a mix of low-quality, poor-quality (unsuitable), or questionable rusty patched bumble bee foraging, nesting, or overwintering habitat (RUS 2018).

State-Listed Species

The IDNR considers 20 state endangered species and 20 state threatened species to be potentially present in Clayton and Dubuque Counties (see Table 3.4-1). The IDNR reviewed the proposed C-HC Project for its potential to impact state threatened and endangered species. They determined that no site-specific records that would be impacted by the proposed Project (Moore 2017).

The WDNR conducted an Endangered Resources review within the project area and a surrounding 2-mile buffer. The WDNR identified records of 16 state endangered species and 24 state threatened species within 2 miles of the Aquatic and Terrestrial project area (WDNR 2018b).

Mammals

The WDNR has determined that the state endangered northern long-eared bat is known to occur within 1 mile of the project area. Additionally, three threatened species are known to occur within 1 mile of the project—big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), and eastern pipistrelle (*Pipistrellus subflavus*). These bat species hibernate in caves, mines, and human-made structures during the winter. During the summer they forage in and near forested areas, over water, and other riparian habitat. They roost in trees and human-made structures singly or in colonies (WDNR 2018b).

Birds

The WDNR has determined that two state endangered bird species—peregrine falcon (*Falco peregrinus*) and yellow-throated warbler (*Setophaga dominica*)—and eight threatened bird species—Acadian flycatcher (*Empidonax virescens*), Bell's vireo (*Vireo bellii*), cerulean warbler (*Setophaga cerulean*), Henslow's sparrow (*Ammodramus henslowii*), hooded warbler (*Setophaga citrina*), Kentucky warbler (*Ceothlypis Formosa*), upland sandpiper (*Bartramia longicauda*), and red-shouldered hawk—have been recorded within 1 mile of the project. These species occupy forested habitat, scrub/shrub, and open grasslands (WDNR 2018b).

Reptiles and Amphibians

The WDNR has determined that the state endangered Blanchard's cricket frog (*Acris blanchardi*) and ornate box turtle (*Terrapene ornata*) have been recorded within 2 miles of the project. Blanchard's cricket frogs occupy a variety of aquatic and wetland habitat, though tend to breed in areas with limited or no flow. Suitable habitat for the ornate box turtle includes grasslands and forested areas, such as dry-mesic prairies, sand prairies, oak savannas with sandy soils, and open to semi-open woodlands (WDNR 2018b).

Fish and Other Aquatic Species

The WDNR has determined that four state endangered fish species (bluntnose darter (*Etheostoma chlorosoma*), crystal darter goldeye (*Crystallaria asprella*), and pallid shiner (*Hybopsis amnis*)) and six state threatened species (black buffalo (*Ictiobus niger*), blue sucker (*Cycleptus elongates*), Ozark minnow (*Notropis nubilus*), paddlefish, river redhorse (*Moxostoma carinatum*), and shoal chub (*Macrhybopsis hyostoma*)) have been recorded within 2 miles of the project. The WDNR has determined that three state endangered mussel species (butterfly (*Ellipsaria lineolate*) and Higgin's-eye, and yellow and slough sandshell (*Lampsilis teres anodontoides* and *Lampsilis teres teres*)) and five state threatened mussel species (ellipse (*Venustaconcha ellipsiformis*), fawnsfoot (*Truncilla donaciformis*), monkeyface (*Quadrula metanevra*), rock pocketbook (*Arcidens confragosus*), and wartyback (*Quadrula nodulata*)) have been recorded within 2 miles of the project. These species can be found in a variety of stream types and differing micro-habitats within perennial waters (WDNR 2018b).

Insects

The WDNR has determined that five state endangered insects—a leafhopper (*Attenuipyga vanduzeei*), Ottoe skipper (*Hesperia ottoe*), red-tailed prairie leafhopper (*Aflexia rubranura*), regal fritillary (*Speyeria idalia*), and silphium borer moth (*Papaipema silphii*)—and one state threatened species (an Issid planthopper [*Fitchiella robertsonii*]) have been recorded within 1 mile of the project. These insects occupy grassland and wetland habitat where their host plants are present (WDNR 2018b).

3.4.2 *Environmental Consequences*

This section describes impacts to wildlife, including special status species, associated with the construction, operation, and maintenance of the C-HC Project. Impacts to wildlife and special status species are discussed in terms of impacts to species and their habitat(s).

3.4.2.1 DATA SOURCES, METHODS, AND ANALYSIS ASSUMPTIONS

The following impact indicators were considered when analyzing potential impacts to wildlife, including special status species:

Acres of habitat, including federally designated critical habitat, to be modified/removed by construction and maintenance activities.

For non-listed species, a qualitative description of potential direct and indirect impacts to individuals.

For federally and state-listed species, a qualitative description of potential direct and indirect impacts to populations will be written and the appropriate "effect determination" language will be incorporated to help inform the Federal and state agencies that will be consulted on the C-HC Project.

In 2017, the Utilities completed habitat assessments for some species within accessible portions of the analysis area, though no species-specific presence/probable absence surveys have been completed. This analysis includes those field-collected data, while the remaining portions of the analysis area were assessed through review of aerial imagery; review of project-specific land cover mapping developed through the combination of NLCD (USGS 2011), state-level land cover datasets provided by IDNR (2017) and WDNR (2016d); and coordination with USFWS, IDNR, and WDNR for their potential to be occupied by the wildlife species above. Impacts were analyzed through both the potential for direct effects during construction of the project, and indirect effects that can result from operation and habitat modification resulting from construction of the project, as categorized below. Finally, the analyses conducted for the RUS BA are included here.

Impacts will be classified by their assessed severity relative to their severity and duration (Table 3.4-2). Temporary impacts are those that are expected to occur during construction and specific to construction activities. Permanent impacts are those impacts that are expected to result from maintenance and operation of the project once construction is complete.

Table 3.4-2. Impact Thresholds and Descriptions for Wildlife, including Special Status Species

	Minor Impact	Moderate Impact	Major Impact
Wildlife, including Special Status Species	Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, but discountable and would not measurably alter natural conditions. Infrequent responses to disturbances by some individuals could be expected, but without interference to feeding, breeding, sheltering, or other factors affecting population levels. Small changes to local population numbers, population structure, and other demographic factors could occur. Sufficient habitat would remain functional at both the local and range-wide scales to maintain the viability of the species.	Impacts on native species, their habitats, or the natural processes sustaining them would be detectable and/or measurable. Occasional responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, resting, migrating, or other factors affecting local population levels. Sufficient population numbers or habitat would retain function to maintain the viability of the species both locally and throughout its range.	Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and would be extensive. Frequent responses to disturbances by some individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a decrease in both local and range-wide population levels and habitat type. Impacts would occur during critical periods of reproduction and would result in mortality of individuals or loss of habitat that might affect the viability of a species. Local population numbers, population structure, and other demographic factors might experience large changes or declines.

3.4.2.2 NO ACTION

Under the No Action Alternative, the proposed project would not be built, and there would be no impacts to wildlife, including special status species.

3.4.2.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

All of the alternatives cross a variety of terrain, vegetative communities, and habitat types used by the wildlife species described above. Construction and maintenance of any chosen alternative would result in long-term adverse impacts to habitat.

Potential construction-related impacts from the C-HC Project common to all wildlife groups would 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 construction-related impacts would be moderate and short-term.

Portions of the ROW would be converted from one vegetation community, such as forested, to a different vegetation community, grassland. Long-term moderate impacts associated with clearing the ROW would include habitat loss, fragmentation, and degradation along with changes to species movement. Fragmentation could result in a shift in species composition, especially in continuous blocks forest habitat, where forest-obligate species are likely to occur. Habitat generalists use a range of habitat types and therefore would be less impacted by habitat fragmentation; however species that have poor dispersal abilities are area-sensitive and these species or forest-interior species can be intolerant of disturbance associated with clearing the ROW in forested areas. The shift in species composition can be a concern where rare, unique, or specialized species exist because they are more likely to be adversely impacted from fragmentation (Brittingham 2018). The transmission line would serve as a movement corridor for some species and as a barrier for others. Although some wildlife species would be temporarily displaced during construction of the transmission line, permanent displacement of these species is not anticipated, except potentially in cleared forest areas that may provide habitat for forest-obligate species and in areas of permanent conversion to substations. Forest habitat would be available in other areas near or adjacent to the ROW, and any loss of woodland would be minimal, with adjacent woodland areas still available along the route for refuge during construction and as habitat during project operation.

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.

Potential impacts from maintenance activities would be similar in nature to those previously discussed above for construction activities. However, the scope of maintenance impacts would be lower in magnitude than those for construction as there would be less equipment and fewer people working. Maintenance impacts would be temporary and would occur sporadically over the life of the C-HC Project. After construction, a mid-year cycle application of herbicide will be conducted in 2 to 3 years. Thereafter, the vegetation management cycle will occur every 5 years.

The following subsections describe typical impacts to animal groups, including state-listed species.

Mammals

Potential impacts on mammals from the proposed C-HC Project would include those described above as common to all species. Small mammals that shelter underground would be susceptible to being crushed by construction equipment. Mammals that forage or hunt in edge habitat would see beneficial effects upon completion of construction. Overall, potential impacts on mammals common to the analysis area would be long term and minor for most mammal species.

The state-listed mammals with potential to occur within the analysis area are all bat species. Direct long-term impacts could occur if occupied roosts are felled. Indirect moderate impacts could result from permanent modification of suitable roosting and foraging habitat. Modification to foraging habitat could result in changes to insect prey abundance and variety, degrading its quality. However, creation of a permanent ROW could result in a net gain in edge habitat suitable for foraging.

Birds

Potential impacts on bird species from the proposed C-HC Project would include those described above as common to all species. Additional impacts to bird species outside the ROW would occur and would include disturbance from noise as well as changes to habitat use. Noise-related construction activities could affect nesting, roosting, and foraging activities. Changes to behavior could include increased alertness, turning toward the disturbance, fleeing the disturbance, changes in activity patterns, and nest abandonment. Raptors would be especially susceptible to noise disturbance early in the breeding season, when it can cause nest abandonment and failure.

The presence of transmission structures would provide perches as well as nesting habitat for some species. This would allow some species to use areas that would otherwise be unsuitable. The increased amount of edge habitat created by the proposed C-HC Project would allow for an increase in species that use edge habitats. This would change the species composition of the ROW area and impact species that use larger blocks of habitat as they would be subject to increased predation. Other species that use edge habitats or have more general habitat requirements would benefit from the increased amount of edge habitat.

Habitat loss may occur for forest-dwelling bird species, causing temporary displacement of local populations during construction. When construction is completed, grassland species would be expected to return to the area as grassland is restored and disturbances specific to construction are eliminated. Forest-dwelling species would likely move into neighboring forested areas adjacent to the ROW during construction and operation of the transmission line. Species dependent on forested habitat would experience a permanent loss of habitat within the ROW. Forest fragmentation occurs when linear corridors are cleared through large contiguous tracts of woodland habitat. Woodland species, particularly interior woodland nesting birds, may experience a loss of habitat or nesting success in these edge areas because they may result in altered vegetation characteristics, availability of preferred food sources, or increased nest competition or predation with other species more adapted to edge habitats.

Operation of the proposed project would present the potential for avian collisions with the transmission line, particularly for larger species and in areas of dense bird congregations, such as migrating waterfowl corridors in the Mississippi Flyway (Avian Powerline Interaction Committee [APLIC] 2012). Under high wind, fog, or poor light conditions, avian collisions with the transmission line may occur. Migratory waterfowl would be especially susceptible to transmission line collisions where the proposed transmission lines are near migration staging areas and natural flight corridors such as the Mississippi River. Collocating with existing transmission line creates only an incremental elevation in existing collision risk, whereas construction of a new and separate ROW creates a new collision risk on the landscape.

Electrocutions of large avian species, particularly raptors, have been known to occur from contact with energized lines. Electrocutions are primarily due to the close vertical or horizontal separation of conductors and other equipment often found in distribution lines (APLIC 2012). Design standards for this Project would meet avian-safe guidelines as outlined by APLIC and the Utilities would develop a project-specific Avian Protection Plan, thereby minimizing potential avian electrocution risk. Electrocution impacts from operation of the line would be permanent, though minor, as a result of implementation of the APLIC guidelines. The project-specific Avian Protection Plan would include also an eagle management plan to ensure that impacts to eagles were minimized. Eagle nest surveys would also be conducted prior to construction activities, and the Utilities would coordinate with the appropriate agencies to minimize the impacts to nearby nesting eagles.

Fish and Other Aquatic Species

All aquatic sites would be spanned, and construction equipment would be kept out of flowing stream channels and active drainages to the extent possible to avoid directly impacting fish and other aquatic species' habitat. No operational or maintenance impacts on fish species are anticipated. Increases in soil erosion from ground-disturbing activities would be avoided through the development and implementation of a SWPPP. A spill prevention plan would be developed that would limit the potential for construction equipment to leak any hazardous materials that could impact water quality. Areas of ground disturbance would be restored to the extent possible upon completion of construction activities. If restoration activities were successful potential erosion would be minimized. However, if restoration activities were not successful erosion could continue to impact water quality for fish species throughout the operation and maintenance of the transmission line.

Nearby waterways could be used to obtain water to fill foundation excavation sites and for other construction purposes. Water could also be hauled from a municipal source or other water body outside the project area. Standard practice is to notify the WDNR or IDNR of water withdrawal from water bodies for construction activities. Withdrawal activities would be scheduled to avoid spawning seasons, if possible. Utilities would coordinate water withdrawal activities with the IDNR and WDNR; therefore, impacts to state-listed fish and other aquatic species or their habitat are considered minor and temporary.

Reptiles and Amphibians

Potential impacts on reptile and amphibian species from the proposed C-HC Project would include those described above as common to all species. Amphibian species would also be affected by any changes to water quality. Potential construction impacts on amphibian species would be short term and minor. No operational or maintenance impacts on amphibians are anticipated. Increases in erosion from ground-disturbing activities would be avoided through the development and implementation of a SWPPP. A spill prevention plan would be developed that would limit the potential for construction equipment to leak any hazardous materials that could impact water quality. Areas of ground disturbance would be restored to the extent possible upon completion of construction activities. If restoration activities are successful, potential erosion would be minimized. However, if restoration activities are not successful, erosion could continue throughout the life of the transmission line operation and maintenance, which may contribute to long-term impacts to water quality for amphibian species. Reptile and amphibian species that shelter underground would be susceptible to being crushed by construction equipment. Construction-related materials or debris may attract reptile predators such as raptor species. The presence of the transmission line and poles could provide perching and nesting habitat for reptile predators such as raptors. Potential construction impacts on reptiles would be long term and moderate. Impacts from the operation and maintenance of the proposed C-HC Project on reptiles would be long term and minor.

The state-listed reptiles and amphibians with potential to occur within the analysis area use a variety of habitat types. Direct impacts could occur if these habitats remain occupied during construction. Indirect impacts include permanent modification of suitable habitat, such as forested habitat removal, and degradation of suitable habitat through ongoing maintenance activities, including herbicide application.

Insects

The state-listed insects with potential to occur within the analysis area use a variety of habitat types and rely on several different host plants. Direct impacts could occur during construction if individuals remain within construction areas during active construction. Indirect impacts could result from construction through the removal of host plants and modification of suitable habitat. Indirect impacts could result from ongoing maintenance activities if a given species' host plan is prevented from regrowth within the maintained ROW via maintenance activities such as mowing or herbicide application. Therefore, impacts to insects or their habitat are considered moderate and long term.

3.4.2.3.1 SPECIAL STATUS SPECIES

Federally Listed Species

Whooping Crane

Individuals from the eastern non-essential experimental population of whooping cranes can experience direct impacts through collision with transmission lines or structures during their migration. Wetland stopover habitat suitability may be modified by construction or degraded during construction. However, during coordination with the USFWS, it was determined that the project would have no effect to whooping cranes.

Federally Listed Mussel Species

There would be no C-HC Project construction within the ordinary high-water mark (OHWM) of streams or rivers, where the three federally listed mussel species occur. However, construction of structures or grading required for ancillary features near streams may result in siltation. Erosion control BMPs would be implemented to avoid indirect effects to all waterways. As such, there are no anticipated impacts to federally listed mussel species or their habitat. During coordination with the USFWS, it was determined that the project would have no effect to these federally listed mussel species.

Hine’s Emerald Dragonfly

Though the Hine’s emerald dragonfly is considered potentially present within the resource evaluation area, through coordination with the USFWS and WDNR it was determined that the species is likely absent from the analysis area. Therefore, there are no anticipated impacts to the Hine’s emerald dragonfly.

Iowa Pleistocene Snail

The USFWS provided locations for potential suitable habitat for the Iowa Pleistocene snail within the analysis area. During field surveys by the Utilities, no suitable habitat for the species was found (RUS 2018). To ensure impacts to the Iowa Pleistocene snail are avoided, the Utilities will implement the species-specific environmental commitments described in Section 3.4.3.1. Therefore, no impacts to the species are anticipated. During consultation with USFWS it was determined that the project may affect but is not likely to adversely affect the Iowa Pleistocene snail.

Northern Long-Eared Bat

The analysis area contains suitable roosting and foraging habitat within the forested areas, and northern long-eared bats are presumed present for the purposes of this analysis. Clearing of trees would be required under all alternatives, though in varying quantities. Direct mortality could result from clearing occupied roost trees, though the Utilities have committed to avoiding tree removal activities during the “pup season,” the time of year when juveniles are unable to fly and therefore maternity colonies are most sensitive (see Section 3.4.3.1). Removal of roosting and foraging habitat can degrade the existing suitable habitat within the analysis area. Habitat fragmentation has been minimized by collocating the proposed ROW with existing cleared areas; however, some tree clearing would be required.

Direct mortality of individual bats from collision with moving construction equipment is unlikely given that construction activities would occur during daylight hours when bats would not be active. In addition, bats are highly maneuverable and can fly up and over or down and under the power lines, rapidly changing course. Since the diameter of the C-HC Project conductor is over a third of the bat's body length (the average 345-kV conductor is approximately 1.4 inches in diameter), and bats have advanced sonar detection systems, it is unlikely that a bat would fly into a static cable that large relative to their body size. Similarly, it is unlikely that bats would collide with the stationary transmission line structures (RUS 2018).

Noise associated with construction, maintenance, and operation of the C-HC Project may potentially cause an indirect effect to bats. The presence of construction and maintenance noise, as well as increased human activity, may indirectly disrupt the bats and cause them to flush from day roosts or potentially leave the area. Furthermore, auditory disruption or nuisance from the audible noise produced from the corona generated by the energized transmission line may potentially cause indirect effects. Electric corona results when high-voltage lines ionize the air around the line, which then also becomes a conductor, and an audible hissing sound can be heard. Corona is more prevalent near sharp corners in the line, nicks or scrapes in the line, snow/rain/frost on the line, or around bird flight diverters (APLIC 2012). Because the corona noise dissipates quickly and because corona is more pronounced during rainy conditions when bats are less likely to be flying, potential indirect effects due to line noise are not expected to be significant, even in areas where the C-HC Project crosses through suitable foraging habitat.

To minimize adverse impacts to the northern long-eared bat, the Utilities will implement the species-specific environmental commitments described in Section 3.4.3.1. During consultation with USFWS, it was determined that the project may affect, but would not result in prohibited take of the northern long-eared bat.

Rusty Patched Bumble Bee

Direct impacts to rusty patched bumble bees could occur if construction vehicles or temporary construction matting cover, crushes, or collapses a nest colony or hibernation area. Individual bees could also be disturbed by construction activities; thereby disrupting foraging, nesting, and hibernating activities. Habitat modification of herbaceous plant communities could degrade suitable habitat, adversely impacting the species. However, there could be a net gain of suitable habitat through creation of herbaceous plant communities where forested areas are converted to grassland as part of construction of the C-HC Project. ROW maintenance, specifically herbicide application, could adversely impact the rusty patched bumble bee by diminishing the variety and abundance of food resources. These maintenance activities are primarily used for treating areas dominated by woody vegetation, rather than suitable rusty patched bumble bee habitat. To minimize adverse impacts to the rusty patched bumble bee, the Utilities will implement the species-specific environmental commitments described in Section 3.4.3.1. During consultation with the USFWS, it was determined that the project may affect and is likely to adversely affect the rusty patched bumble bee.

3.4.2.4 ALTERNATIVE 1

Under Alternative 1, 524 acres of forested habitat would be permanently converted to maintained ROW, which is 51% of the forested habitat within the analysis area Table 3.4-3). An additional 40 acres of forest would be temporarily cleared for construction of access roads. For forest-dwelling wildlife species sensitive to fragmentation this is anticipated to be a moderate and long-term impact.

Table 3.4-3. Acres of Habitat Types within the Alternative 1 Analysis Area

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Total Analysis Area	**1,891**	**1,699**	**22**	**204**	**213**
Land Cover Class					
Forest	524	496	0	11	0
Grassland	228	153	0	40	0
Wetland	110	73	0	4	0
Open Water	15	10	0	0	0

There are 228 acres of existing grassland habitat within the ROW of Alternative 1, and an additional 153 acres outside the ROW but within the analysis area (see Table 3.4-3). Impacts to grassland habitat and species that use it are expected to be primarily temporary, mostly limited to the duration of construction, and minor. Grassland habitat is expected to return to preconstruction conditions after construction is complete and revegetation occurs; however, long-term minor impacts to plant diversity within grasslands could occur from herbicide applications necessary to maintain the ROW. Within these acres presented in Table 3.4-3 effects to species that use grassland and forested habitat described under Impacts Common to All Action Alternatives would be expected to occur.

There are 110 acres of wetland and 15 acres open water habitat within the proposed permanent ROW of Alternative 1 (see Table 3.4-3). Impacts to wetlands and open water habitat, and the species that use them, are expected to be temporary and minor (conversion of forested wetlands is included with the analysis of forested habitat conversion described above). Emergent wetlands may experience temporary disturbance during construction, though these impacts would be minimized through the measures described in Section 3.1, Table 3.1-4.

Construction of Alternative 1 would result in 99 miles of transmission line, 62 miles of which would be collocated with existing transmission lines. This results in 37 miles of new collision risk to raptors and other large birds through construction of Alternative 1, which would be a moderate impact to birds.

The ROW of Alternative 1 contains 76 and 954 acres of rusty patched bumble bee High Potential and Low Potential Zones, respectively. The area outside the ROW but within the 300-foot analysis area contains 78 and 957 acres of rusty patched bumble bee High Potential and Low Potential Zones, respectively. Alternative 1 includes transmission line Segment Y, which has been surveyed and verified to contain small patches of high-quality rusty patched bumble bee foraging and nesting habitat, and Segment P, which has been determined to contain a mix of low-quality and poor-quality rusty patched bumble bee habitat (RUS 2018). Temporary impacts that would occur to the rusty patched bee during construction under Alternative 1 would be moderate, though temporary. Ongoing impacts during operation of the C-HC Project (i.e., vegetation maintenance activities) are anticipated to be minor due to the proposed conservation measures.

Alternative 1 includes a 1.4-mile crossing of the Refuge. Wildlife species unique to the Refuge are expected to experience minor impacts through construction of Alternative 1 given the habitat types present within the analysis area. Under Alternative 1, the existing transmission line ROW would be decommissioned and revegetated. This element of Alternative 1 would have long-term beneficial impacts to wildlife within the Refuge because habitat would be improved along the existing transmission line ROW over the next 25 to 50 years.

3.4.2.5 ALTERNATIVE 2

Under Alternative 2, 530 acres of forested habitat would be converted to maintained ROW, which is 51% of the forested habitat within the analysis area (Table 3.4-4). An additional 11 acres of forest would be temporarily cleared for construction of access roads. For forest-dwelling wildlife species sensitive to fragmentation this is anticipated to be a moderate and long-term impact.

Table 3.4-4. Acres of Habitat Types within the Alternative 2 Analysis Area

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Total Analysis Area	**2,008**	**1,766**	**22**	**210**	**213**
Land Cover Class					
Forest	530	500	0	11	0
Grassland	249	171	0	42	0
Wetland	121	77	0	3	0
Open Water	13	8	0	0	0

There are 249 acres of existing grassland habitat within the ROW of Alternative 2, and an additional 171 outside the ROW but within the analysis area (see Table 3.4-4). Impacts to grassland habitat and species that use it are expected to be primarily temporary, mostly limited to the duration of construction, and minor. Grassland habitat is expected to return to preconstruction conditions after construction is complete and revegetation occurs; however, long-term minor impacts to plant diversity within grasslands could occur from herbicide applications necessary to maintain the ROW. Within these acres presented in Table 3.4-4 effects to species that use grassland and forested habitat described under Impacts Common to All Action Alternatives would be expected to occur.

There are 121 acres of wetland and 13 acres open water habitat within the proposed permanent ROW of Alternative 2 (see Table 3.4-4). Impacts to wetlands and open water habitat, and the species that use them, are expected to be temporary and minor (conversion of forested wetlands is included with the analysis of forested habitat conversion described above). Emergent wetlands may experience temporary disturbance during construction, though these impacts would be minimized through the measures described in Section 3.1, Table 3.1-4.

Construction of Alternative 2 would result in 105 miles of transmission line, 63 miles of which would be collocated with existing transmission lines. This results in 42 miles of new collision risk to raptors and other large birds through construction of Alternative 2, which would be a moderate impact to birds.

The ROW of Alternative 2 contains 86 and 958 acres of rusty patched bumble bee High Potential and Low Potential Zones, respectively. The area outside the ROW but within the 300-foot analysis area contains 87 and 959 acres of rusty patched bumble bee High Potential and Low Potential Zones, respectively. Additionally, Alternative 2 includes transmission line Segment Y, Segment Y, which has been surveyed and verified to contain small patches of high-quality rusty patched bumble bee foraging and nesting habitat, and Segments P and Z, which have been determined to contain a mix of low-quality and poor-quality rusty patched bumble bee habitat (RUS 2018). Temporary impacts that occur to the rusty patched bee during construction of Alternative 2 are considered moderate, though temporary. Ongoing impacts during operation of the project (i.e., vegetation maintenance activities) are anticipated to be minor due to the proposed conservation measures.

Alternative 2 includes a 1.5-mile crossing of the Refuge; however, the proposed route would follow an existing transmission line ROW. Wildlife species unique to the Refuge are expected to experience minor impacts through construction of Alternative 2, given the existence of the current ROW.

3.4.2.6 ALTERNATIVE 3

Under Alternative 3, 504 acres of forested habitat would be converted to maintained ROW, which is 50% of the forested habitat within the analysis area (Table 3.4-5). An additional 12 acres of forest would be temporarily cleared for construction of access roads. For forest-dwelling wildlife species sensitive to fragmentation this is anticipated to be a moderate and long-term impact.

Table 3.4-5. Acres of Habitat Types within the Alternative 3 Analysis Area

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Total Analysis Area	**2,210**	**2,016**	**22**	**157**	**213**
Land Cover Class					
Forest	504	504	0	12	0
Grassland	302	198	0	27	0
Wetland	107	66	0	3	0
Open Water	11	6	0	0	0

There are 302 acres of existing grassland habitat within the ROW of Alternative 3, and an additional 198 outside the ROW but within the analysis area (see Table 3.4-5). Impacts to grassland habitat and species that use it are expected to be primarily temporary, mostly limited to the duration of construction, and minor.

Grassland habitat is expected to return to preconstruction conditions after construction is complete and revegetation occurs; however, long-term, minor impacts to plant diversity within grasslands could occur from herbicide applications necessary to maintain the ROW. Within these acres presented in Table 3.4-5 effects to species that use grassland and forested habitat described under Impacts Common to All Action Alternatives would be expected to occur.

There are 107 acres of wetland and 11 acres of open water habitat within the proposed permanent ROW of Alternative 3 (see Table 3.4-5). Impacts to wetlands and open water habitat, and the species that use them, are expected to be temporary and minor (conversion of forested wetlands is included with the analysis of forested habitat conversion described above). Emergent wetlands may experience temporary disturbance during construction, though these impacts would be minimized through the environmental commitments described in Section 3.1, Table 3.1-4.

Construction of Alternative 3 would result in 117 miles of transmission line, 71 miles of which would be collocated with existing transmission lines. This results in 46 miles of new collision risk to raptors and other large birds through construction of Alternative 3, which can be considered a moderate impact to birds.

The ROW of Alternative 3 contains 77 and 1,003 acres of rusty patched bumble bee High Potential and Low Potential Zones, respectively. The area outside the ROW but within the 300-foot analysis area contains 79 and 1,001 acres of rusty patched bumble bee High Potential and Low Potential Zones, respectively. Additionally, Alternative 3 includes transmission line Segment Y, which has been surveyed and verified to contain small patches of high-quality rusty patched bumble bee foraging and nesting habitat, and Segment P, which has been determined to contain a mix of low-quality and poor-quality rusty patched bumble bee habitat (RUS 2018). Temporary impacts that occur to the rusty patched bee during construction of Alternative 3 are considered moderate, though temporary. Ongoing impacts during operation of the project (i.e., vegetation maintenance activities) are anticipated to be minor due to the proposed conservation measures.

Alternative 3 would have the same impacts to wildlife within the Refuge as Alternative 2.

3.4.2.7 ALTERNATIVE 4

Under Alternative 4, 236 acres of forested habitat would be converted to maintained ROW, which is 52% of the forested habitat within the analysis area (Table 3.4-6). An additional 7 acres of forest would be temporarily cleared for construction of access roads. For forest-dwelling wildlife species sensitive to fragmentation this is anticipated to be a moderate and long-term impact.

Table 3.4-6. Acres of Habitat Types within the Alternative 4 Analysis Area

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Total Analysis Area	**2,246**	**2,083**	**22**	**116**	**213**
Land Cover Class					
Forest	236	216	0	7	0
Grassland	433	317	0	19	0
Wetland	69	28	0	2	0
Open Water	11	6	0	0	0

There are 433 acres of existing grassland habitat within the ROW of Alternative 4, and an additional 317 outside the ROW but within the analysis area (see Table 3.4-6). Impacts to grassland habitat and species that use it are expected to be primarily temporary, mostly limited to the duration of construction, and minor. Grassland habitat is expected to return to preconstruction conditions after construction is complete and revegetation occurs; however, long-term minor impacts to plant diversity within grasslands could occur from herbicide applications necessary to maintain the ROW. Within these acres presented in Table 3.4-6 effects to species that use grassland and forested habitat described under Impacts Common to All Action Alternatives would be expected to occur.

There are 69 acres of wetland and 11 acres of open water habitat within the proposed permanent ROW of Alternative 4 (see Table 3.4-6). Impacts to wetlands and open water habitat, and the species that use them, are expected to be temporary and minor (conversion of forested wetlands is included with the analysis of forested habitat conversion described above). Emergent wetlands may experience temporary disturbance during construction, though these impacts would be minimized through the measures described in Section 3.1, Table 3.1-4.

Construction of Alternative 4 would result in 119 miles of transmission line, 82 miles of which would be collocated with existing transmission lines. This results in 37 miles of new collision risk to raptors and other large birds through construction of Alternative 4, which can be considered a moderate impact to birds.

The ROW of Alternative 4 contains 51 and 995 acres of rusty patched bumble bee High Potential and Low Potential Zones, respectively. The area outside the ROW but within the 300-foot analysis area contains 54 and 1,027 acres of rusty patched bumble bee High Potential and Low Potential Zones, respectively. Additionally, Alternative 4 includes transmission line Segment Y, which has been surveyed and verified to contain small patches of high-quality rusty patched bumble bee foraging and nesting habitat, and Segment S, which has been determined to contain a mix of low quality and poor quality rusty patched bumble bee habitat (RUS 2018). Temporary impacts that occur to the rusty patched bee during construction of Alternative 4 are considered moderate, though temporary. Ongoing impacts during operation of the project (i.e., vegetation maintenance activities) are anticipated to be minor due to the proposed conservation measures.

Alternative 4 would have the same impacts to wildlife within the Refuge as Alternative 2.

3.4.2.8 ALTERNATIVE 5

Under Alternative 5, 245 acres of forested habitat would be converted to maintained ROW, which is a 54% change of forested habitat availability within the analysis area (Table 3.4-7). An additional 7 acres of forest would be temporarily cleared for construction of access roads. For forest-dwelling wildlife species sensitive to fragmentation this is anticipated to be a moderate and long-term impact.

Table 3.4-7. Acres of Habitat Types within the Alternative 5 Analysis Area

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Total Analysis Area	**2,431**	**2,230**	**22**	**129**	**213**
Land Cover Class					
Forest	245	216	0	7	0
Grassland	454	338	0	22	0
Wetland	66	35	0	2	0
Open Water	10	8	0	0	0

There are 454 acres of existing grassland habitat within the ROW of Alternative 5, and an additional 338 outside the ROW but within the analysis area (see Table 3.4-7). Impacts to grassland habitat and species that use it are expected to be primarily temporary, mostly limited to the duration of construction, and minor. Grassland habitat is expected to return to preconstruction conditions after construction is complete and revegetation occurs; however, long-term minor impacts to plant diversity within grasslands could occur from herbicide applications necessary to maintain the ROW. Within these acres presented in Table 3.4-7 effects to species that use grassland and forested habitat described under Impacts Common to All Action Alternatives would be expected to occur.

There are 66 acres of wetland and 10 acres of open water habitat within the proposed permanent ROW of Alternative 5 (see Table 3.4-7). Impacts to wetlands and open water habitat, and the species that use them, are expected to be temporary and minor (conversion of forested wetlands is included with the analysis of forested habitat conversion described above). Emergent wetlands may experience temporary disturbance during construction, though these impacts would be minimized through the measures described in Section 3.1, Table 3.1-4.

Construction of Alternative 5 would result in 127 miles of transmission line, 75 miles of which would be collocated with existing transmission lines. This results in 52 miles of new collision risk to raptors and other large birds through construction of Alternative 5, which can be considered a moderate impact to birds.

The ROW of Alternative 5 contains 45 and 937 acres of rusty patched bumble bee High Potential and Low Potential Zones, respectively. The area outside the ROW but within the 300-foot analysis area contains 49 and 974 acres of rusty patched bumble bee High Potential and Low Potential Zones, respectively. Additionally, Alternative 5 includes transmission line Segment Y, which has been surveyed and verified to contain small patches of high-quality rusty patched bumble bee foraging and nesting habitat, and Segment S, which has been determined to contain a mix of low-quality and poor-quality rusty patched bumble bee habitat (RUS 2018). Temporary impacts that occur to the rusty patched bee during construction of Alternative 5 are considered moderate, though temporary. Ongoing impacts during operation of the C-HC Project (i.e., vegetation maintenance activities) are anticipated to be minor due to the proposed conservation measures.

Alternative 5 would have the same impacts to wildlife within the Refuge as Alternative 1.

3.4.2.9 ALTERNATIVE 6

Under Alternative 6, 252 acres of forested habitat would be converted to maintained ROW, which is 56% of the forested habitat within the analysis area (Table 3.4-8). An additional 6 acres of forest would be temporarily cleared for construction of access roads. For forest-dwelling wildlife species sensitive to fragmentation this is anticipated to be a moderate and long-term impact.

Table 3.4-8. Acres of Habitat Types within Cardinal-Hickory Creek Alternative 6 Analysis Area

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Total Area	1,936	1,773	22	163	213
Land Cover Class					
Forest	252	203	0	6	0
Grassland	355	275	0	32	0
Wetland	72	35	0	2	0
Open Water	14	10	0	0	0

There are 355 acres of existing grassland habitat within the ROW of Alternative 6, and an additional 275 outside the ROW but within the analysis area (see Table 3.4-8). Impacts to grassland habitat and species that use it are expected to be primarily temporary, mostly limited to the duration of construction, and minor.

Grassland habitat is expected to return to preconstruction conditions after construction is complete and revegetation occurs; however, long-term minor impacts to plant diversity within grasslands could occur from herbicide applications necessary to maintain the ROW. Within these acres presented in Table 3.4-8 effects to species that use grassland and forested habitat described under Impacts Common to All Action Alternatives would be expected to occur.

There are 72 acres of wetland and 14 acres of open water habitat within the proposed permanent ROW of Alternative 6 (see Table 3.4-8). Impacts to wetlands and open water habitat, and the species that use them, are expected to be temporary and minor (conversion of forested wetlands is included with the analysis of forested habitat conversion described above). Emergent wetlands may experience temporary disturbance during construction, though these impacts would be minimized through the measures described in Section 3.1, Table 3.1-4.

Construction of Alternative 6 would result in 101 miles of transmission line, 70 miles of which would be collocated with existing transmission lines. This results in 31 miles of new collision risk to raptors and other large birds through construction of Alternative 6, which can be considered a moderate impact.

The ROW of Alternative 6 contains 55 and 948 acres of rusty patched bumble bee High Potential and Low Potential Zones, respectively. The area outside the ROW but within the 300-foot analysis area contains 58 and 983 acres of rusty patched bumble bee High Potential and Low Potential Zones, respectively. Additionally, Alternative 6 includes transmission line Segment Y, which has been surveyed and verified to contain small patches of high-quality rusty patched bumble bee foraging and nesting habitat, and Segments Z and S, which have been determined to contain a mix of low-quality and poor-quality rusty patched bumble bee habitat (RUS 2018). Temporary impacts that occur to the rusty patched bee during construction of Alternative 6 are considered moderate, though temporary. Ongoing impacts during operation of the project (i.e., vegetation maintenance activities) are anticipated to be minor due to the proposed conservation measures.

Alternative 6 would have the same impacts to wildlife within the Refuge as Alternative 1.

3.4.3 *Summary of Impacts*

Table 3.4-9 provides a summary of wildlife habitat availability, miles of new transmission line, rusty patched bumble bee occurrence zones, and a comparison of impacts within the Refuge for the ROW of each proposed alternative. Alternative 2 would convert the largest amount of forested habitat to grassland, while Alternative 4 would convert the least amount of forested habitat to grassland. Alternative 2 would cross the largest amount of rusty patched bumble bee high potential zone, compared with Alternative 5, which would cross the least amount of rusty patched bumble bee high potential zone.

Table 3.4-9. Impact Summary Table for Wildlife and their Habitat

	Total ROW (acres)	Forested Habitat (acres)	Grassland Habitat (acres)	Wetland Habitat (acres)	Open Water (acres)	Non-Collocated, New Transmission Line (miles)	Rusty Patched Bumble Bee High Potential Zone (acres)	Rusty Patched Bumble Bee Low Potential Zone (miles)	Miles within the Refuge
Alternative 1	1,891	524	228	110	15	37	76	954	1.4
Alternative 2	2,008	530	249	121	13	42	86	958	1.5
Alternative 3	2,210	504	302	107	11	46	77	1,003	1.5
Alternative 4	2,246	236	433	69	11	37	51	995	1.5
Alternative 5	2,431	245	454	66	10	52	45	937	1.4
Alternative 6	1,936	252	203	72	14	31	55	948	1.4

Table 3.4-10 summarizes the effect determinations under the Endangered Species Act for the federally listed species that may occur in the C-HC Project analysis area.

Table 3.4-10. Federally Listed Species with Potential to Occur in the C-HC Project and the Effect Determinations for Each in the RUS Biological Assessment

Species	Federal Status	Effect Determination from RUS BA
Whooping crane	Nonessential, experimental population	No effect
Higgins eye pearly mussel	Endangered	No effect
Sheepnose mussel	Endangered	No effect
Spectaclecase mussel	Endangered	No effect
Hine's emerald dragonfly	Endangered	No effect
Iowa Pleistocene snail	Endangered	May Affect, Not Likely to Adversely Affect
Northern long-eared bat	Threatened	May Affect, Not Result in Prohibited Take
Rusty patched bumble bee	Endangered	May Affect, Likely to Adversely Affect

3.5 Water Resources and Quality

This section discusses water resources within the project analysis area, including surface water, floodplains, groundwater resources, water quality, and other special status waters such as outstanding and exceptional waters, trout streams, sovereign meandered rivers, and protected streams. Information regarding wetlands can be found in Section 3.3.

3.5.1 *Affected Environment*

The analysis area for water resources and quality is defined by the seven watersheds that are crossed by the six action alternatives presented in Chapter 2. Each watershed is assigned a unique eight-digit Hydrologic Unit Code [HUC-8] by the USEPA.

Watersheds included in the analysis area for the project are the Maquoketa River (IA, 07060006), Turkey River (IA, 07060004), Grant-Little Maquoketa Rivers (WI, 07060003), Lower Wisconsin River (WI, 07070005), Apple-Plum River (WI, 07060005), Pecatonica River (WI, 07090003), and Sugar River watersheds (WI, 07090004) (eight-digit Hydrologic Unit Code [HUC-8] watersheds). Major surface water features within the analysis area and the HUC-8 watersheds crossed by the project alternatives are shown in Figure 3.5-1 (USEPA 2018a).

3.5.1.1 SURFACE WATER

The analysis area includes the Mississippi River near Cassville, Wisconsin, just south of the Mississippi River and Turkey River confluence. Additional named rivers and streams within the analysis area include (USEPA 2018a):

- North Fork Maquoketa River (IA)
- Bluebell Creek (IA)
- Furnace Branch (WI)
- Mill Branch (WI)
- Rattlesnake Creek (WI)
- Beetown Branch (WI)
- Grant River (WI)
- Pigeon Creek (WI)
- Moore Branch (WI)
- Platte River (WI)
- Martinville Creek (WI)
- Pecatonica River (WI)
- Little Platte River (WI)
- Mounds Branch (WI)
- Bonner Branch (WI)
- Galena River (WI)
- Blockhouse Creek (WI)
- Whig Branch (WI)
- Boice Creek (WI)
- McCartney Branch (WI)
- Sudan Branch (WI)

- Laxey Creek (WI)
- Mineral Point Branch (WI)
- Dodge Branch (WI)
- Badger Hollow Creek (WI)
- Sugar River (WI)
- Black Earth Creek (WI)
- Garfoot Creek (WI)
- Vermont Creek (WI)
- East Branch Blue Mounds Creek (WI)
- West Branch Blue Mounds Creek (WI)
- White Hollow Creek (WI)
- Mill Creek (WI)
- Lowery Creek (WI)
- Otter Creek (WI)
- East Branch Pecatonica River (WI)
- Gordon Creek (WI)
- West Branch Sugar River (WI)
- Deer Creek (WI)
- Fryes Feeder (WI)

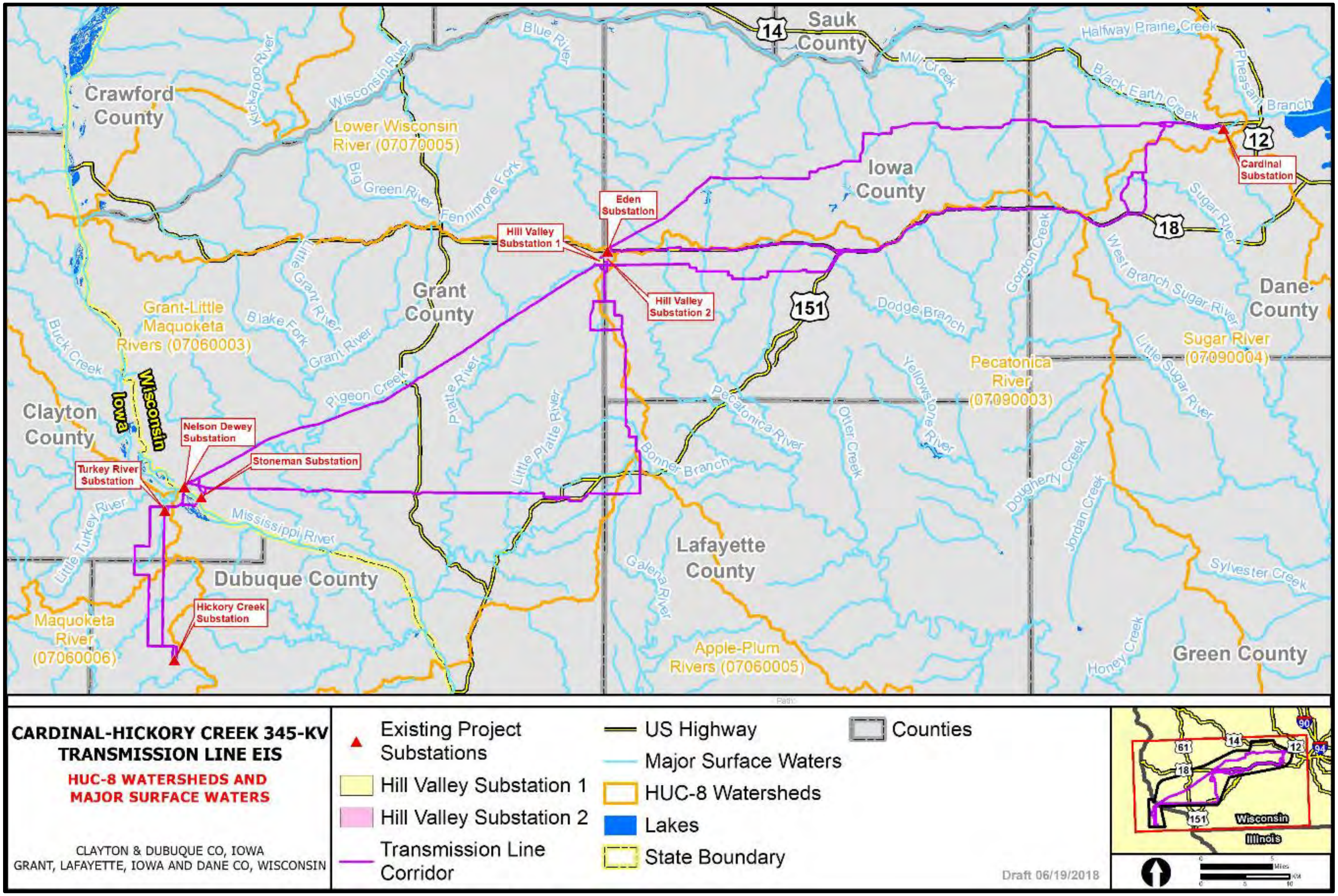

Figure 3.5-1. HUC-8 watersheds and major surface waters in the action area.

The analysis area also includes Black Hawk Lake, Twin Valley Lake, Cox Hollow Lake, and Halverson Lake in Iowa County, Wisconsin; and Stewart Lake in Dane County, Wisconsin. Additional surface waters found throughout the analysis area include scattered small farm ponds, retention basins, and sediment basins (USEPA 2018a).

The USACE defines traditional navigable water as a regulated WUS. Section 10 of the Rivers and Harbors Act of 1899 (33 CFR 322) requires authorization from the USACE for the construction of any structure in or over any traditional navigable WUS, including transmission lines. The Mississippi River (in Iowa and Wisconsin) and the Pecatonica River (in Wisconsin) are the two traditional navigable WUS in the analysis area.

3.5.1.2 WATER QUALITY

Iowa and Wisconsin both publish lists of waters designated as impaired every 2 years (lists are published within the Integrated Report), as required by Section 303(d) of the CWA. The list includes streams, lakes and other water bodies that are not meeting their designated uses because of excess pollutants, or pollutants that are present in concentrations higher than the thresholds set in water quality standards. The USEPA regulations that govern 303(d) listing can be found in 40 CFR 130.7. The WDNR (2018e) and IDNR (2016) have jurisdiction over impaired waters (as defined in the WDNR 2018 and the IDNR 2016) for their respective states. As required under Section 303(d) of the CWA, both the WDNR and IDNR have identified impaired water bodies that require the development of a total maximum daily load (TMDL) management plan. A TMDL is defined in the CWA as a management plan for restoring impaired waters that identifies the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards established by the USEPA.

Impaired waters are categorized as follows (IDNR 2016; WDNR 2018e):

- Category 1: All designated uses (e.g., for water contact recreation, aquatic life, and/or drinking water) are met.
- Category 2: Some of the designated uses are met but insufficient information exists to determine whether the remaining uses are met.
- Category 3: Insufficient information exists to determine whether any uses are met.
- Category 4: The waterbody is impaired but a TMDL is not required.
- Category 5: The waterbody is impaired and a TMDL is required.

Category 5 waters are considered the State's 303(d) list of impaired waters. There are four Category 5 waters in the Iowa portion of the analysis area: Turkey River, Little Turkey River, North Fork Maquoketa River, and Middle Fork Little Maquoketo River. The impairments include low aquatic macroinvertebrate levels, fish kills due to fertilizer spills, and *E. coli*.

In Wisconsin, there are 31 Category 5 waters within the analysis area. Impairments include: Sediment/Total Suspended Solids, Total Phosphorous, Unknown Pollutant, Ammonia, and Biochemical Oxygen Demand. The reach of the Mississippi River within the analysis area is also a Category 5 water, with Aluminum as the impairment.

3.5.1.3 OUTSTANDING AND EXCEPTIONAL WATERS

In Wisconsin, waters designated by the WDNR as Outstanding Resource Waters or Exceptional Resource Waters (WAC Chapter NR 102.10 and Chapter NR 1.02.11) are surface waters that provide outstanding recreational opportunities, support valuable fisheries and wildlife habitat, have good water quality, and are not significantly impacted by human activities. There are approximately 21 Outstanding Resource Waters and Exceptional Resource Waters within the Wisconsin portion of the analysis area, including 10 that are within the analysis area.

The IDNR manages the Outstanding Iowa Waters program. This program gives certain surface waters the classification as Outstanding Resource Waters based on water quality standards, thereby warranting special protection (IAC 567 Chapter 61). No current Outstanding Iowa Waters are within the analysis area (IDNR 2018a).

3.5.1.4 TROUT STREAMS

Designated trout streams are abundant in sections of northeast Iowa (IDNR 2018b) and parts of Wisconsin included in the analysis area. Trout generally require cold water streams with low sediment loads, stable and consistent flow, high diversity of aquatic habitat, and good water quality. Trout streams provide recreational opportunities and the relatively cool, clear waters support wildlife. They are an important environmental and economic resource.

Within Wisconsin, there are approximately 69 trout streams in the analysis area (WDNR 2018f). Twelve of the streams are considered Class I trout streams. Class I trout streams are typically smaller streams with high-quality trout fishing. Class I trout streams can support naturally reproducing trout populations, and do not require stocking from a hatchery. These high-quality Class I trout streams are most often associated with headwaters and the uppermost reaches within a watershed. Approximately 57 streams are Class II trout streams. Class II streams may support some natural reproduction of trout but are not capable of maintaining a sustainable trout population without restocking from a hatchery. Class II streams have good survival and carry-over of adult trout, often producing some larger-than-average fish. Two Class I trout streams and 15 Class II trout streams are within the analysis area. Within Wisconsin, two Class I trout streams and 15 Class II trout streams are within 150 feet of the six action alternatives. There is one trout stream in Iowa that falls within the analysis area.

3.5.1.5 MEANDERED SOVEREIGN RIVERS

Meandered Sovereign Rivers are defined and administered by IDNR and are “those rivers which, at the time of the original federal government surveys, were surveyed as navigable and important water bodies and were transferred to the states upon their admission to the union to be transferred or retained by the public in accordance with the laws of the respective states upon their admission to the union” (IAC 571 Chapter 13; IDNR 2018c). The Mississippi River is the only Meandered Sovereign River in the analysis area. A Sovereign Lands Construction Permit would be required for proposed construction activities that may impact the Mississippi River (IAC 571 Chapter 13).

WDNR does not have a Meandered Sovereign River designation.

3.5.1.6 PROTECTED STREAMS

Protected Streams are those defined and administered by the IDNR as those streams where “channel changes are not allowed on protected streams because of actual or potential significant adverse effects on fisheries, water quality, flood control, flood plain management, wildlife habitat, soil erosion, public recreation, the public health, welfare and safety, compatibility with the state water plan, rights of other landowners, and other factors relevant to the control, development, protection, allocation, and utilization of the stream” (IAC 567 chapter 72). Middle Fork Little Maquoketa River and White Pine Hollow are the two protected streams in Iowa. The protected segments are both at the outer edge of the analysis area and are not near the six action alternatives. Wisconsin does not have a Protected Stream designation.

3.5.1.7 FLOODPLAINS

Floodplains are areas adjacent to stream, rivers, or other water bodies that experience flooding or inundation during periods of high flow or water discharge. Floodplains are generally thought to provide numerous benefits such as

- Attenuation and reduction of flood severity
- Water quality maintenance
- Groundwater recharge
- Erosion and scour reduction in drainageways
- Habitat for fish, wildlife, and plants
- Open spaces and recreational opportunities
- Fertile and productive areas for agriculture, aquaculture, and forestry

With regard to floodplains, the Federal Emergency Management Agency (FEMA), through the National Flood Insurance Program, has responsibility for developing and implementing regulations and procedures to control development in areas subject to flooding. The National Flood Insurance Program was established by the U.S. Congress with the passage of the National Flood Insurance Act of 1968 (42 U.S.C. 4001 et seq.). To implement the National Flood Insurance Program, FEMA prepares Flood Insurance Rate Maps (FIRMs) that show special flood hazard areas, commonly referred to as floodplains. The floodplain boundary most commonly used to regulate floodplain activities is the 100-year flood, or base flood. The 100-year flood is the flood event that has a 1 in 100, or 1%, chance of being equaled or exceeded in any given year. The FEMA-designated 100-year floodplains within the analysis area are shown in Figure 3.5-2.

EO 11988, Floodplain Management (44 CFR 9), directs Federal agencies to take action to reduce or eliminate flood loss risks; minimize the impacts of floods on human health, safety, and welfare; and restore and preserve the natural and beneficial values served by floodplains. The order also requires agencies to elevate structures or buildings above the base flood elevation, where possible. Revisions to EO 11988, made in conjunction with EO 13690, Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input, require federally funded projects and critical facilities, such as hospitals, fire stations, and emergency management control centers to be elevated above the 500-year flood, or 0.2% annual chance event of being equaled or exceeded in any given year. The objective of the order is to avoid the short- and long-term adverse impacts associated with activities or facilities that modify the floodplain and to avoid direct or indirect support of floodplain development when a practicable alternative exists.

There are numerous FEMA-designated 100-year floodplains within the analysis area. The largest of which is the Mississippi River floodplain. Since detailed mapping was performed for the Mississippi River, a floodway has also been designated along the river. The floodway is the portion of the floodplain where buildings and structures for human habitation are prohibited, to preserve the ability of that area to convey flood flows. The floodway for the Mississippi River, the portion of the floodplain where buildings and structures for human habitation are prohibited, is approximately 1.5 miles wide within the analysis area.

In Iowa, floodplain development is managed by the applicable local agency. The IDNR also regulates construction activities within floodplains and floodways. Any person who desires to construct or maintain a structure, dam, obstruction, deposit or excavation, or allow the same in any floodplain or floodway must contact the IDNR prior to the beginning of any work. In Wisconsin, floodplain development is managed by the applicable local agency. The local agency must have floodplain ordinances that meet the minimum requirements of the National Flood Insurance Program and the Wisconsin Administrative Code.

Federal Civil Works projects, including levees and other flood control structures are common along reaches of the Mississippi River. Section 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. 408), also referred to as Section 408, mandates that any use or alteration of a Civil Works project by another party is subject to the approval of USACE. Upon a determination that the alteration proposed will not be injurious to the public interest and will not impair the usefulness of the Civil Works project, the USACE is authorized to permit the alteration. The analysis area does not include any mapped Mississippi River levees, floodwalls, or other known Civil Works projects; however, the analysis area does cross USACE-managed and owned real estate within the refuge, which is subject to Section 408 review. The USACE will follow the procedures outlined in Engineer Circular 1165-2-220 when conducting this review (USACE 2018).

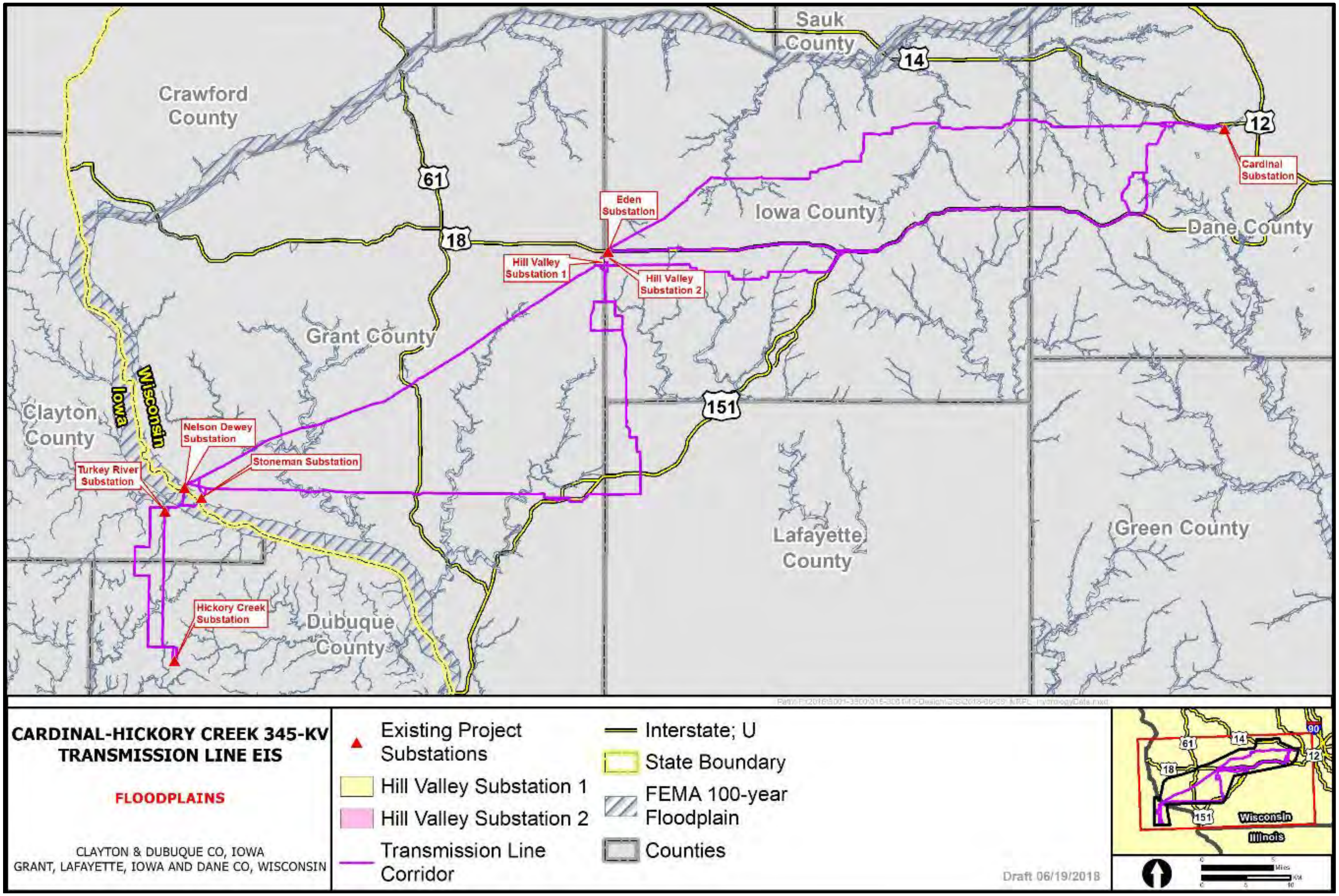

Figure 3.5-2. Floodplains in the action area.

3.5.1.8 GROUNDWATER RESOURCES

Groundwater is water stored underground in rock crevices and in the pores of geologic materials. An aquifer is a geologic formation that can accumulate, store, and yield a usable quantity of groundwater. In the analysis area there are three types of aquifers: 1) sand and gravel aquifers; 2) sandstone and dolomite aquifers; and 3) crystalline aquifers. As is clear by their name, each aquifer type exists within different geologic materials and with these divergent geologic materials, the quantity and quality of the water varies.

Sand and gravel aquifers exist along a small portion of the northeastern edge of the analysis area and along the Mississippi River. The sand and gravel aquifers are very productive sub-regional aquifers. The thick sandy deposits, along the Wisconsin River Valley and the northeastern edge of the analysis area, were deposited by a large outwash river fed by melting glaciers. These deposits have great storage and conductivity properties, resulting in an aquifer allowing for rapid infiltration and for large quantities to be extracted with relative ease.

Sandstone and dolomite aquifers are the principal bedrock aquifer within the study area because of their ability to provide good quality and adequate quantities of groundwater. Spatially, these aquifers exist beneath nearly the entire analysis area. As described previously in Section 3.2, groundwater can dissolve dolomite overtime creating karst and where karst form the potential for sinkhole development exists.

Crystalline bedrock aquifers are comprised of cracks and fractures storing and transmitting water in granite-type crystalline rock and exist beneath the entire study area. Extent and severity of fractures vary spatially and are difficult to predict. The crystalline bedrock aquifer often cannot provide adequate quantities of water for larger water users and may have dissolved minerals that compromise the water quality.

The depth to groundwater across the project study area is highly variable ranging from a few feet in valleys and along the Mississippi River to over 100 feet in the higher elevation areas. In general, where sand and gravel aquifers exist, they are the shallowest aquifers. The sandstone and dolomite aquifers occur beneath the sand and gravel aquifers and above the crystalline aquifers.

Groundwater resources throughout the analysis area are used by agriculture producers, industrial, domestic, and municipal users. Groundwater is regulated by the IDNR and WDNR with respect to drinking water, wellhead protection, and source water protection. There are five communities within the area of analysis that have groundwater protection plans in place: Lancaster (WI), Fennimore (WI), Montfort (WI), Dodgeville (WI), Blue Mounds (WI).

3.5.1.8.1 SOLE SOURCE AQUIFERS

The USEPA defines a sole source aquifer as one where the aquifer supplies at least 50% of the drinking water for its service area, or one where there are no reasonably available alternative drinking water sources should the aquifer become contaminated. At the time of this study, no aquifers within the analysis area are designated as sole source aquifers (USEPA 2018b).

3.5.2 *Environmental Consequences*

This section describes potential impacts to water resources and quality, associated with the construction, operation, and maintenance of the C-HC Project. Impacts are presented in terms of crossing surface water features, disturbance with drainages, and changes to water quality.

3.5.2.1 DATA SOURCES, METHODS, AND ANALYSIS ASSUMPTIONS

The following impact indicators were considered when analyzing impacts to water resources:

- Number of potential jurisdictional waterways to be crossed by the C-HC Project. Provides a measure of potential direct and indirect impact to surface waters.
- Acres of disturbance within potential jurisdictional drainages.
- Potential impacts to groundwater resources due to project construction or project facilities.
- Potential changes in surface water contaminants of concern, including increases in sediment from erosion, compared to applicable state surface water standards and concentrations of groundwater contaminants of concern compared to applicable state groundwater standards.
- Potential impacts to floodplains measured as expected changes in surface flow capacities, velocities, and stages due to temporary or permanent disturbances; and expected changes in downstream channel morphology.

The following assumptions based upon construction methods, permitting requirements, and water resources identified within the analysis area were applied to assess potential impacts of the project:

- According to the Utilities application to the Public Service Commission of Wisconsin, no transmission line structures would be placed below the ordinary high-water mark (OHWM) of waterways and no temporary structures would be placed below the OHWM. Therefore, there would be no disturbance within potential jurisdictional drainages under any of the action alternatives.
- In Iowa and Wisconsin, Floodplain Development Permits would be required for proposed construction activities within a regulatory floodplain. A permit from the local floodplain management agency (county, city, town, etc.) would generally be required for any construction in the floodplain. In Iowa, depending on the size of the contributing drainage area of the stream crossed, a Joint Permit may also be required from the USACE and the IDNR. There is no known Joint Permit requirement within Wisconsin.
- Many floodplains can be freely spanned. In general, if a floodplain crossing is greater than 1,000 feet, it cannot be freely spanned, and structure(s) would need to be placed in the floodplain. Structures would be placed so the transmission lines span the channel, preferably with transmission line structures located several hundred feet outside the channel banks. For each alternative, floodplain crossings greater than 1,000 feet are assumed to require support structures within the mapped 100-year floodplain. Floodplain crossings greater than 1,000 feet wide are identified below for each alternative.
- Erosion and sediment control measures, including measures for stabilization of disturbed areas during and at the completion of construction, would be defined in the SWPPP for the project. Not all areas would be disturbed at the same time.
- The Utilities have identified locations where temporary clear span bridges (TCSBs) and permits would be required. Wisconsin law requires a permit for construction of temporary bridges over navigable waters. There is no known permit specific to TCSBs over navigable waters in Iowa; however, applicable local, state, and federal permits would be required for temporary bridges over waterways with respect to potential impacts to floodplains, flood control structures, wetlands, and other water resources throughout the extent of the project. In Wisconsin, documentation and coordination with the WDNR will be required for Outstanding or Exceptional Waters to demonstrate the proposed project meets the requirements of the antidegradation rule (WAC Chapter NR 207).

Table 3.5-1 defines the impact thresholds for defining impacts to water resources and quality. These thresholds are used in this section to characterize the intensity and duration of impacts that are estimated for each alternative.

Table 3.5-1. Water Resources and Quality Impact Intensity Definitions

	Minor Impact	Moderate Impact	Major Impact
Water Resources and Quality	The effect on groundwater or surface waters would be measurable or perceptible, but small and localized. The effect would not alter the physical or chemical characteristics of the groundwater or surface water or aquatic influence zone resource.	The effect on groundwater or surface waters would be measurable or perceptible and could alter the physical or chemical characteristics of the surface water resources in a localized area, but not to large areas. The functions typically provided by the groundwater or surface water or aquatic influence zone would not be substantially altered.	The impact would cause a measurable effect on groundwater or surface waters and would modify physical or chemical characteristics of the groundwater or surface waters. The impacts would be substantial and highly noticeable. The character of the surface water or aquatic influence zone would be changed so that the functions typically provided by the groundwater or surface water or aquatic influence zone would be substantially altered.

3.5.2.2 NO ACTION

The No Action Alternative would result in no impacts to water resources and quality within the analysis area. The proposal would not be constructed or operated. As such, water resources and quality would not be impacted.

3.5.2.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

Most water resource impacts would be associated with construction of the C-HC Project. These impacts fall into one of three broad categories: (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, primarily during construction, 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.

Materials would be used during construction, including petroleum products (oil, gasoline, diesel) and other hazardous materials, that are potential contaminants that could impact surface water or shallow groundwater. The C-HC Project includes environmental commitments and BMPs that are intended to minimize the risk of water contamination from these construction-related sources (see Table 3.1-4 in Section 3.1). These BMPs are standard industry practices and are typically effective at minimizing risk for accidental release of contaminants to surface water or shallow ground water when implemented properly.

The most common contaminant from construction activity is the movement of sediment by stormwater into nearby surface waters, due to ground disturbance. The C-HC Project includes enviornmental commitments and BMPs that are intended to stabilize disturbed ground, control erosion from disturbed areas, and prevent sediment from entering surface waters. The SWPPP(s) required to be prepared for the construction activities would identify the specific structural control measures and BMPs to be implemented. When implemented properly, as required under Section 402 of the CWA, 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. Adverse impacts from sedimentation is expected to be short term for all alternatives.

Taller (approximately 196 feet), tubular steel, H-frame support structures may be required at the channel crossings, so the transmission line can span the channel and still provide adequate clearance for river-going vessels. At either crossing location, the transmission line would need to have a free span of approximately 1,600 feet in order to span the channel. With the support structures outside the channel and the transmission line elevated according to U.S. Coast Guard standards, the impacts to the Mississippi River would be temporary and minor.

The removal of tall vegetation from areas adjacent to surface water bodies can cause water temperatures to rise and may adversely affect aquatic habitat, especially cold-water systems, like trout streams. Depending on the height of the vegetation along the banks of the surface water body, removal of vegetation for construction and operation of the C-HC Project may be necessary for safety reasons. The removal of tall vegetation that provides shade to the nearby water body could result in longer term adverse impacts to aquatic habitat until sufficiently tall vegetation is able to become reestablished. All water body crossings would be revegetated and restored according to IDNR and WDNR recommendations and impacts to trout streams. Therefore, impacts to trout streams are expected to be moderate.

Projects that involve construction activities in a regulatory floodway must demonstrate that they would not result in increases to flood elevations (“no rise”) upstream. Should the project be unable to demonstrate “no rise”, a Conditional Letter of Map Revision must be submitted and approved by FEMA prior to construction. The Mississippi River floodway is the only regulatory floodway that would be crossed by the proposed alternatives. All of the alternatives would cross the Mississippi River floodway. The support structures for the transmission line would be small when compared to the Mississippi River floodway dimensions, as would be the grading required at the base of the structures. Neither the structures nor the grading at the base would be significant obstructions to the flood flows in the Mississippi River floodway. “No rise” conditions would likely be met for the proposed project, regardless of proposed Mississippi River crossing location. Modeling would be performed to demonstrate “no rise” conditions are met.

Some minor localized and short-term impacts to groundwater could occur in areas with shallow groundwater where construction of tower foundations requires dewatering. Dewatering requirements would be determined on a case-by-case basis for each tower construction site based on the required depth of drilling and depth to groundwater. Any impacts would be temporary and would only be required during installation of the structural footings for the transmission towers. No long-term impacts to groundwater are anticipated.

Similar BMPs and control measures identified above for construction activities would be implemented during operation and maintenance to minimize the risk for accidental release of potential contaminants, erosion, and movement of sediment in stormwater due to ground disturbance. It is anticipated that environmental commitments and BMPs would be incorporated during operation and maintenance of the project, and therefore any potential impacts to WUS would be minor.

No transmission line structures would be placed below the OHWM of waterways and no temporary structures would be placed below the OHWM. Therefore, there would be no disturbance within potential jurisdictional drainages under any of the action alternatives.

3.5.2.4 ALTERNATIVE 1

The water resources that would be crossed by Alternative 1 are provided in Table 3.5-2. Alternative 1 would cross approximately 9,091 feet of floodway and 43,661 feet of 100-year floodplain. Alternative 1 would also cross one meandered sovereign river (the Mississippi River), eight 303(d) impaired waters, three outstanding and exceptional waters, and 12 trout streams. A description of potential impacts to these water resources is provided under Impacts Common to All Alternatives (above).

Table 3.5-2. Water Resources crossed by Alternative 1

	Floodplain Crossed (linear feet)	Floodway Crossed (linear feet)	Crossings > 1,000 feet Wide (number)	Meandered Sovereign River (number)	Impaired Waters (number)	Outstanding and Exceptional Waters (number)	Trout Streams (number)
Alternative 1	43,661	9,091	14	1	8	3	12

A summary of floodplain crossings, including those greater than 1,000 feet in length, is included in Table 3.5-3. For Alternative 1, there are 14 floodplain crossings that would be greater than 1,000 feet. In these locations, it is likely that transmission line structures would be placed within the 100-year floodplain. It is anticipated the Utilities would need to coordinate with local floodplain management agencies to ensure consistency with floodplain regulations and ordinances.

Table 3.5-3. 100-Year Floodplain Crossings Greater than 1,000 feet under Alternative 1

River or Stream Name	Crossings > 1,000 feet Wide (number)	Floodplain Crossed (linear feet)
Black Earth Creek	3	3,440
Vermont Creek and Tributary	1	4,340
East Branch Blue Mounds Creek	1	1,290
West Branch Blue Mounds Creek	1	1,590
Platte River	1	1,510
Platte River	1	3,950
Pigeon Creek	1	1,560
Grant River	1	4,830
Rattlesnake Creek	2	5,400
Mississippi River	1	9,131
North Fork Maquoketa River	1	1,310

3.5.2.5 ALTERNATIVE 2

The water resources that would be crossed by Alternative 2 are provided in Table 3.5-4. Alternative 2 would cross approximately 8,620 feet of floodway and 40,100 feet of 100-year floodplain. Alternative 2 would also cross one Meandered Sovereign River, eight 303(d) Impaired Waters, three Outstanding and Exceptional Waters, and 11 trout streams. A description of potential impacts to these water resources is provided under Impacts Common to All Alternatives (above).

Table 3.5-4. Alternative 2 Water Resource Impacts

	Floodplain Crossed (linear feet)	Floodway Crossed (linear feet)	Crossings > 1,000 feet Wide (number)	Meandered Sovereign River (number)	Impaired Waters (number)	Outstanding and Exceptional Waters (number)	Trout Streams (number)
Alternative 2	40,100	8,620	14	1	8	3	11

A summary of floodplain crossings, including those greater than 1,000 feet in length, is included in Table 3.5-5. For Alternative 2, there are 14 floodplain crossings that would be greater than 1,000 feet. In these locations, it is likely that transmission line structures would be placed within the 100-year floodplain. It is anticipated the Utilities would need to coordinate with local floodplain management agencies to ensure consistency with floodplain regulations and ordinances.

Table 3.5-5. 100-Year Floodplain Crossings Greater than 1,000 feet under Alternative 2

River or Stream Name	Crossings > 1,000 feet Wide (number)	Floodplain Crossed (linear feet)
Black Earth Creek	1	1,040
Black Earth Creek	1	1,710
Unnamed	1	1,710
Vermont Creek and Tributary	1	4,340
East Branch Blue Mounds Creek	1	1,290
West Branch Blue Mounds Creek	1	1,590
Platte River	2	5,460
Pigeon Creek	1	1,560
Grant River	1	4,830
Rattlesnake Creek	2	5,400
Mississippi River	1	9,240
North Fork Maquoketa River	1	1,080

3.5.2.6 ALTERNATIVE 3

The water resources that would be crossed by Alternative 3 are provided in Table 3.5-6. Alternative 3 would cross approximately 8,620 feet of floodway and 28,310 feet of 100-year floodplain. Alternative 3 would also cross one Meandered Sovereign River, five 303(d) Impaired Waters, 10 Outstanding and Exceptional Waters, and nine trout streams. A description of potential impacts to these water resources is provided under Impacts Common to All Alternatives (above).

Table 3.5-6. Alternative 3 Water Resource Impacts

	Floodplain Crossed (linear feet)	Floodway Crossed (linear feet)	Crossings > 1,000 feet Wide (Number)	Meandered Sovereign River (Number)	Impaired Waters (number)	Outstanding and Exceptional Waters (number)	Trout Streams (number)
Alternative 3	28,310	8,620	10	1	5	10	9

A summary of floodplain crossings, including those greater than 1,000 feet in length, is included in Table 3.5-7. For Alternative 3, there are 10 floodplain crossings that would be greater than 1,000 feet. In these locations, it is likely that transmission line structures would be placed within the 100-year floodplain. It is anticipated the Utilities would need to coordinate with local floodplain management agencies to ensure consistency with floodplain regulations and ordinances.

Table 3.5-7. 100-Year Floodplain Crossings Greater than 1,000 feet under Alternative 3

River or Stream Name	Crossings > 1,000 feet Wide (number)	Floodplain Crossed (linear feet)
Black Earth Creek	3	3,440
Vermont Creek and Tributary	1	4,340
East Branch Blue Mounds Creek	1	1,290
West Branch Blue Mounds Creek	1	1,590
Platte River	1	1,150
Grant River	1	1,050
Mississippi River	1	9,240
North Fork Maquoketa River	1	1,310

3.5.2.7 ALTERNATIVE 4

The water resources that would be crossed by Alternative 4 are provided in Table 3.5-8. Alternative 4 would cross approximately 8,620 feet of floodway and 21,150 feet of 100-year floodplain. Alternative 4 would also cross one Meandered Sovereign River, eight 303(d) impaired waters, eight outstanding and exceptional waters, and seven trout streams. A description of potential impacts to these water resources is provided under Impacts Common to All Alternatives (above).

Table 3.5-8. Alternative 4 Water Resource Impacts

	Floodplain Crossed (linear feet)	Floodway Crossed (linear feet)	Crossings > 1,000 feet Wide (Number)	Meandered Sovereign River (Number)	Impaired Waters (number)	Outstanding and Exceptional Waters (number)	Trout Streams (number)
Alternative 4	21,150	8,620	8	1	8	8	7

A summary of floodplain crossings, including those greater than 1,000 feet in length, is included in Table 3.5-9. For Alternative 4, there are eight floodplain crossings that would be greater than 1,000 feet. In these locations, it is likely that transmission line structures would be placed within the 100-year floodplain. It is anticipated the Utilities would need to coordinate with local floodplain management agencies to ensure consistency with floodplain regulations and ordinances.

Table 3.5-9. 100-Year Floodplain Crossings Greater than 1,000 feet under Alternative 4

River or Stream Name	Crossings > 1,000 feet Wide (Number)	Floodplain Crossed (linear feet)
Black Earth Creek	3	3,440
Pecatonica River and Tributaries	1	1,150
Platte River	1	1,150
Grant River	1	1,050
Mississippi River	1	9,240
North Fork Maquoketa River	1	1,310

3.5.2.8 ALTERNATIVE 5

The water resources that would be crossed by Alternative 5 are provided in Table 3.5-10. Alternative 5 would cross approximately 9,081 feet of floodway and 21,051 feet of 100-year floodplain. Alternative 5 would also cross one Meandered Sovereign River, nine 303(d) Impaired Waters, eight Outstanding and Exceptional Waters, and seven trout streams. A description of potential impacts to these water resources is provided under Impacts Common to All Alternatives (above).

Table 3.5-10. Alternative 5 Water Resource Impacts

	Floodplain Crossed (linear feet)	Floodway Crossed (linear feet)	Crossings > 1,000 feet Wide (number)	Meandered Sovereign River (number)	Impaired Waters (number)	Outstanding and Exceptional Waters (number)	Trout Streams (number)
Alternative 5	21,051	9,091	7	1	9	8	7

A summary of floodplain crossings, including those greater than 1,000 feet in length, is included in Table 3.5-11. For Alternative 5, there are seven floodplain crossings that would be greater than 1,000 feet. In these locations, it is likely that transmission line structures would be placed within the 100-year floodplain. It is anticipated the Utilities would need to coordinate with local floodplain management agencies to ensure consistency with floodplain regulations and ordinances.

Table 3.5-11. 100-Year Floodplain Crossings Greater than 1,000 feet under Alternative 5

River or Stream Name	Crossings > 1,000 feet Wide (number)	Floodplain Crossed (linear feet)
Black Earth Creek	3	3,440
Platte River	1	1,150
Grant River	1	1,050
Mississippi River	1	9,131
North Fork Maquoketa River	1	1,310

3.5.2.9 ALTERNATIVE 6

The water resources that would be crossed by Alternative 6 are provided in Table 3.5-12. Alternative 6 would cross approximately 9,091 feet of floodway and 35,091 feet of 100-year floodplain. Alternative 6 would also cross one Meandered Sovereign River, six 303(d) Impaired Waters, six Outstanding and

Exceptional Waters, and 10 trout streams. A description of potential impacts to these water resources is provided under Impacts Common to All Alternatives (above).

Table 3.5-12. Alternative 6 Water Resource Impacts

	Floodplain Crossed (linear feet)	Floodway Crossed (linear feet)	Crossings > 1,000 feet Wide (number)	Meandered Sovereign River (number)	Impaired Waters (number)	Outstanding and Exceptional Waters (number)	Trout Streams (number)
Alternative 6	35,091	9,091	11	1	6	6	10

A summary of floodplain crossings, including those greater than 1,000 feet in length, is included in Table 3.5-13. For Alternative 6, there are 11 floodplain crossings that would be greater than 1,000 feet. In these locations, it is likely that transmission line structures would be placed within the 100-year floodplain. It is anticipated the Utilities would need to coordinate with local floodplain management agencies to ensure consistency with floodplain regulations and ordinances.

Table 3.5-13. 100-Year Floodplain Crossings Greater than 1,000 feet under Alternative 6

River or Stream Name	Crossings > 1,000 feet Wide (number)	Floodplain Crossed (linear feet)
Black Earth Creek	3	3,440
Pecatonica River and Tributaries	1	1,150
Platte River	2	5,460
Pigeon Creek	1	1,560
Grant River	1	4,830
Rattlesnake Creek	2	5,400
Mississippi River	1	9,131
North Fork Maquoketa River	1	1,310

3.5.3 *Summary of Impacts*

The potential impacts to water resources as a result of the C-HC Project are summarized in Table 3.5-14. Alternative 1 would cross the largest floodplain acreage, water body crossings greater than 1,000 feet wide, and trout streams. Alternative 5 would cross the least floodplain acreage, fewest water body crossings greater than 1,000 feet, and fewest trout streams. Alternative 5 would cross the greatest number of impaired water bodies, while Alternative 3 would cross the least. Alternative 3 would cross the greatest number of Outstanding and Exceptional Waters, while Alternatives 1 and 2 would cross the least.

Impacts to surface water during construction would be temporary and primarily due to potential sediment discharges from disturbed areas, including temporary crossings at streams. Where the transmission line crosses the riparian corridor, the removal of trees and clearing and grubbing within the ROW would also cause temporary disturbance, until permanent vegetative cover is reestablished. Under all action alternatives, transmission line structures may need to be placed within floodplains and this floodplain development would require coordination with local floodplain management agencies. As a result, impacts to both surface water and groundwater are expected to be short term and minor. Maintenance activities would likely have minimal impacts. Maintenance work on the transmission line or structures would be done above or outside the stream crossings, respectively. Work done on the ground to manage vegetation in the ROW would need to be done with care, to avoid sediment discharges to the adjacent streams. Furthermore, in accordance with its environmental commitments, the Utilities will employ a Certified Pesticide Applicator for all herbicide applications within the C-HC Project. The Certified Pesticide Applicators will only use herbicides registered and labeled by the USEPA and will follow all herbicide product label requirements. Herbicides approved for use in wetland and aquatic environments will be used in accordance with label requirements, as conditions warrant.

Table 3.5-14. Water Resource Impacts Summary

	Floodplain Crossed (linear feet)	Floodway Crossed (linear feet)	Crossings > 1,000 feet Wide (Number)	Meandered Sovereign River (Number)	Impaired Waters (number)	Outstanding and Exceptional Waters (number)	Trout Streams (number)
Alternative 1	43,661	9,091	14	1	8	3	12
Alternative 2	40,100	8,620	14	1	8	3	11
Alternative 3	28,310	8,620	10	1	5	10	9
Alternative 4	21,150	8,620	8	1	8	8	7
Alternative 5	21,051	9,091	7	1	9	8	7
Alternative 6	35,091	9,091	11	1	6	6	10

3.6 Air Quality

This section describes air quality conditions that occur within the C-HC Project's analysis area. For air quality, the analysis area contains portions of six counties: Clayton and Dubuque Counties in Iowa; and Dane, Grant, Iowa, and Lafayette Counties in Wisconsin. Air pollutants tend to disperse into the atmosphere, becoming more spread out as they travel away from a source of pollution, and therefore cannot be confined within defined boundaries, such as the boundary of the ROW or county lines. Because of the nature of air pollutants, the air quality analysis area extends 5 miles in all directions beyond the project ROW.

Air quality is characterized by meteorology and climate, ambient air quality standards, and county emission inventories. Calculated estimates of how much of each pollutant the C-HC Project will create are compared to the county emission inventories in order to show the amount of pollution caused by the C-HC Project, compared with the annual pollution contribution of each county.

3.6.1 *Affected Environment*

3.6.1.1 METEOROLOGY AND CLIMATE

Wisconsin and Iowa are located in the interior of the United States, exposing them to a climate with large ranges in temperature. The project area experiences cold winters and mild to hot summers. The lack of mountains to the north or south allows for incursions of bitterly cold air masses from the Arctic, as well as warm and humid air masses from the Gulf of Mexico, further increasing the range of conditions that can affect these two states. The winter season is dominated by dry and cold air with occasional intrusions of milder air from the west and south. The summer is characterized by frequent warm air masses, either hot and dry continental air masses from the Arid West and Southwest, or warm and moist air from the South. However, periodic intrusions of cooler air from Canada provide breaks from summer heat. The average winter temperature (January–March) is 25°F and 19.0°F in Iowa and Wisconsin, respectively, while the average summer temperature (June-August) is 71.5°F and 66.5°F, respectively

(National Oceanic and Atmospheric Administration [NOAA] National Centers for Environmental Information 2018a). Precipitation varies widely across Iowa and Wisconsin, with the project area portion of the states receiving around 30 inches annually. Much of the project area's precipitation falls during the summer months. Snowfall averages around 40 inches in the project area (NOAA National Centers for Environmental Information 2018b, 2018c).

3.6.1.2 AMBIENT AIR QUALITY STANDARDS

Federal regulations that govern air quality resources have established the following National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. The NAAQS are presented in Table 3.6-1. The USEPA assigns classifications to geographic areas based on monitored ambient air quality conditions. Areas that meet both the primary and secondary standards of a pollutant subject to NAAQS are classified as being in attainment for that pollutant. Areas that do not meet the NAAQS for a pollutant are designated as being in nonattainment for that pollutant. Areas that cannot be classified based on available information for a pollutant are designated as being unclassified. An area's attainment status is designated separately for each criteria pollutant; one area may have all three classifications. Previously designated nonattainment areas for one of the NAAQS that have since met the NAAQS standards are referred to as attainment areas with a maintenance plan. To ensure that the air quality in those areas continues to meet the standards, a maintenance plan is developed and implemented. The analysis area is in attainment for criteria pollutants. There is a 1.6-square-mile portion of Dane County, outside the analysis area, that is designated as a maintenance area for sulfur dioxide (SO_2). The maintenance area is 10 miles to the east of Cardinal Substation and surrounds the Dane County Regional Airport.

The Wisconsin Ambient Air Quality Standards are codified in WAC, Chapter NR 404, Article 4. Rules pertaining to air quality are found in Chapters 400 through 499, of the WAC, administered by the WDNR. Under the provisions of the Clean Air Act, any state can have requirements that are more stringent than those of the national program. In addition to the NAAQS established by the USEPA, Wisconsin has additional ambient air quality standards that apply. The Wisconsin Ambient Air Quality Standards are presented in Table 3.6-1. Iowa does not have any separate ambient air quality standards (IAC 567, Chapter 28, part 1).

In 1999, the USEPA announced an effort to improve air quality and visibility in 156 national parks and wilderness areas designated as Class I, known as the Regional Haze Rule (USEPA 1999). Regional haze reduces long-range visibility over a wide region. Section 169A of the Clean Air Act sets forth a national goal for visibility. States are required by the rule to demonstrate reasonable progress toward the "prevention of any future, and the remedying of any existing, impairment in Class I areas which impairment results from manmade air pollution." The nearest Class I area is 441 km northeast of the project in the upper peninsula of Michigan, too far for the project to affect.

Table 3.6-1. Ambient Air Quality Standards

Pollutant	Averaging Time	National		Wisconsin	
		Primary Standards	Secondary Standards	Primary Standards	Secondary Standards
CO	1 hour [a] 8 hour [a]	35 ppm 9 ppm	– –	35 ppm 9 ppm	– –
Pb	3 months (rolling) [b]	0.15 µg/m^3	Same as primary	0.15 µg/m^3	1.5 µg/m^3
NO_2	Annual [c] 1 hour [d]	0.053 ppm 0.100 ppm	Same as primary --	0.053 ppm 0.100 ppm	Same as primary --
O_3	1 hour [a] 8 hour [e]	-- 0.07 ppm	-- Same as primary	0.12 ppm 0.07 ppm	Same as primary 0.08 ppm
PM_{10}	24 hour [f]	150 µg/m^3	Same as primary	150 µg/m^3	Same as primary
$PM_{2.5}$	24 hour [g] Annual [h]	35 µg/m^3 12 µg/m^3	Same as primary 15 µg/m^3	35 µg/m^3 12 µg/m^3	Same as primary 15 µg/m^3
SO_2	1 hour [i] 3 hour [j]	0.075 ppm --	-- 0.5 ppm	0.075 ppm --	-- 0.5 ppm

Sources: USEPA (2018a); WAC, Chapter NR 404, Section NR 404.04

Notes:

µg/m^3: micrograms per cubic meter.

ppm: parts per million.

ppb: parts per billion.

[a] Not to be exceeded more than once per year.

[b] Not to be exceeded.

[c] Annual mean.

[d] The 3-year average of the 98th percentile of the daily maximum 1-hour average must not exceed this standard.

[e] The 3-year average of the 4th highest daily maximum 8-hour average O_3 concentration measured at each monitor within an area over each year must not exceed this standard.

[f] Not to be exceeded more than once per year on average over 3 years.

[g] The 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed this standard.

[h] The 3-year average of the annual arithmetic mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed this standard.

[i] The 3-year average of the annual 99th percentile of the 1-hour daily maximum must not exceed this standard.

[j] Not to be exceeded more than once per year.

[k] Not to be exceeded more than once per year.

[l] Annual geometric mean.

The General Conformity Rule was established under the Clean Air Act Section 176(c)(4) and serves to ensure that Federal actions do not inhibit state's attainment plans for areas designated as non-attainment or maintenance. The rule effectively applies to all Federal actions that take place in areas designated as non-attainment or maintenance. De minimis levels, established under the General Conformity Rule, are based on the severity of an area's air quality problem and establish a threshold for determining if a general conformity determination must be performed. Activities below this threshold level are assumed to have no significant impact on air quality. De minimis levels for hazardous air pollutants (HAPs) and greenhouse gases (GHGs) are not yet defined. Exceptions to the General Conformity Rule include the following: actions covered under the transportation conformity rule; actions with associated emissions below specified de minimis levels; and other actions that are exempt or presumed to conform. The 1.6 square mile portion of Dane County that is designated as a maintenance area for SO_2 falls outside the air quality analysis area for this EIS. The maintenance area is 10 miles to the east of Cardinal Substation and surrounds the Dane County Regional Airport. Thus, the General Conformity Rule does not apply.

3.6.1.3 EMISSION INVENTORIES FOR COUNTIES IN THE ANALYSIS AREA

Emission inventories are useful in comparing emission source categories to determine which industries or practices are contributing to the general level of pollution in the six counties crossed by the C-HC Project. Emission inventories provide an overview of the types of pollution sources in the area, as well as the amount of pollution being emitted on an annual basis by said sources. For the purposes of this assessment, the most recent National Emissions Inventory conducted in 2014 was summarized.

The National Emissions Inventory is a detailed annual estimate of criterial pollutants and HAPs from air emission sources. Data are collected from State, local and Tribal air agencies and supplemented with data from the USEPA (2018d). The emissions inventory includes estimates of emissions from many sources including point sources, nonpoint sources, on-road sources, non-road sources, and event sources, in order to create as complete an inventory as possible. Point sources are sources of air pollutants located at a fixed point. Point sources include facilities such as power plants and airports, as well as commercial sources. Nonpoint sources are those which are too small to pinpoint as point sources. Nonpoint sources include emission sources such as asphalt paving, solvent use, and residential heating. On-road sources are emissions from on-road vehicles. Non-road sources are mobile sources of emissions that operate off road such as construction equipment, lawn and garden equipment, trains, and emissions from barges, ships, and other marine vessels. Event sources include emissions from sources such as wildfires. This inventory is a good estimate of how much each county and state is contributing to air pollution for a given year. The emission inventory data for 2014 for each county are presented in Table 3.6-2.

Table 3.6-2. 2014 County Emissions Inventories in Tons per Year

Category	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	HAPs
Dane County, WI							
Agriculture	0	0	7,160	1,436	0	88	23
Biogenics[1]	1,257	461	0	0	0	5,948	909
Dust	0	0	7,763	906	0	0	0
Fires	2,588	54	285	240	25	603	198
Fuel Combustion	5,130	2,143	1,069	994	158	660	166
Industrial Processes	41	52	342	104	5	416	20
Miscellaneous[2]	457	11	188	171	0	5,630	653
Mobile	68,079	11,727	752	545	64	6,314	1,852
Waste Disposal	3,495	131	426	342	43	281	34
Total	**81,048**	**14,579**	**17,985**	**4,739**	**295**	**19,941**	**3,854**
Grant County, WI							
Agriculture	0	0	7,639	1,532	0	109	22
Biogenics[1]	1,285	466	0	0	0	6,999	947
Dust	0	0	3,811	414	0	0	0
Fires	1,416	26	152	128	13	332	101
Fuel Combustion	1,887	2,306	420	343	3,858	260	89
Industrial Processes	1	4	74	31	0	1	2
Miscellaneous[2]	48	1	13	12	0	708	76
Mobile	8,501	3,086	153	128	7	1,194	354
Waste Disposal	341	17	72	63	4	52	16
Total	**13,479**	**5,905**	**12,335**	**2,652**	**3,881**	**9,654**	**1,607**

Category	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	HAPs
Iowa County, WI							
Agriculture	0	0	2,858	577	0	46	11
Biogenics[1]	961	315	0	0	0	6,061	715
Dust	0	0	2,216	247	0	0	0
Fires	1,070	19	115	97	9	248	74
Fuel Combustion	973	86	161	158	16	144	22
Industrial Processes	0	0	19	3	0	3	0
Miscellaneous[2]	26	1	9	8	0	366	37
Mobile	5,985	1,094	74	59	5	1,005	313
Waste Disposal	207	10	42	37	2	16	7
Total	**9,221**	**1,526**	**5,494**	**1,186**	**32**	**7,890**	**1,179**
Lafayette County, WI							
Agriculture	0	0	5,647	1,135	0	58	14
Biogenics[1]	749	361	0	0	0	2,998	556
Dust	0	0	1,906	205	0	0	0
Fires	400	9	46	38	4	90	32
Fuel Combustion	964	56	160	159	18	145	21
Industrial Processes	0	0	36	21	0	0	0
Miscellaneous[2]	16	0	2	2	0	246	25
Mobile	5,002	897	72	61	3	1,080	347
Waste Disposal	101	6	29	26	1	8	6
Total	**7,232**	**1,329**	**7,897**	**1,646**	**26**	**4,625**	**1,002**
Clayton County, IA							
Agriculture	0	0	3,233	610	0	262	17
Biogenics[1]	896	359	0	0	0	4,095	666
Dust	0	0	1,062	121	0	0	0
Fires	1,850	35	197	167	17	439	83
Fuel Combustion	684	56	97	97	7	102	17
Industrial Processes	0	0	231	29	0	1	0
Miscellaneous[2]	20	0	7	6	0	298	25
Mobile	6,170	1,307	72	63	3	883	279
Waste Disposal	126	7	32	29	1	10	6
Total	**9,746**	**1,766**	**4,931**	**1,121**	**28**	**6,090**	**1,092**

Category	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC	HAPs
Dubuque County, IA							
Agriculture	0	0	3,455	680	0	218	19
Biogenics[1]	727	313	0	0	0	3,352	547
Dust	0	0	1,630	188	0	0	0
Fires	500	10	53	45	5	119	23
Fuel Combustion	1,373	374	162	157	20	179	27
Industrial Processes	2	2	22	10	0	168	9
Miscellaneous[2]	98	2	48	44	0	1,579	182
Mobile	13,205	2,248	142	104	9	1,430	421
Waste Disposal	597	25	90	75	7	83	13
Total	**16,503**	**2,975**	**5,601**	**1,303**	**40**	**7,127**	**1,241**

Source: USEPA (2018d)

Note: Column totals may not sum exactly due to rounding.
[1] Biogenic emissions are those emissions derived from natural processes (such as vegetation and soil).
[2] Miscellaneous categories include bulk gasoline terminals, commercial cooking, gas stations, miscellaneous non-industrial (not elsewhere classified), and solvent use.[3] CO_2e (CO_2 equivalent) assumes a USEPA recommended global warming potential of 25 for methane (CH_4) and 298 for nitrous oxide (N_2O).

The above table shows that out of the six counties crossed by the C-HC Project, Dane county contributed the most to all pollutants except SO_2 in 2014. Grant County contributed the most SO_2 pollution. In Dane County, mobile emissions are the biggest contributors to carbon monoxide (CO), nitrogen oxides (NO_X), volatile organic compound (VOC), and HAP pollution. Particulate matter 10 (PM_{10}) pollution is mostly caused by dust emissions, agriculture contributes most to $PM_{2.5}$ pollution, and fuel combustion contributes most to SO_2 pollution. In Grant, Iowa, Lafayette, and Dubuque Counties, mobile emissions are the biggest contributors to CO and NO_X pollution, VOC and HAP pollution are mostly caused by biogenic emissions, agriculture contributes most to PM_{10} and particulate matter 2.5 ($PM_{2.5}$) pollution, and fuel combustion contributes most to SO_2 pollution. In Clayton County, mobile emissions are the biggest contributors to CO and NO_X pollution, VOC and HAP pollution are mostly caused by biogenic emissions, agriculture contributes most to PM_{10} and $PM_{2.5}$ pollution, and fires contribute most to SO_2 pollution. For all six counties, CO was emitted the most out of the seven pollutants.

3.6.1.4 GREENHOUSE GASES/CLIMATE CHANGE

Climate change is a global issue that results from several factors, including, but not limited to, the release of GHGs, land use management practices, and the albedo effect, or reflectivity of various surfaces (including reflectivity of clouds). Specific to the proposed project, GHGs are produced and emitted by various sources during the development and operational phases of transmission lines. The primary sources of GHGs associated with transmission lines and substations are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) from fuel combustion in construction and maintenance vehicles and equipment, as well as operational emissions of sulfur hexafluoride (SF_6) associated with potential leakage from gas-insulated circuit breakers at the substation.

An analysis of regional climate impacts prepared by the Third National Climate Assessment (Garfin et al. 2014) concludes that the rate of warming in the Midwest has markedly accelerated over the past few decades. The higher temperatures and continued human pollution increases the number of heat events and extreme rain events that cause flooding. The higher temperatures also extend the duration of the pollen season, which contributes to poor air quality. Analysis of past records and future projections indicates an overall increase in regional temperatures, including in the project area vicinity, and the observed increase has been happening more rapidly at night and during winter. The most recently available data on GHG emissions in the United States indicate that annual GHG emissions in 2016 were an estimated 6,511 million metric tons of GHG (USEPA 2018e).

3.6.2 *Environmental Consequences*

This section describes the potential impacts to air quality associated with the construction, operation and maintenance of the transmission line and improved substations. Impacts to air quality are discussed in terms of project emissions of criteria air pollutants, HAPs, and GHGs. Impacts to climate change are also discussed in a qualitative manner.

3.6.2.1 DATA SOURCES, METHODS, AND ANALYSIS ASSUMPTIONS

Impact indicators used to analyze impacts to air quality include:

- Emission estimates for regulated pollutants and GHGs.
- Comparison of project emission estimates to county emission inventories.
- Class I or II Prevention of Significant Deterioration increments or air quality-related values.
- General conformity de minimis levels.

Emissions calculations for the project were subdivided into construction-related emissions (those emissions that are expected to be temporary in nature) and operational-related emissions (those emissions that are expected to occur throughout the operational lifetime of the project). Construction-related emissions include:

- Exhaust from on- and off-road construction vehicles and equipment.
- Exhaust from on-road construction worker commuter vehicles.
- Exhaust from on-road construction material and equipment delivery vehicles.
- Fugitive dust from vehicle travel on paved and unpaved roads.
- Fugitive dust from earthmoving and general construction activities.

The following assumptions were used to complete the air quality impact analysis for the C-HC Project:

- Emissions associated with heavy-duty on-road construction equipment were estimated using SCAQMD emission factors for Heavy-Heavy-Duty-Vehicles (with vehicle weights ranging from 33,001 to 60,000 pounds) for 2018 (SCAQMD 2007a).

- Emissions from off-road construction equipment and vehicles were estimated using composite off-road emission factors for the 2018 vehicle fleet from the California Air Resource Board's Off-Road Model (SCAQMD 2007b). The type of equipment used for construction and the quantity of each type was based on similar projects. The appropriate emission factor, equipment type, quantity of equipment needed, and duration of use during construction of the project were used in determining emissions from construction equipment.

- Exhaust emissions from construction worker commute, some on-road construction equipment, and equipment delivery were calculated using South Coast Air Quality Management District's (SCAQMD) emission factors for On-Road Passenger Vehicles and Delivery Trucks for the 2018 vehicle fleet (SCAQMD 2007a).

- An estimated maximum number of 120 construction worker commuters are assumed to commute from Madison, Wisconsin—an average distance of 104 miles round trip per day.

- Heavy-hauling trucks would be used to deliver materials and equipment from McFarland, Wisconsin (approximately 43 miles away) or Wautoma, Wisconsin (approximately 84 miles away).
- Concrete trucks would be used for about 4 months during construction of the transmission line and substation construction and improvements, commuting approximately 86 miles per round trip.
- Fugitive dust emissions from vehicle travel on paved and unpaved roads were estimated using emission factor calculations from USEPA's Compilation of Air Pollutant Emission Factors Sections 3.2.1 and 3.2.2 (USEPA 2006, 2011).
- Fugitive dust emissions from earthmoving were estimated using the Western Regional Air Partnership's (2006) Fugitive Dust Handbook.

Impact intensity thresholds for the air quality impact analysis is provided in Table 3.6-3.

Table 3.6-3. Impact Thresholds and Descriptions for Air Quality

	Minor Impact	Moderate Impact	Major Impact
Air Quality	The impact on air quality associated with emissions from the construction, operation, and maintenance is measurable, but localized and small.	The impact on air quality would be measurable and primarily localized, but have the potential to result in regional impacts.	The impact on air quality would be measurable on a local and regional scale. Emissions from construction, operation, and maintenance are high.

3.6.2.2 NO ACTION

Under the No Action Alternative, the transmission line would not be developed. No surface disturbance would occur, and air resources would not be affected. Climate change would continue as defined by current trends.

3.6.2.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

Impacts to air quality would be common to all alternatives. As a worst-case scenario assessment, only the emissions from constructing the longest route (Alternative 5) have been calculated. The other alternatives would have a shorter route and would have less air emissions than the longest alternative (Alternative 5).

3.6.2.3.1 CONSTRUCTION

Construction activities would result in air pollutant emissions from equipment exhaust, including the use of helicopters during construction; vehicle exhaust from travel to and from the project site; and fugitive dust from soil disturbance. Table 3.6-4 presents the estimated total criteria, HAPs, and GHG emissions that would occur from the project.

Table 3.6-4. Estimated Total Project Construction Emissions in Tons

Construction Emission Source	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	VOC	HAPs	CO_2e
Construction equipment (off-road)	15.76	22.80	0.10	1.03	0.92	3.28	0.33	4,175
Worker and on-road construction equipment commuting	4.07	1.61	0.01	120.53	12.33	0.52	0.05	1,032
Equipment/material delivery	13.38	14.20	0.04	22.98	3.74	2.03	0.20	3,745
Fugitive dust from construction operations	-	-	-	481.52	48.15	-	-	-
Total	**33.21**	**38.61**	**0.15**	**626.06**	**65.15**	**5.83**	**0.58**	**8,952**

Construction Emission Source	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	VOC	HAPs	CO_2e
Clayton County, IA Emissions Inventory (EI) Total	9,746	1,766	28	4,931	1,121	6,090	1,092	-
Percent of Clayton County EI Total	0.34%	2.19%	0.52%	12.70%	5.81%	0.10%	0.05%	-
Dubuque County, IA EI Total	16,503	2,975	40	5,601	1,303	7,127	1,241	-
Percent of Dubuque County EI Total	0.20%	1.30%	0.37%	11.18%	5.00%	0.08%	0.05%	-
Dane County, WI EI Total	81,048	14,579	295	17,985	4,739	19,941	3,854	-
Percent of Dane County EI Total	0.04%	0.26%	0.05%	3.48%	1.37%	0.03%	0.02%	-
Grant County, WI EI Total	13,479	5,905	3,881	12,335	2,652	9,654	1,607	-
Percent of Grant County EI Total	0.25%	0.65%	<0.01%	5.08%	2.46%	0.06%	0.04%	-
Iowa County, WI EI Total	9,221	1,526	32	5,494	1,186	7,890	1,179	-
Percent of Iowa County EI Total	0.36%	2.53%	0.46%	11.40%	5.49%	0.07%	0.05%	-
Lafayette County, WI EI Total	7,232	1,329	26	7,897	1,646	4,625	1,002	-
Percent of Lafayette County EI Total	0.46%	2.90%	0.57%	7.93%	3.96%	0.13%	0.06%	-

Note: Carbon dioxide equivalent (CO_2e) is expressed in metric tons.

Construction emissions would span 2 years and be dispersed across the length of the power line, small amounts being emitted at each substation and each pole installation point. Table 3.6-4 presents the estimated total project construction emissions over the 2-year construction period. The top of the table presents construction activity emission sources by pollutant. The next segment of the table presents total emissions at the county level and emissions from the construction of the C-HC Project as a percentage of the county's total emissions. Overall the total pollutants emitted from the C-HC Project construction in each county would be much smaller than the county's total projected annual emissions. The overall projected emission estimate for each pollutant from the construction of the C-HC Project is small in comparison to the proportion each pollutant contributes to each county's annual emissions. Furthermore, this comparison would be even smaller when the project construction emission contribution is divided annually between the six counties. The C-HC Project's construction emissions would be temporary and transient in nature. Construction of the project would have short-term, minor impacts on air quality.

3.6.2.3.2 OPERATIONS

Operations-related emissions are summarized in Table 3.6-5 and include:

- Emissions from inspection activities such as exhaust from on-road inspection vehicles and fugitive dust from paved and unpaved roads.
- Emissions from maintenance activities including exhaust from worker vehicles and any needed equipment as well as fugitive dust from paved and unpaved roads.
- Emissions of SF_6 from operation of any new gas-insulated circuit breakers.

Table 3.6-5. Operational-Related Emissions in Tons per Year

Source	Emissions (tons)							Emissions (mt)
	CO	NO_X	SO_X[1]	PM_{10}	$PM_{2.5}$	VOC	HAPs	GHG[2]
Inspection and Maintenance Activities	0.23	0.48	0.01	0.61	0.08	0.04	0.00	47
SF_6 Emissions	-	-	-	-	-	-	-	455
Total	**0.23**	**0.48**	**0.01**	**0.61**	**0.08**	**0.04**	**<0.01**	**497**

Source	Emissions (tons)							Emissions (mt)
	CO	NO_X	SO_X[1]	PM_{10}	$PM_{2.5}$	VOC	HAPs	GHG[2]
Percent of Clayton County Emissions Inventory (EI) Total	< 0.01%	0.03%	0.04%	0.01%	0.01%	< 0.01%	< 0.01%	N/A[3]
Percent of Dubuque County EI Total	< 0.01%	0.02%	0.03%	0.01%	0.01%	< 0.01%	< 0.01%	-
Percent of Dane County EI Total	< 0.01%	< 0.01%	< 0.01%	< 0.01%	< 0.01%	< 0.01%	< 0.01%	-
Percent of Grant County EI Total	< 0.01%	0.01%	< 0.01%	< 0.01%	< 0.01%	< 0.01%	< 0.01%	-
Percent of Iowa County EI Total	< 0.01%	0.03%	0.04%	0.01%	0.01%	< 0.01%	< 0.01%	-
Percent of Lafayette County EI Total	< 0.01%	0.04%	0.05%	0.01%	0.01%	< 0.01%	< 0.01%	-

Notes:
[1] All oxides of sulfur (including SO_2). For purposes of comparison, SO_2 emissions reported in the county inventory are assumed to be equal to SO_X.
[2] GHG are based on the GWP of CO_2 (1) and CH_4 (25) and are reported in metric tons per year (mtpy).
[3] CO_2e emissions are not reported for all sources in the county inventory. Therefore, CO_2e emissions are not compared to the county inventory.
[4] 100,000 tons = 90,718.474 metric tons.

Table 3.6-5 shows operational-related emissions per year. The table is organized with emissions by operational activities at the top, followed by the total operational emissions, and then operational emissions as a percentage of county total emissions. Operation and maintenance emissions would include vehicle exhaust from travel to substations and the transmission line for routine inspection, as well as potential SF_6 emissions from operation of the additional gas-insulated circuit breakers at the new Hill Valley Substation and expanded substations. Emissions from vehicle travel during operation and maintenance would be minimal, and mileage for vehicle travel to the substations and along the transmission line for routine inspection would be much less than during construction. Emissions from vehicle exhaust during operation and maintenance are significantly lower than construction emissions from the use of construction equipment as shown in Table 3.6-4 above. Therefore, impacts to air quality resources from operations would be minor but long term and these emissions would be much lower than construction emissions and impacts.

GHG emissions from the construction, operation, and maintenance of the project (including potential SF_6 leaks from circuit breakers) would result in a minor (relative to local, national, and/or global GHG emissions) long-term increase in GHGs.

3.7 Noise

This section describes noise conditions that occur within the C-HC Project's analysis area. Noise is characterized by defining general noise terminology and sources, corona noise, and vibration. For noise, the analysis area is 300 feet in all directions of the transmission line and substation.

3.7.1 *Affected Environment*

Noise is generally defined as loud, unpleasant, unexpected, or undesired sound that is typically associated with human activity and that interferes with or disrupts normal activities. Although prolonged exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. The response of individuals to similar noise events is diverse and influenced by the type of noise; the perceived importance of the noise, and its appropriateness in the setting; the time of day and the type of activity during which the noise occurs; and the sensitivity of the individual.

Noise could also disrupt wildlife life-cycle activities of foraging, resting, migrating, and other patterns of behavior. While wildlife already existing in proximity to human development may already be habituated to noise from land use and human disturbance, changes to these baseline activities may still result in wildlife disruption. Additionally, sensitivity to noise varies from species to species, making it difficult to identify how a noise source would affect all flora and fauna in an area.

The following sections discuss local noise regulations, how noise levels and increases in noise levels are perceived by the general human population, corona noise generated by transmission lines, and causes and effects of vibration.

3.7.1.1 NOISE REGULATIONS

There are state and local noise regulations applicable to the project. These regulations are reviewed in Table 3.7-1.

Table 3.7-1. State and Local Noise Regulations

Location	Noise Regulation
State of Wisconsin	All registered motor vehicles operated on a highway must be equipped with an adequate muffler in constant operation.
State of Iowa	Every motor vehicle shall at all times be equipped with a muffler in good working order and in constant operation to prevent excessive or unusual noise.
Iowa County, WI	No individual shall be unreasonably loud at any time between 11.00 p.m. and 8.00 a.m. within the confines of Blackhawk Lake Recreation Area. “Unreasonably loud” means a level of noise that tends to cause or provoke a disturbance (Iowa County Ordinances 2001).
City of Dodgeville, WI	Except for City employees, between the hours of 10:00 P.M. and 6:00 A.M. no person shall do construction work or operate any chain saw, lawn mower or any other loud machinery of a similar nature (Dodgeville City Ordinances 2018).
City of Middleton, WI	No person shall operate any heavy construction or other heavy machinery, tools or equipment used for construction, including, but not limited to, pile drivers, bulldozers, pneumatic hammers, derricks, dump trucks, cement trucks, cement mixers, steam or electric hoists, or any other similar equipment other than between the hours of 7:00 a.m. and 6:00 p.m. Monday through Friday, except Federal and State holidays, unless such operation is not plainly audible at any time from within any occupied residential structure (Middleton City Code of Ordinances 2018).
Village of Mount Horeb, WI	No operation or activity shall transmit any noise exceeding 75 dBA from 7:00 a.m. to 11:00 p.m. and 70 dBA from 11:00 p.m. to 7:00 a.m. beyond the property line. The following noises are exempt from the regulations: (a)Noises not directly under the control of the property owner. (b)Noises from temporary construction or maintenance activities during daylight hours. (c)Noises from emergency, safety, or warning devices. The operation of any pile driver, steam shovel, pneumatic hammer, derrick, steam or electric hoist, other than between the hours of 6:30 a.m. and 8:00 p.m., Monday through Saturday, is prohibited; provided, however, the Building Inspector shall have the authority, upon determining that the loss or inconvenience which would result to any party in interest would be extraordinary and of such nature as to warrant special consideration, to grant a permit for hours other than those herein specified during which time such work and operation may take place (Mount Horeb Municipal Code 2013).

3.7.1.2 PERCEPTION OF NOISE LEVELS

The general human response to changes in noise levels that are similar in frequency content (such as comparing increases in continuous [Leq] traffic noise levels) are summarized as follows:

- A 3-decibel (dB) change in sound level is considered to be a barely noticeable difference.

- A 5-dB change in sound level typically is noticeable.
- A 10-dB increase is considered to be a doubling in loudness.

Community sound levels are generally presented in terms of A-weighted decibels (dBA). The A-weighting network measures sound in a similar fashion to how a person perceives or hears sound, thus achieving a strong correlation with how people perceive acceptable and unacceptable sound levels. Table 3.7-2 presents A-weighted sound levels and the general subjective responses associated with common sources of noise in the physical environment.

Table 3.7-2. Typical Sound Levels Measured in the Environment and Industry

Noise Source at a Given Distance	Sound Level in A-weighted Decibels (dBA)	Qualitative Description
Carrier deck jet operation	140	
Civil defense siren (100 feet)	130	Pain threshold
Jet takeoff (200 feet)	120	Deafening
Auto horn (3 feet) Pile driver (50 feet) Rock music concert environment	110	Maximum vocal effort
Jet takeoff (100 feet) Shout (0.5 foot) Ambulance siren (10 0 feet) Newspaper press (5 feet) Power lawn mower (3 feet)	100	
Heavy truck (50 feet) Power mower Motorcycle (25 feet) Propeller plane flyover (1,000 feet)	90	Very loud/annoying; Hearing damage (8-hour, continuous exposure)
Pneumatic drill (50 feet) Garbage disposal (3 feet) High urban environment	80	Very loud
Passenger car, 65 mph (25 feet) Living room stereo (15 feet) Vacuum cleaner (3 feet)	70	Loud/Intrusive (telephone use difficult)
Air conditioning unit (20 feet) Human voice (3 feet) Department store environment	60	
Light auto traffic (50 feet) Residential air conditioner (50 feet) Private business office environment	50	Moderate/Quiet
Living room/Bedroom Bird calls (distant)	40	
Library Soft whisper (5 feet) Quiet bedroom environment	30	Very quiet
Broadcasting/Recording studio	20	Faint
	10	Just audible
	0	Threshold of human audibility

Source: Adapted from Table E, "Assessing and Mitigating Noise Impacts" (New York Department of Environmental Conservation 2001) and *Handbook of Environmental Acoustics* (Cowan 1993).

The American National Standards Institute (ANSI) has published a standard (Acoustical Society of America S12.9-1993/Part 3) (ANSI 1993) with estimates of general ambient noise levels (Leq [energy average noise level] and Ldn [day-night average noise level]) based on detailed descriptions of land use categories. The ANSI document organizes land use based on six categories. Table 3.7-3 provides existing conditions for the analysis area and the associated estimated daytime and nighttime Leq ambient noise levels.

Table 3.7-3. Representative Existing Conditions for the Analysis Area Based on Land Use

Category	Land Use	Description	Estimated Existing Daytime Leq (dBA)	Estimated Existing Nighttime Leq(dBA)
1	Noisy Commercial and Industrial Areas	Very heavy traffic conditions, such as in busy downtown commercial areas, at intersections of mass transportation and other vehicles including trains, heavy motor trucks, and other heavy traffic, and street corners where motor buses and heavy trucks accelerate.	69	61
2	Moderate Noisy Commercial and Industrial Areas, and Noisy Residential Areas	Heavy traffic areas with conditions similar to Category 1 but with somewhat less traffic, routes of relatively heavy or fast automobile traffic but where heavy truck traffic is not extremely dense, and motor bus routes.	64	56
3	Quiet Commercial Areas, Industrial Areas, Normal Urban Areas, and Noisy Residential Areas	Light traffic conditions where there are no mass transportation vehicles and relatively few automobiles and trucks pass, and where these vehicles generally travel at low speeds. Residential areas and commercial streets and intersections with little traffic comprise this category.	58	52
4	Quiet Urban Areas and Normal Residential Areas	These areas are similar to Category 3 but, for this group, the background noise is either distant traffic or is unidentifiable.	53	47
5	Quiet Suburban Residential Areas	Isolated areas far from significant sources of sound.	48	42
6	Very Quiet, Sparse Suburban or Rural Areas	These areas are similar to Category 5 but are usually in unincorporated areas and, for this group, there are few if any near neighbors.	43	37

Source: ANSI (1993)

3.7.1.3 CORONA NOISE

Corona generates audible noise during operation of high-voltage transmission lines. Under certain conditions, the localized electric field near an energized conductor can be sufficiently concentrated to produce a tiny electric discharge that can ionize air close to the conductors. This partial discharge of electrical energy is called corona discharge, or corona. Several factors, including conductor voltage, shape and diameter, and surface irregularities such as scratches, nicks, dust, or water drops, can affect a conductor's electrical surface gradient and its corona performance. Corona is the physical manifestation of energy loss and can transform discharge energy into very small amounts of sound, radio noise, heat, and chemical reactions of the air components.

Transmission lines can generate a small amount of sound energy during corona activity. This audible noise from the line can barely be heard in fair weather conditions on higher voltage lines. During wet weather conditions (such as rain or fog), water drops collect on the conductor and increase corona activity so that a crackling or humming sound may be heard near the line. This noise is caused by small electrical discharges from the water drops. However, during heavy rain, the ambient noise generated by the falling raindrops will typically be greater than the noise generated by corona.

3.7.1.4 VIBRATION

Ground-borne vibration may be induced by traffic and construction activities, such as pile driving and earthmoving. The effects of ground-borne vibration may include perceptible movement of building floors, interference with vibration-sensitive instruments, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds. The rumbling sounds heard is the noise radiated from the motion of the room surfaces. Annoyance from vibration often occurs when the vibration exceeds the threshold of perception by only a small margin. A vibration level that causes annoyance would be well below the damage threshold for normal buildings. Ground-borne vibration is almost never annoying to people who are outdoors; without the effects associated with the shaking of a building, the rumble noise of vibrations is not perceptible. Unlike noise, human response to vibration is not dependent on existing vibration levels. Humans respond to a new source of vibration based on the frequency of such events.

3.7.2 *Environmental Consequences*

This section describes the potential noise impacts from the C-HC Project associated with the construction, operation and maintenance of the transmission line and improved substations. Noise impacts are discussed in terms of sensitive noise receptors within the analysis area for the C-HC Project alternatives, project noise generation, and vibration impacts.

3.7.2.1 Data Sources, Methods, and Analysis Assumptions

Impact indicators used to analyze noise impacts from the C-HC Project include:

- Changes in ambient noise levels (measured in decibels) at sensitive noise receptor sites, including nearby residences, state parks and the refuge.

Existing land use in the project analysis area was estimated based on aerial photography. The project is adjacent to or runs through quiet, sparsely populated suburban or rural areas. Therefore, estimated existing daytime Leq is considered to be 43 dBA and estimated existing nighttime Leq is considered to be 37 dBA.

The construction noise level was estimated using the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM). The RCNM is FHWA’s national model for the prediction of construction noise. This software is based on actual sound level measurements from various equipment types taken during the Central Artery/Tunnel project conducted in Boston, Massachusetts, during the early 1990s. The maximum noise levels presented at a specified distance from the source are based on a roster of likely construction equipment operating. Although the project is not a road construction project, the RCNM includes the same types of equipment that would be used in the construction of the project.

Worker commutes and material delivery vehicles would cause noise that would be short term and have little effect on the hourly average noise level. Therefore, this traffic was not included in the construction noise analysis.

3.7.2.1.1 DEFINITION OF NOISE SENSITIVE RECEPTORS

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. 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. Sensitive receptors within 300 feet of the transmission line route and Hill Valley Substation were analyzed for potential impacts as a result of project construction and operation.

The project goes through the Blackhawk Lake Recreation Area, Black Earth Creek Wildlife Area Sunnyside Unit, and Thompson Memorial Prairie State Natural Area, which are all noise sensitive areas. Trails would also be considered noise-sensitive areas and there are several trails within the noise analysis area. There are also noise-sensitive receptors, including residences, daycares, and schools, within the noise analysis area. The majority of the analysis area consists of open space.

Impact intensity thresholds for the noise impact analysis are provided in Table 3.7-4.

Table 3.7-4. Impact Thresholds and Descriptions for Noise

	Minor Impact	Moderate Impact	Major Impact
Noise	Noise impacts could attract attention but would not dominate the soundscape or detract from current user activities.	Noise impacts would attract attention and contribute to the soundscape but would not dominate. User activities would remain unaffected.	Impacts on the characteristic soundscape would be considered significant when those impacts dominate the soundscape and detract from current user activities.

3.7.2.2 NO ACTION

Under the No Action Alternative, the transmission line would not be developed. No new noise sources would occur, and current noise levels would not be affected.

3.7.2.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

Noise impacts common to all alternatives include noise from the proposed Hill Valley Substation, construction and operation noise from the transmission line ROW, and vibration impacts.

3.7.2.3.1 SUBSTATION CONSTRUCTION AND IMPROVEMENTS

Estimates of noise from the construction of the Hill Valley Substation are based on a roster of the maximum amount of construction equipment used at the station on a given day analyzed from the center of the substation construction area to the nearest residence (for ease of calculation, all equipment is assumed to be operating at this single point). The RCNM 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 construction equipment used in the analysis is given in Table 3.7-5.

Table 3.7-5. Hill Valley Substation Construction Equipment Roster Used for Noise Analysis

Equipment Type	Quantity	Typical Maximum Noise Levels (dBA at 50 feet)
Bulldozer	1	82
Hole digger	1	84
Crane	1	81
Bucket truck	1	75
Forklift	1	79
2-ton truck	1	77

Equipment Type	Quantity	Typical Maximum Noise Levels (dBA at 50 feet)
Pickup truck	1	75
Flatbed truck	1	74
Bobcat	1	81

The nearest sensitive receptor to Hill Valley Substation Option #1 is a residence 3,846 feet north of the center of the substation. The nearest sensitive receptor to Hill Valley Substation Option #2 is a residence 2,885 feet north of the center of the substation. The estimated construction noise level at the nearest sensitive receptor for each substation location option is given in Table 3.7-6, below.

Table 3.7-6. Calculated Noise Levels at Nearest Sensitive Receptor due to Hill Valley Substation Construction

	Calculated L_{max} (dBA)	Calculated L_{eq} Total (dBA)	Noise Level, Ambient + Construction (dBA)
			L_{day}
Ambient Baseline Noise Level*	--	--	43.0
Noise Level at Nearest Sensitive Receptor to Location Option 1 (3,846 feet from Substation)	46.6	46.4	48.0
Noise Level at Nearest Sensitive Receptor to Location Option 2 (2,885 feet from Substation)	49.1	48.9	49.9

* Baseline noise level obtained based on estimated local land use.

The noise level at the nearest sensitive receptor to location option 1 would increase by approximately 5 dBA, which is a noticeable change from the ambient noise level but approximately equivalent to hearing light traffic or a residential air conditioning unit. The noise level at the nearest sensitive receptor to location option 2 would increase by approximately 7 dBA, which is louder than the increase in option 1 but still would be comparable to hearing light traffic or a residential air conditioning unit.

Impacts due to the noise generated by the construction of the Hill Valley Substation would be minor and short term. There are no noise sensitive receptors within the ROW or outside the ROW within the analysis area for the Hill Valley Substation.

For the improvements at the other seven substations, there would be fewer construction activities and less equipment associated with improvements than with the construction activity and equipment required to build the proposed Hill Valley Substation. The closest sensitive noise receptors at the other seven substations are listed in Table 3.7-7. Eden and Stoneman Substations are the closest to sensitive noise receptors, which are located approximately 780 and 737 feet away. The farthest sensitive receptor is over 14,000 feet from Hickory Creek Substation.

Table 3.7-7. Closest Sensitive Noise Receptor to Each Substation

Substation	Construction Duration	Receptor Type	Distance (feet)
Cardinal Substation	3 months	Residential - Home	2,562
Eden Substation	3 weeks	Residential - Home	780
Wyoming Valley Substation	Less than 1 week	Residential - Home	1,000
Nelson Dewey Substation	3 months	Residential - Home	3,465

Substation	Construction Duration	Receptor Type	Distance (feet)
Stoneman Substation	2 months	Residential - Home	737
Turkey River Substation	6 months	Residential - Home	4,464
Hickory Creek Substation	3 months	Residential - Home	14,687

Table 3.7-8 shows the estimated construction noise levels at the closest sensitive noise receptor for the substation improvements. Impacts from substation construction would be limited to the construction period and would be localized to the proposed substation/switchyard areas.

Table 3.7-8. Estimated Construction Noise Levels at the Nearest Sensitive Noise Receptor for Each Improved Substation

	Calculated L_{max} (dBA)	Calculated L_{eq} Total (dBA)	Noise Level, Ambient + Construction (dBA)
			L_{day}
Ambient Baseline Noise Level*	–	–	43.0
Cardinal Substation	50.2	49.9	50.7
Eden Substation	60.5	60.3	60.3
Wyoming Valley Substation	58.3	58.1	58.2
Nelson Dewey Substation	47.5	47.3	48.7
Stoneman Substation	61.0	60.8	60.8
Turkey River Substation	45.3	45.1	47.2
Hickory Creek Substation	35.0	34.8	43.6

* Baseline noise level obtained based on estimated local land use.

Table 3.7-9 shows the comparable noise level environments relative to the change in ambient noise level at the nearest sensitive receptor due to substation construction. The change in ambient noise levels at the nearest receptors ranges from 0.6 dBA at Hickory Creek Substation to 17.8 at Stoneman Substation. A change of 3 dB is considered to be a barely noticeable difference, so the change in ambient noise at Hickory Creek would be negligible. A change of 5 dB is typically noticeable and a 10-dB increase is considered to be a doubling in loudness. An approximate 5-dB increase is expected to occur from the substation construction at Hill Valley Substation – Location Option 1, Nelson Dewey Substation, and Turkey River Substation. Eden, Wyoming Valley, and Stoneman Substations all have changes over 10 dB, which is equivalent to air conditioning units at 20 feet, a human voice at 3 feet, or a department store environment.

Table 3.7-9. Change in Ambient Noise Level at Nearest Receptor due to Substation Construction and Improvements with Comparable Noise Level Environments

Substation	Change in Ambient Noise Level at Nearest Receptor due to Substation Construction (dBA)	Equivalent Measured Noise Level Environment
Hill Valley Substation – Location Option 1	5.0	Light auto traffic (50 feet) Residential air conditioner (50 feet) Private business office environment
Hill Valley Substation – Location Option 2	7.0	Light auto traffic (50 feet) Residential air conditioner (50 feet) Private business office environment

Substation	Change in Ambient Noise Level at Nearest Receptor due to Substation Construction (dBA)	Equivalent Measured Noise Level Environment
Cardinal Substation	7.7	Light auto traffic (50 feet) Residential air conditioner (50 feet) Private business office environment
Eden Substation	17.3	Air conditioning unit (20 feet) Human voice (3 feet) Department store environment
Wyoming Valley Substation	15.2	Air conditioning unit (20 feet) Human voice (3 feet) Department store environment
Nelson Dewey Substation	5.7	Light auto traffic (50 feet) Residential air conditioner (50 feet) Private business office environment
Stoneman Substation	17.8	Air conditioning unit (20 feet) Human voice (3 feet) Department store environment
Turkey River Substation	4.2	Light auto traffic (50 feet)Residential air conditioner (50 feet) Private business office environment
Hickory Creek Substation	0.6	Living room/Bedroom Bird calls (distant)

Sources: Cowan (1993); New York Department of Environmental Conservation (2001)

3.7.2.3.2 TRANSMISSION LINE CONSTRUCTION

Estimates of noise from the construction of the transmission line route are based on a roster of maximum amount of construction equipment used at one time in one place to construct the transmission line. Table 3.7-10 shows the construction equipment that has been analyzed (for ease of calculation, all equipment is assumed to be operating at this single point). The RCNM 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.

Table 3.7-10. Transmission Line Construction Equipment Roster Used for Noise Analysis

Equipment Type	Quantity	Typical Maximum Noise Levels (dBA at 50 feet)
Backhoe	2	78
Concrete truck	3	79
Tractor trailer	1	84
Pickup truck	3	75
Crane	1	81
Utility truck	1	75
Water truck	2	75
Bucket truck	3	75
Line truck	3	75
2-ton truck	3	77

The RCNM assumes that the L_{max} is the maximum sound level for the loudest piece of equipment. L_{max} at a distance of 50 feet from the point source will be 84.1 dBA, and at 1,312 feet, it will attenuate to 55.6 dBA. The approximate noise generated by the construction equipment used at the transmission line has been conservatively calculated based on the maximum amount of construction equipment that would be used in constructing or reconductoring the transmission line at one time, and not taking into account further attenuation due to atmospheric interference, intervening structures, or implementation of any environmental commitments. The results of the RCNM construction noise calculations are given in Table 3.7-11.

Table 3.7-11. Calculated Noise Levels Due to Transmission Line Construction

	Calculated L_{max} (dBA)	Calculated L_{eq} Total (dBA)	Noise Level, Ambient + Construction (dBA)
			L_{day}
Ambient Baseline Noise Level*	--	--	43.0
Noise Level Attenuated to Nearest Sensitive Receptor (50 feet)	84.1	86.5	86.5
Attenuated to 300 feet	68.6	71.0	71.0

* Baseline noise level obtained based on estimated local land use.

During construction, 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 at the edge of the analysis area would be comparable to listening to a vacuum cleaner or living room stereo. The noise level would be loud and intrusive.

Noise due to construction of the transmission line would be temporary. Total construction duration for the transmission line would occur over a 2-year period. During this time, construction activities would occur along discrete portions of the transmission line; therefore, noise impacts would occur over a shorter time frame at any given location. For those sensitive receptors closest to the ROW, adverse noise impacts from construction of the C-HC Project would be major and short term (lasting less than the total construction duration).

As noted in the Project Description, helicopters may be used to install poles and replace transmission towers when the use of cranes is not feasible. A large single-rotor helicopter such as the Bell 214 produces a maximum sound level of about 79 dBA at a distance of 500 feet under level flight conditions (Nelson 1987). This is comparable to hearing a pneumatic drill operating 50 feet away. At 100 feet, the sound level would be about 93 dBA, similar to hearing a power mower or a heavy truck from 50 feet away. A small single-rotor helicopter such as the Hughes 500 produces a maximum sound level of 75 dBA at a distance of 500 feet under level flight conditions (Nelson 1987). This corresponds to a sound level of about 89 dBA at 100 feet. The sound levels of both helicopters would be perceived similarly. Helicopters could produce noise in the range of 89 to 93 dBA in the vicinity of residences as close as 100 feet to helicopter staging areas. Noise from helicopters operating above pole installation locations could be as close as about 250 feet to residences. At this distance, helicopter noise levels could be in the range of about 83 to 87 dBA, comparable to hearing other construction-related noise. However, helicopter use would be temporary and only occur during the established daily hours of construction, thus the impact would be minor and short term.

Construction of the transmission line, substation, and substation improvements would comply with all applicable local noise ordinances. Construction impacts due to construction of the transmission line, substation, and substation improvements would be temporary. Impacts due to construction of the transmission line would vary as the distance to a sensitive receptor would change as construction progressed. The number of sensitive receptors within proximity of the C-HC Project are presented below, by alternative.

3.7.2.3.3 OPERATION AND MAINTENANE

Noise impacts during operation and maintenance of the proposed project are expected to be negligible. Maintenance activities for the transmission line would include driving the length of the transmission line, inspecting the transmission line aerially via helicopter, and making any necessary repairs which may involve construction equipment. The noise impacts due to maintenance activities would be temporary and would have less of an impact than construction of the transmission line. The operation of the proposed transmission line would result primarily in corona generated noise, occurring in the atmosphere near the conductor. Changes to local atmospheric pressure may result in a hissing or cracking sound that may be heard directly under the transmission line or within a few feet of the ROW depending on weather, altitude, and system voltage, with the level of corona noise receding with distance. Maximum noise levels associated with corona noise typically do not exceed 50 dBA as heard from the edge of the ROW, during extreme weather events, and noise levels typically do not exceed 25 dBA during fair weather events—less than the ambient sound levels of a library (USEPA 1974).

Hill Valley Substation would create noise due to the 345/138-kV autotransformer and associated cooling fans. Transformers are the loudest piece of operational equipment in a substation. Transformer noise is principally a result of core vibration and is a function of the surface area, whether the transformer is air-filled or oil-filled, and the power rating. In addition to core vibration noise, transformer cooling fans and oil pumps at larger transformer stations generate broadband noise, but are limited to periods when additional cooling is required. The fan noise is relatively low and is generally considered secondary to the core vibration noise source. Equipment noise levels may be obtained from manufacturers, equipment tendering documents, or test results. Transformer noise propagates and attenuates at different rates depending on size, voltage rating, and design, but typically generates a noise level ranging from 60 to 80 dBA. Conservatively, operational noise from the transformer at the Hill Valley Substation would be no louder than the loudest construction equipment, the tractor trailer with a dBA of 84 as shown in Table 3.7-10. Therefore, when operational noise from the transformer is attenuated to the nearest sensitive receptor, it would be less than or equal to 53 dBA which is twice as loud as the ambient noise level. This is comparable to hearing light traffic or a residential air conditioning unit, as shown in Table 3.7-6. Impacts due to the noise generated by the operation of the Hill Valley Substation would be minor and long term.

3.7.2.3.4 VIBRATION

Construction activities (e.g., ground-disturbing activities, including grading and movement of heavy construction equipment) may generate localized groundborne vibration and noise. Generally, construction-related groundborne vibration is not expected to extend beyond 25 feet from the generating source, and no sensitive receptors are within 25 feet of areas of construction. As a result, no vibration-related impacts to sensitive receptors, such as local residents, would occur due to construction. There would be no source of groundborne vibration due to operation of the substation or transmission line. Thus, there is no vibration-related impact to sensitive receptors due to operation.

3.7.2.4 ALTERNATIVE 1

Table 3.7-12 presents the number of sensitive receptors within the C-HC Project ROW and also presents the number of sensitive receptors outside the ROW, but within the analysis area for Alternative 1. There are two residential noise sensitive receptors within the ROW and 19 residential sensitive receptors within the 300-foot analysis area.

Table 3.7-12. Noise Sensitive Receptors within Close Proximity of Alternative 1

	Noise Sensitive Receptors Within ROW		Noise Sensitive Receptors Outside ROW, within Analysis Area	
	Quantity	Type	Quantity	Type
Alternative 1	2	Residences	19	Residences

Noise impacts to the sensitive receptors in close proximity to Alternative 1 are described in detail under Impacts Common to All Alternatives.

3.7.2.5 ALTERNATIVE 2

Table 3.7-13 presents the number of sensitive receptors within the C-HC Project ROW and also presents the number of sensitive receptors outside the ROW, but within the analysis area for Alternative 2. There are three sensitive receptors within the ROW: two residences and one school. Within the 300-foot analysis area, noise sensitive receptors include 26 residences, one daycare, and one school.

Table 3.7-13. Noise Sensitive Receptors within Close Proximity of Alternative 2

	Noise Sensitive Receptors Within ROW		Noise Sensitive Receptors Outside ROW, Within Analysis Area	
	Quantity	Type	Quantity	Type
Alternative 2	2	Residences	26	Residences
	-	-	1	Daycare
	1	School	1	School

Noise impacts to the sensitive receptors in close proximity to Alternative 2 are described in detail under Impacts Common to All Alternatives.

3.7.2.6 ALTERNATIVE 3

Table 3.7-14 presents the number of sensitive receptors within the C-HC Project ROW and also presents the number of sensitive receptors outside the ROW, but within the analysis area for Alternative 3. There are four sensitive receptors within the ROW: three residences and one school. Within the 300-foot analysis area, noise sensitive receptors include 34 residences, one daycare, and one school.

Table 3.7-14. Noise Sensitive Receptors within Close Proximity of Alternative 3

	Noise Sensitive Receptors Within ROW		Noise Sensitive Receptors Outside ROW, Within Analysis Area	
	Quantity	Type	Quantity	Type
Alternative 3	3	Residences	34	Residences
	-	-	1	Daycare
	1	School	1	School

Noise impacts to the sensitive receptors in close proximity to Alternative 3 are described in detail under Impacts Common to All Alternatives.

3.7.2.7 ALTERNATIVE 4

Table 3.7-15 presents the number of sensitive receptors within the C-HC Project ROW and also presents the number of sensitive receptors outside the ROW, but within the analysis area for Alternative 4. There are 10 sensitive receptors within the ROW: nine residences and one school. Within the 300-foot analysis area, noise sensitive receptors include 52 residences, one daycare, and one school.

Table 3.7-15. Noise Sensitive Receptors Within Close Proximity of Alternative 4

	Noise Sensitive Receptors Within ROW		Noise Sensitive Receptors Outside ROW, Within Analysis Area	
	Quantity	Type	Quantity	Type
Alternative 4	9	Residences	52	Residences
	-	-	1	Daycare
	1	School	1	School

Noise impacts to the sensitive receptors in close proximity to Alternative 4 are described in detail under Impacts Common to All Alternatives.

3.7.2.8 ALTERNATIVE 5

Table 3.7-16 presents the number of sensitive receptors within the C-HC Project ROW and also presents the number of sensitive receptors outside the ROW, but within the analysis area for Alternative 1. There are two residential sensitive receptors within ROW and 53 residential sensitive receptors within the 300-foot analysis area.

Table 3.7-16. Noise Sensitive Receptors Within Close Proximity of Alternative 5

	Noise Sensitive Receptors Within ROW		Noise Sensitive Receptors Outside ROW, Within Analysis Area	
	Quantity	Type	Quantity	Type
Alternative 5	2	Residences	53	Residences

Noise impacts to the sensitive receptors in close proximity to Alternative 5 are described in detail under Impacts Common to All Alternatives.

3.7.2.9 ALTERNATIVE 6

Table 3.7-17 presents the number of sensitive receptors within the C-HC Project ROW and also presents the number of sensitive receptors outside the ROW, but within the analysis area for Alternative 1. There are eight residential sensitive receptors within the ROW and 39 residential sensitive receptors within the 300-foot analysis area.

Table 3.7-17. Noise Sensitive Receptors within Close Proximity of Alternative 6

	Noise Sensitive Receptors Within ROW		Noise Sensitive Receptors Outside ROW, Within Analysis Area	
	Quantity	**Type**	**Quantity**	**Type**
Alternative 6	8	Residences	39	Residences

Noise impacts to the sensitive receptors in close proximity to Alternative 6 are described in detail under Impacts Common to All Alternatives.

3.7.3 *Summary of Impacts*

Noise impacts would occur under all action alternatives. Noise impacts from the construction and improvements at the substations would be minor and short term. There are no noise sensitive receptors within the ROW or outside the ROW for the proposed Hill Valley Substation. Impacts associated with substation improvements at seven other substations would be limited to the construction period and localized to the proposed substation areas. The closest sensitive receptor to these substations is approximately 700 feet away. The largest increase in noise levels associated with these substation improvements is equivalent to an air conditioning unit at 20 feet, human voice at 3 feet, or a department store environment.

Construction-related noise would be adverse, minor, and temporary, effecting those sensitive noise receptors closest to the proposed ROW. For noise sensitive receptors closest to the ROW, construction noise would be loud and comparable to a pneumatic drill or heavy truck from 50 feet away, whereas for noise sensitive receptors at the edge of the analysis area, construction noise would equate to a vacuum cleaner or living room stereo. Alternative 1 would adversely impact the fewest sensitive noise receptors, and Alternative 4 would impact the greatest number of sensitive noise receptors (Table 3.7-18).

Table 3.7-18. Impact Summary Table

	Noise Sensitive Receptors within ROW			Noise Sensitive Receptors Outside ROW, within Analysis Area			Total
	Residences	**Daycares**	**Schools**	**Residences**	**Daycares**	**Schools**	
Alternative 1	2	-	-	19	-	-	**21**
Alternative 2	2	-	1	26	1	1	**31**
Alternative 3	3	-	1	34	1	1	**40**
Alternative 4	9	-	1	52	1	1	**64**
Alternative 5	2	-	-	53	-	-	**55**
Alternative 6	8	-	-	39	-	-	**47**

Noise impacts during operation and maintenance of the transmission line are expected to be negligible and comparable to the ambient sound level of a library. No vibration-related impacts to sensitive receptors, such as local residents, would occur due to construction.

3.8 Transportation

The transportation section describes the existing roadway, railway, river crossings, and airports located within the transportation analysis area and the related potential impacts to them based on the alternatives proposed. Transportation resources were identified based on a review of aerial photographs, mapping, and available public data.

3.8.1 *Affected Environment*

The analysis area for transportation includes a 5-mile area surrounding the proposed action alternatives presented in Chapter 2. The western end point of the proposed project is in Dubuque County, Iowa, with the eastern end point in the town of Middleton, Wisconsin, in Dane County.

Transportation resources in the analysis area include roadways, railway, river crossings, and airports. This section identifies the transportation resources that could be affected by construction, operations, maintenance, and decommissioning of the project.

3.8.1.1 ROADWAYS

The transportation analysis area is served by a network of Federal, state, county, and local roadways. Roads throughout the transportation analysis area are managed by the U.S. Department of Transportation [USDOT], Federal Highway Administration, Iowa Department of Transportation [Iowa DOT], Wisconsin Department of Transportation [WisDOT], and local agencies. A greater number of state and county roads are concentrated in town centers, while many areas that are more rural are served by a single state and county road. Local roads provide access from Federal, state, and county roads to homes, farms, and businesses. Some local roads are unpaved. Major roadways, defined as state and U.S. highways within 5 miles of the project alternatives, are shown in Table 3.8-1 (U.S. Census Bureau 2017a).

The construction of a transmission line along highway corridors in Iowa and Wisconsin requires close coordination with WisDOT and Iowa DOT to account for future planned roadway expansion or modifications. The total number of roadway segments within the transportation analysis area, including Federal, state, and local roads is approximately 2,700, with the majority of roads categorized as local roads. Average daily traffic (ADT) volumes on segments of major roadways vary throughout the transportation analysis area from 1,020 in the rural areas of the area to over 10,200 in the more urban areas (see Table 3.8-1) (Iowa DOT 2016; WisDOT 2014). These roadways may be used during the construction phases of the project by construction workers and material delivery trucks to reach assembly points, yards, and work sites along the project alternatives. However, after the construction phase is complete, very little traffic is generated by the project while in operation.

For all roadways, permitting from the above agencies will need to be coordinated for construction, location, installation, maintenance, or use of pole lines, wires, guys, anchors, or other related fixtures within designated ROWs.

Table 3.8-1. Major Roadways and Average Daily Traffic Volume

Roadway	Description	Average Daily Traffic Volume
U.S. Route 12	Runs east-west across the western to southeast portions of WI. Primarily a 4-lane freeway.	10,133
U.S. Route 14	Runs northwest-southeast across the western to southwest portions of WI. Primarily 2-lane surface road, a few multilane urban arterials and freeway sections near Madison.	Iowa Co – 10,262; Dane Co – 10,133

Roadway	Description	Average Daily Traffic Volume
U.S. Route 18/ U.S. Route 18W	Runs east-west across the southern portion of WI and crosses the Mississippi River at Marquette, IA, and Prairie du Chien, WI. Primarily 2-lane surface road, with several multilane sections within communities.	Grant Co – 2,620; Iowa Co – 10,262; Dane Co – 10,133
U.S. Route 52	Runs north-south across state. Generally 4-lane surface road.	Clayton Co – 2,833; Dubuque Co – 3,571
U.S. Route 61	Generally follows the Mississippi River and designated the Great River Road for much of the roadway. Primarily multilane facility.	2,620
U.S. Route 151 /151B / EUS151B / WUS151B	Follows northeasterly path through WI and IA. Limited access highway for much of the route.	2,620
WI SH23	WI SH23 is a north-south route in WI, generally with either a 2-lane surface road or urban multilane arterial, and some freeway segments near larger communities.	2,127
WI SH78	WI SH78 is a north-south trunk route in WI. Primarily a 2-lane surface road.	8,531
WI SH80	WI SH80 is a north-south WI state trunk highway in southwest and west central WI. Primarily a 2-lane surface road.	Grant Co – 2,953; Iowa Co – 2,127
WI SH81	WI SH81 runs east-west in southwest and south-central WI. Primarily a 2-lane surface road.	2,953
WI SH126	WI SH126 is a short north-south highway in Western Lafayette County. It runs from Belmont to WI SH81.	3,239
WI SH129	WI SH129 is a short WI state highway trunk line constructed as a bypass route near Lancaster.	2,953
WI SH133 / SH133B	WI SH133 is a north-south WI route, which operates in a U-shape running east-west on the top and bottom of the route. Primarily a 2-lane surface road.	2,953
WI SH191 / STRD129	State Trunk Highway 191 runs east–west in south-central Wisconsin from Dodgeville to Hollandale.	2,127–2,953
IA SH3	Runs east to west across the state of Iowa and is the longest state highway in Iowa, at 327.81 miles long.	1,020
IA SH136	IA SH136 runs for 98 miles in eastern Iowa.	2,828

In addition to roadway infrastructure, bridges for highways, railway, bicycle and pedestrian use, and highway overpasses and interchanges are present within the analysis area. The following bridge and overpass structures are in the analysis area (National Bridge Inventory 2018):

- Highway bridges in the defined area range from 38 to 90 structures, depending upon the final routing.
- Railroad bridges in the defined area range from 63 to 85 structures, depending upon the final routing.
- Bicycle and pedestrian bridges in the defined area range from 79 to 90 structures, depending upon the final routing.
- Highway pedestrian bridges in the defined area range from 3 to 7 structures, depending upon the final routing.
- Overpass structures in the defined area range from 136 to 154 structures, depending upon the final routing.

During the construction and operation phases of the project, coordination would be required with the USDOT, FHWA, Iowa DOT, WisDOT, and local agencies to ensure the weight loads and width of the existing facilities are considered in the project planning and delivery of materials and equipment.

3.8.1.2 RAILWAYS

Three mainline railroads are owned and/or operating in the analysis area.

Wisconsin and Southern Railroad (WSOR) is a Class II regional railroad in southern Wisconsin and northeastern Illinois operated by Watco Companies. WSOR has an estimated 19 to 33 miles of track within the analysis area, depending on the action alternative (USDOT 2017).

Burlington Northern-Santa Fe (BNSF) is the largest freight railroad network in North America. BNSF is one of seven North American Class I railroads. BNSF has an estimated 12 to 37 miles of track within the analysis area, depending on the action alternative (USDOT 2017).

Canadian Pacific Railway (CPRS) is a historic Canadian Class I railroad. CPRS has an estimated 11 to 22 miles of track within the analysis area, depending on the action alternative (USDOT 2017).

Daily train volumes for the mainline railroads in the analysis area is presented in Table 3.8-2.

Table 3.8-2. Daily Train Volumes for Mainline Railroads, shown in Trains per Day

	Dane County, WI	Grant County, WI	Iowa County, WI	Lafayette County, WI	Dubuque County, IA
WSOR	4	2	2	N/A	N/A
BNSF	N/A	48	N/A	N/A	N/A
CPRS	3	N/A	20	N/A	8

The active mainline railroads within the analysis area used for freight, and no passenger rail service operates in the defined analysis area. Coordination between the Federal Railroad Administration and with the three rail companies would be required for permitting in areas where the project would encroach on mainline railroad ROW.

3.8.1.3 RIVER CROSSINGS

All Project alternatives include a span of the transmission line crossing the Mississippi River (see Figure 3.1-1) and the Refuge. Coordination efforts for special permitting in these areas would include several agencies—the U.S. Coast Guard, the Utilities, the USFWS, and the USACE.

A car ferry operates out of Cassville, Wisconsin, and connects the Village of Cassville, Wisconsin, on the east side of the Mississippi River, with Iowa, the Refuge, and Oak Road on the west side of the Mississippi River. The ferry served early settlement in the region as early as 1833, and it continues today, making roughly the same trip back and forth across the Mississippi River. It is the oldest operating ferry service in the state of Wisconsin (Village of Cassville 2016). The Cassville Car Ferry operates seasonally with daily service between Memorial Day and Labor Day and limited weekend service in May, September, and October (Village of Cassville 2016).

The Cassville car ferry landing is also used as a river access point, named the Turkey River landing and is located next to the IDNR maintained boat launch area and at the termination of the county-maintained roadway. Other nearby river access points include Cassville Public Access launch and the Wisconsin Power and Light launch on the Wisconsin side of the Mississippi River. The public park in Cassville also serves as a Refuge overlook. Commercial navigation passes through the Refuge.

3.8.1.4 AIRPORTS

Airports, heliports, and landing strips are used for transportation of passengers, cargo and agricultural activities in Wisconsin and Iowa. There are 12 airports and two heliports within the analysis area (USDOT 2017). Table 3.8-3 provides a short description of each facility.

Coordination for permitting with the appropriate local officials, Wisconsin Bureau of Aeronautics, Federal Aviation Administration (FAA), Iowa Department of Aviation, and local airport operators would be required. Specifically related to coordination of agencies, the FAA objective is to ensure safe and efficient use of the navigable airspace for public use, military airports, and heliports (facilities). Once the final project route is selected, notice would be provided to the FAA for review and compatibility with FAA's criteria for structure heights, markings, and/or lighting one or more transmission structures or wire spans.

Table 3.8-3. Airport Information

Airport Name	Type	Community	Description
Cassville Municipal – C74	Airport/Public	Cassville	One runway (11/29) with an asphalt surface that is 3,000 feet in length and runs in a northwest/southeast alignment.
Lancaster Municipal – 73C	Airport/Public	Lancaster	One runway (18/36) with an asphalt surface that is 3,300 feet in length and runs in a north/south alignment.
Platteville Municipal – PVB	Airport/Public	Platteville	Two runways at an elevation of 1,022 feet. One runway has an asphalt surface that is 3,599 feet in length and runs in a southwest/northeast alignment. The second runway has an asphalt surface that is 3,999 feet in length and runs in a northwest/southeast alignment.
Iowa County – MRJ	Airport/Public	Mineral Point	Two runways at Iowa County. The first runway is at an elevation of 1,171 feet, with an asphalt surface that is 3,600 feet in length and runs in a southwest/northeast alignment. The second runway is at an elevation of 1,164 feet, with an asphalt surface that is 5,001 feet in length and runs in a northwest/southeast alignment.
Southwind – 22WN	Airport/Private	Dodgeville	One runway with a turf surface of 1,800 feet in length and runs in a northwest/southeast alignment.
Forseth Field – WI61	Airport/Private	Arena	One runway (10/28) with a turf surface that is 2,500 feet in length and runs in an east/west alignment.
Hallick Farm – WI66	Airport-Heliport/Private	Black Earth	One helipad and one runway at Hallick Farm. The runway is at an elevation of 1,097 feet, with a turf surface 1,550 feet in length, running in a northwest/southeast alignment. Helipad has a concrete surface that is 40 × 40 feet in size.
Memorial Hospital – WI44 / Upland Hills Health	Heliport/Private	Dodgeville	Helipad has an asphalt surface at an elevation of 1,213 and is 39 × 39 feet in size.
Atkins Ridge – WI43	Airport/Private	Daleyville	One runway with a turf surface that is 2,400 feet in length running in a north/south alignment.
Docken Field – 37WI	Airport/Private	Mount Horeb	One runway with a turf surface that is 1,800 feet in length running in a northwest/southeast alignment. Based on aerial imagery, this runway appears to have fallen out of use but is still on file with the FAA.
Hecklers' Strip – 2WI7	Airport/Private	Mount Vernon	One runway with a turf surface that is 2,114 feet in length running in a southwest/northeast alignment.
Middleton Muni – Morey Field – C29	Airport/Public	Middleton	Two runways at Morey Field. The first runway is elevation of 928 feet with a turf surface, 2,000 feet in length and runs in a north/south alignment. The second runway is elevation of 928 feet with an asphalt surface, 4,000 feet in length and runs in an east/west alignment.
Tuschen Airport – 89WI	Airport/Private	Jonesdale	Two runways at Tuschen. The first runway is elevation of 1,060 feet with a turf surface, and 1,584 feet in length. The second runway is turf surface and 483 feet in length.

3.8.2 *Environmental Consequences*

The following section discusses the comparative potential environmental consequences (impacts) of conducting the No Action Alternative and six proposed project alternatives to the existing transportation resources of roadways, railway, river crossings, and airports. The data reviewed focus on Federal, state, and local resources most likely to be affected.

Impacts common to all action alternatives are presented ahead of the discussion of unique impacts of the individual alternatives. For ease in the review of data presented, the discussion of potential impacts from the six proposed alternatives is organized by individual transportation resource (roadways, railways, river crossings, and airports).

3.8.2.1 DATA SOURCES, METHODS, AND ANALYSIS ASSUMPTIONS

The following impact indicators were considered when analyzing potential impacts to transportation:

- Changes in traffic volumes on roadway systems.
- Distances of the C-HC Project to airports and heliports.
- Changes in road transportation, based on information required by Wisconsin and Iowa Department of Transportation ROW permits.
- Changes in rail transportation, based on information required by permits issued by rail operators.
- Changes in waterway transportation, based on information required for USACE permits.

Transportation data for the analysis area were collected and analyzed from highway maps, GIS coverages, route alignment maps, and other maps from various reports and websites of the affected state and local agencies. A review of Federal, state, and local transportation plans was conducted. The transportation analysis area is a 10-mile-wide area spanning the centerline of the proposed transmission line (with 5 miles on either side of the centerline of the six alternatives). The area was assessed to identify existing and proposed Federal, state, and local transportation infrastructure that would be directly and indirectly impacted by construction, operations, and decommissioning of the proposed project.

The methodology for roadway analysis assumes the primary impacts associated with the proposed project would occur within the 2-year construction phase of the project. The roadway analysis considers the existing traffic volumes and analyzes estimated project traffic volumes to determine potential impact. This analysis is also true for bridge impacts, where the project final alignment must adhere to existing permits from the appropriate agencies and consider weight and load restrictions on existing facilities. At the time of the assessment, information related to when and where project-related traffic would occur on specific roads was not available. Therefore, a qualitative approach was taken to assess the potential impacts to roadway resources.

The railway analysis considers any segments of the project that may encroach upon ROW owned by private carriers or local entities. In addition, where potential encroachment is confirmed, project impact load and/or speed restrictions or horizontal clearance on existing or planned facilities is assessed. As mentioned previously, once the final design is identified, the Federal Railroad Administration would be notified for coordination of required permitting.

The river crossings analysis considers the potential impact on navigation activities within the analysis area. Information regarding clearance and restrictions on activities was also considered.

The airport analysis methodology considers the proximity of the proposed project to existing and planned airport facilities. These comparisons provide insight into the potential for impacts that could dictate the requirement for an airspace obstruction analysis by the FAA. A 10-mile corridor is necessary to allow for flexibility of project routing and design, and to allow for errors in the recorded locations and boundaries of some resources.

Table 3.8-4 provides a description of the impact threshold definitions used in the analysis of potential impacts to transportation resources.

Table 3.8-4. Transportation Impact Threshold Definitions

	Minor Impact	Moderate Impact	Major Impact
Transportation	Roadway – Negligible increases in daily traffic volumes resulting in perceived inconveniences to drivers but no actual disruptions to traffic. Perceived inconveniences to drivers due to routine inspections by small vehicles or pickup trucks. Railroad – No impact to existing and planned railroad operations, with adequate horizontal and vertical clearances provided. River Crossing – No impact to either commercial or recreational operations. Airport – No impact to flight paths, runway protection zones, or future airport expansion plans. The proposed path is more than 5 miles from any airport (commercial or general aviation).	Roadway – Detectable increases in daily traffic volumes (with slightly reduced speeds of travel) resulting in slowing down traffic and delays of less than 10%. Railroad – No impact to existing and planned railroad operations; however, additional safety protections are required due to a lack of horizontal clearance. River Crossing – Obstruction constructed within the navigable waterway; however, adequate clearance is available so as not to significantly impede navigation activities. Airport – No impact to flight paths, runway protection zones, or future airport expansion planes. The proposed path is within 5 miles of an airport.	Roadway – Significant increases in daily traffic volumes (with reduced speeds of travel) resulting in an adverse change in travel speeds and delays of more than 10%. Railroad – Operations or expansion plans of railroads impacted, resulting in load restrictions or speed restrictions of railroad operations. River Crossing – Obstructions in navigable waterways are present that place restrictions on recreational or commercial activities. Airport – Impacts and limitations to flight paths, runway protection zones, or future airport expansion plans.

3.8.2.2 NO ACTION

Under the No Action Alternative, the proposed C-HC Project would not be constructed, and the potential environmental impacts associated with construction and operation of the project would not occur. There would be no transportation impacts associated with the No Action Alternative.

3.8.2.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

Construction

Impacts to transportation resources that may occur during construction of the project include temporary road/rail line closures and changes to traffic patterns, damage to roadways, interrupted access to private land, and temporary delays resulting from increases in construction vehicle trips. These impacts are anticipated to be short-term, localized to the area of construction, and moderate, considering the potential for delays and interruption of traffic flow.

Overhead construction activities, such as stringing conductors and aerially installing transmission line structures, may interfere with emergency response by ambulance, fire, paramedic, and police vehicles. Roadway segments that would be most impacted are two-lane roadways that provide one lane of travel per direction. Additionally, there is a possibility that emergency services may be needed at a location where access is temporarily blocked by the construction zone. The Utilities would implement a program that requires coordination, in advance, with emergency services, such as fire, paramedics, and essential services such as mail delivery and school buses if a closure would exceed 1 hour.

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 two 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 is expected to be minor.

Areas in the vicinity of the project alternatives generally have light existing traffic volumes, as shown previously in Table 3.8-1, considerably below the theoretical traffic capacity of the primary highways and local roads. It is estimated the daily project workforce would consist of 50 to 120 workers of the project construction time frame. Transmission line workers would be dispersed in groups throughout the project area and would not typically be working at the same place at any one time. Haul truck traffic would include trucks carrying equipment and materials, spoils for disposal, and new and old tower support pieces. Trips would be made to and from various points along the transmission line route. The exact routes and scheduling of truck trips are not known at this time.

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.

The project Traffic and Transportation Plan and the requirements of state and county encroachment permits would provide adequate measures to ensure that traffic disruption and delay are minimized. This ensures that project trips are planned in accordance with existing road conditions. The project team would obtain permits that describe circulation and detour routes, limit lane closures, etc.

Increased traffic on roads due to the construction of the project could have adverse impacts to public safety and worker safety. With higher traffic volumes on the roadway, there is an increased risk for vehicular collisions as well as collisions with multi-modal forms of transportation, such as pedestrians and cyclists. All workers would be expected to obey local speed limits and traffic restrictions and it is assumed that local and state law enforcement would enforce traffic regulations throughout the project area as they normally would.

Prior to construction of the project, the Utilities would be required to obtain use permits or similar legal agreements from the public agencies responsible for affected transportation facilities and applicable ROWs. In addition, they would be responsible for all oversize and overweight permits required for delivery of construction materials and subcontractor components.

Standard permit application procedures for utility crossings and installations within railroad ROW would be required. Project alternatives paralleling railroads would require coordination with the railroad companies to determine if installation of the new line would create objectionable induction. Project alternatives crossing railroads would require compliance with National Electrical Safety Code Sections 231 and 232, PSC 114, or the railroad company's reasonable clearance requirements, whichever is more stringent.

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.

Air traffic patterns at public airports would not likely be affected by the placement of new structures or conductors, because the C-HC Project would be designed and constructed to accommodate the existing public airport operations. However, private airports, airstrips, or heliports would potentially be impacted by the C-HC Project, depending on the final C-HC Project design near these facilities and the requirements of the FAA. Airport coordination for permitting with the appropriate local officials, Wisconsin Bureau of Aeronautics, FAA, Iowa Department of Aviation, and local airport operators would be required for each alternative. Specifically related to coordination of agencies, the FAA objective is to ensure safe and efficient use of the navigable airspace for public use, military airports, and heliports (facilities). Once the final route is selected, notice would be provided to the FAA for review of the FAA's criteria for structure heights, markings, and/or lighting one or more transmission structures or wire spans.

Operations

Impacts on public roadways and rail lines that may occur during operations, maintenance, and emergency repairs would be similar to those occurring during construction but would be more localized, involve fewer vehicles, and would be periodic over the life of the C-HC Project (40 years). The C-HC Project would be inspected regularly or as necessary using fixed-wing aircraft, helicopters, ground vehicles, all-terrain vehicles, and/or personnel on foot. Maintenance of project facilities would be performed as needed, and applicable Federal and state permits would be obtained prior to conducting maintenance.

The Utilities or their contractors would develop and implement a Traffic and Transportation Management Plan applicable to operations, maintenance, and emergency repairs. The plan would describe measures designed and taken to avoid and/or minimize adverse effects associated with the existing transportation system, including roadway damage or safety hazards that may occur due to project vehicle weight or size.

Project operations would involve periodic inspection and maintenance of the transmission line and associated facilities. During project operations, maintenance crews and vehicles would conduct inspection and maintenance activities. Aerial inspection would likely be conducted by helicopter or drone annually. Detailed ground inspections of the entire transmission line system would take place on a semi-annual basis using four-wheel-drive trucks or all-terrain vehicles.

Typical maintenance is conducted using live-line maintenance with equipment, such as an aerial lift crane. These activities would increase wear and tear on roadways and bridges. Personnel and equipment traveling to and from the site for operations purposes would also be negligible due to the low volumes of generated traffic.

Helicopter flights associated with project operations may affect the airports and heliports. These flights may occur within the controlled zones throughout the analysis area. All flight operations are FAA controlled. Impacts would include increased traffic load at these airports, though this is expected to be a temporary and minor impact due to the few flights that project operations would require (typically only a few per year).

Existing roads would be improved within the project area to accommodate the proposed project. Road improvements would decrease the potential for nuisance dust; however, dust would be monitored, and suppression measures incorporated into the proposed project construction and operation plans. Because of the environmental commitments, no significant adverse transportation impacts would occur.

3.8.2.4 ROADWAYS

The impact analysis for roadways generated by construction, operation, and maintenance of the proposed project focuses on the change in traffic volumes to determine potential impacts. The existing and projected traffic volumes for the project are shown in Table 3.8-5 and Table 3.8-6, along with the potential impacts from each action alternative.

- The average daily traffic volumes on segments of roadways within 5 miles of the analysis area are shown in Table 3.8-5 (Iowa DOT 2016; WisDOT 2014). These roadways may be used by construction workers and material delivery trucks to reach assembly points, yards, and work sites along the project alternatives.
- The estimated number of heavy truck loads for the duration of the project (December 2021 to June 2023—30 months) is 22,740 trips, which averages 38 trips per day for the project construction time of 30 months. Heavy truck load is defined as a vehicle over a 1-ton pickup.
- For non-heavy truck loads, projected traffic is estimated at 11,370 trips for the duration of the project, which averages 19 trips per day for the duration of the project.
- The estimated construction phase would generate 57 average daily trips of vehicles used for pole segments, drilling equipment, concrete trucks, gravel trucks, moving the transmission line equipment along the ROW, etc.
- The traffic estimates used the assumptions of 670 structures included for the project, with the assumption of 30–40 heavy truck trips per unit, and 15–20 light truck trips per unit.

Table 3.8-5. Average Daily Traffic Impact Analysis, Alternatives 1–3

Roadway	Alternative 1 Existing ADT	Alt 1 - Project Estimated ADT (% Increase)	Alternative 2 Existing ADT	Alt 2 - Project Estimated ADT (% Increase)	Alternative 3 Existing ADT	Alt 3 - Project Estimated ADT (% Increase)
IA SH3	1,020	1,077 (6%)	Delaware Co – 1,169 Dubuque Co – 1,020	1,226 (5%) 1,077 (6%)	1,020	1,077 (6%)
IA SH136	2,828	2,855 (2%)	2,828	2,855 (2%)	2,828	2,855 (2%)
IA US 52	Clayton Co – 2,833 Dubuque Co – 3,571	2,890 (2%) 3,628 (2%)	Clayton Co – 2,833 Dubuque Co – 3,571	2,890 (2%) 3,628 (2%)	Clayton Co – 2,833 Dubuque Co – 3,571	2,890 (2%) 3,628 (2%)
WI SH23	2,127	2,184 (3%)	2,127	2,184 (3%)	2,127	2,184 (3%)
WI SH35	2,953	3,010 (2%)	2,953	3,010 (2%)	2,953	3,010 (2%)
WI SH39	2,127	2,184 (3%)	2,127	2,184 (3%)	2,127	2,184 (3%)
WI SH78	8,531	8,588 (1%)	8,531	8,588 (1%)	8,531	8,588 (1%)
WI SH80	Grant Co – 2,953 Iowa Co – 2,127	3,010 (2%) 2,184 (3%)	Grant Co – 2,953 Iowa Co – 2,127	3,010 (2%) 2,184 (3%)	Grant Co – 2,953 Iowa Co – 2,127	3,010 (2%) 2,184 (3%)
WI SH81	2,953	3,010 (2%)	2,953	3,010 (2%)	2,953	3,010 (2%)
WI SH126	N/A	N/A	N/A	N/A	3,239	3,296 (2%)
WI SH129	2,953	3,010 (2%)	2,953	3,010 (2%)	N/A	N/A
WI SH130	2,127	2,184 (3%)	2,127	2,184 (3%)	2,127	2,184 (3%)
WI SH133	2,953	3,010 (2%)	2,953	3,010 (2%)	2,953	3,010 (2%)
WI SH133 B	N/A	N/A	N/A	N/A	2,953	3,010 (2%)
WI SH191	N/A	N/A	N/A	N/A	2,127	2,184 (3%)
WI TRD129	2,953	3,010 (2%)	2,953	3,010 (2%)	N/A	N/A
WI US12	10,133	10,190 (1%)	10,133	10,190 (1%)	10,133	10,190 (1%)
WI US14	Iowa Co – 10,262 Dane Co – 10,133	10,319 (1%) 10,190 (1%)	Iowa Co – 10,262 Dane Co – 10,133	10,319 (1%) 10,190 (1%)	Iowa Co – 10,262 Dane Co – 10,133	10,319 (1%) 10,190 (1%)

Roadway	Alternative 1 Existing ADT	Alt 1 - Project Estimated ADT (% Increase)	Alternative 2 Existing ADT	Alt 2 - Project Estimated ADT (% Increase)	Alternative 3 Existing ADT	Alt 3 - Project Estimated ADT (% Increase)
WI US18	Grant Co – 2,620 Iowa Co – 2,127	2,677 (2%) 2,184 (3%)	Grant Co – 2,620 Iowa Co – 10,262	2,677 (2%) 10,319 (1%)	Grant Co – 2,620 Iowa Co – 10,262	2,677 (2%) 10,319 (1%)
WI US18W	2,620	2,677 (2%)	2,620	2,677 (2%)	2,620	2,677 (2%)
WI US61	2,620	2,677 (2%)	2,620	2,677 (2%)	2,620	2,677 (2%)
WI US151	N/A	N/A	N/A	N/A	2,620	2,677 (2%)
WI US151B	N/A	N/A	N/A	N/A	2,620	2,677 (2%)
WI US151B	N/A	N/A	N/A	N/A	2,620	2,677 (2%)
WI US151B	N/A	N/A	N/A	N/A	2,620	2,677 (2%)
Impact Measure	Minor Impact – due to negligible increases in daily traffic volumes, average 2% for Alternative 1 roadways.		Minor Impact – due to negligible increases in daily traffic volumes, average 2% for Alternative 2 roadways.		Minor Impact – due to negligible increases in daily traffic volumes, average 2% for Alternative 3 roadways.	

Table 3.8-6. Average Daily Traffic Impact Analysis, Alternatives 4–6

Roadway	Alternative 4 Existing ADT	Alt 4 - Project Estimated ADT (% Increase)	Alternative 5 Existing ADT	Alt 5 - Project Estimated ADT (% Increase)	Alternative 6	Alt 6 - Project Estimated ADT (% Increase)
IA SH3	1,020	1,077 (6%)	Delaware Co – 1,169 Dubuque Co – 1,020	1,226 (5%) 1,077 (6%)	1,020	1,077 (6%)
IA SH136	2,828	2,855 (2%)	2,828	2,855 (2%)	2,828	2,855 (2%)
IA US 52	Clayton Co – 2,833 Dubuque Co – 3,571	2,890 (2%) 3,628 (2%)	Clayton Co – 2,833 Dubuque Co – 3,571	2,890 (2%) 3,628 (2%)	Clayton Co – 2,833 Dubuque Co – 3,571	2,890 (2%) 3,628 (2%)
WI SH23	2,127	2,184 (3%)	2,127	2,184 (3%)	2,127	2,184 (3%)
WI SH35	2,953	3,010 (2%)	2,953	3,010 (2%)	2,953	3,010 (2%)
WI SH39	2,127	2,184 (3%)	2,127	2,184 (3%)	2,127	2,184 (3%)
WI SH78	8,531	8,588 (1%)	8,531	8,588 (1%)	8,531	8,588 (1%)
WI SH80	Grant Co – 2,953 Iowa Co – 2,127	3,010 (2%) 2,184 (3%)	Grant Co – 2,953 Iowa Co – 2,127	3,010 (2%) 2,184 (3%)	Grant Co – 2,953 Iowa Co – 2,127	3,010 (2%) 2,184 (3%)
WI SH81	2,953	3,010 (2%)	2,953	3,010 (2%)	2,953	3,010 (2%)
WI SH126	3,239	3,296 (2%)	3,239	3,296 (%)	N/A	N/A
WI SH129	N/A	N/A	N/A	N/A	2,953	3,010 (2%)
WI SH130	N/A	N/A	N/A	N/A	N/A	N/A
WI SH133	2,953	3,010 (2%)	2,953	3,010 (2%)	2,953	3,010 (2%)
WI SH133 B	2,953	3,010 (2%)	2,953	3,010 (2%)	N/A	N/A
WI SH191	2,127	2,184 (3%)	2,127	2,184 (3%)	2,127	2,184 (3%)
WI STRD129	N/A	N/A	2,953	3,010 (2%)	2,953	3,010 (2%)
WI US12	10,133	10,190 (1%)	10,133	10,190 (1%)	10,133	10,190 (1%)
WI US14	10,133	10,190 (1%)	10,133	10,190 (1%)	10,133	10,190 (1%)
WI US18	Grant Co – 2,620 Iowa Co – 10,262 Dane Co – 10,133	2,677 (2%) 10,319 (1%) 10,190 (1%)	Grant Co – 2,620 Iowa Co – 10,262	2,677 (2%) 10,319 (1%)	Grant Co – 2,620 Iowa Co – 10,262 Dane Co – 10,133	2,677 (2%) 10,319 (1%) 10,190 (1%)
WI US18W	2,620	2,677 (2%)	2,620	2,677 (2%)	2,620	2,677 (2%)
WI US61	2,620	2,677 (2%)	2,620	2,677 (2%)	2,620	2,677 (2%)
WI US151	2,620	2,677 (2%)	Grant Co – 2,620 Iowa Co – 10,262 Dane Co – 10,133	2,677 (2%) 10,319 (1%) 10,190 (1%)	Iowa Co – 10,262 Dane Co – 10,133	10,319 (1%) 10,190 (1%)

Roadway	Alternative 4 Existing ADT	Alt 4 - Project Estimated ADT (% Increase)	Alternative 5 Existing ADT	Alt 5 - Project Estimated ADT (% Increase)	Alternative 6	Alt 6 - Project Estimated ADT (% Increase)
WI US151B	2,953	3,010 (2%)	Grant Co – 2,620 Iowa Co – 10,262	2,677 (2%) 10,319 (1%)	N/A	N/A
WI EUS151B	2,620	2,677 (2%)	2,620	2,677 (2%)	N/A	N/A
WI US151B	2,620	2,677 (2%)	2,620	2,677 (2%)	N/A	N/A
Impact Measure	Minor Impact – due to negligible increases in daily traffic volumes, average 2% for Alternative 4 roadways.		Minor Impact – due to negligible increases in daily traffic volumes, average 2% for Alternative 5 roadways.		Minor Impact – due to negligible increases in daily traffic volumes, average 2% for Alternative 6 roadways.	

The majority of roads within the analysis area would not be adversely affected by the temporary increase in road traffic for construction of 57 average daily trips; therefore, the contribution of the project's impact on traffic and transportation would be minor. The Utilities would acquire the required encroachment permits along the project and implement a Traffic Management and Control Plan to reduce impacts. The Traffic Management Plan would provide strategies to ensure safe and effective passage of through-traffic.

Other impacts considered include those potential impacts to bridges along the roadways that have weight, width, and height restrictions. Once the final design is approved, the utilities, as part of the Traffic Management and Control Plan, would use the existing bridge data to identify facilities with limitations. As a result, during construction and operation phases, the project would avoid complications with identified transportation routes. The project impact for bridges is anticipated to be minor due to the small volume of traffic generated by the overall project during the construction phase. During operation, impact is also anticipated to be minor due to low traffic volumes and because most of the project is within coordinated ROW.

3.8.2.5 RAILWAYS

The impact analysis for railways considers any segments of the project that may encroach upon ROW owned by private rail carriers or local entities. In addition, if encroachment is determined, then the analysis considers how the project would potentially impact load and/or speed restrictions or horizontal/vertical clearance on existing or planned facilities. As mentioned previously, once the final design is identified, the Federal Railroad Administration and railroad companies would be notified for coordination of required permitting. The six action alternatives cross and/or share railroad ROW along parts of the analysis area, as shown in Table 3.8-7.

Table 3.8-7. Railroad Impacts Analysis

Alternative	Total Railroad Segments Affected	Railroad Owners	WI Segments	IA Segments	Total Miles Impacted	Impact Measure
Alternative 1	24	CPRS, WSOR, BNSF	22	2	BNSF – 12 miles CPRS – 11 miles WSOR – 24 miles	Moderate Impact due to number of miles, segments, within ROW areas of multiple carriers. Vertical and horizontal clearances and speed/weight restrictions will be determined w/ final alignment.
Alternative 2	24	CPRS, WSOR, BNSF	22	2	BNSF – 18 miles CPRS – 14 miles WSOR – 33 miles	Moderate Impact due to number of miles, segments, within ROW areas of multiple carriers. Vertical and horizontal clearances and speed/weight restrictions will be determined w/ final alignment.

Alternative	Total Railroad Segments Affected	Railroad Owners	WI Segments	IA Segments	Total Miles Impacted	Impact Measure
Alternative 3	30	CPRS, WSOR, BNSF	27	3	BNSF – 37 miles CPRS – 22 miles WSOR – 33 miles	Moderate Impact due to number of miles, segments, within ROW areas of multiple carriers. Vertical and horizontal clearances and speed/weight restrictions will be determined w/ final alignment.
Alternative 4	26	CPRS, WSOR, BNSF	23	3	BNSF – 37 miles CPRS – 22 miles WSOR – 19 miles	Moderate Impact due to number of miles, segments, within ROW areas of multiple carriers. Vertical and horizontal clearances and speed/weight restrictions will be determined w/ final alignment.
Alternative 5	26	CPRS, WSOR, BNSF	23	3	BNSF – 37 miles CPRS – 22 miles WSOR – 19 miles	Moderate Impact due to number of miles, segments, within ROW areas of multiple carriers. Vertical and horizontal clearances and speed/weight restrictions will be determined w/ final alignment.
Alternative 6	20	WSOR, CPRS, BNSF	18	2	BNSF – 18 miles CPRS – 14 miles WSOR – 19 miles	Moderate Impact due to number of miles, segments, within ROW areas of multiple carriers. Vertical and horizontal clearances and speed/weight restrictions will be determined w/ final alignment.

The project would have a moderate impact on the railway segments along the corridor due to the number of miles and segments crossed by the C-HC Project, in addition to multiple carrier involvement. The primary impacts of the project for railway segments would occur during the construction phases of the project, which would be a moderate impact if railcars are required to slow down in a construction zone. Ongoing operational impacts would occur if the final alignment is within a shared ROW corridor, either paralleling the route or crossing the rail line. There would be minor long-term permanent impacts only in instances of maintenance of the transmission if the maintenance activities were to occur in the shared corridor. The utilities would coordinate with the Federal Railroad Administration and with the above three rail companies for permitting that is required for areas where the project would encroach on mainline railroad ROW. Standard permit application procedures for utility crossings and installations within railroad ROW would also be required.

Each of the alternatives has segments impacting existing right-of-way for the mainline railroads. The utilities would coordinate with the railroad companies to determine if installation of the new line would create objectionable induction. Each of the six alternatives that cross railroads would require compliance with National Electrical Safety Code Sections 231 and 232, PSC 114, or the railroad company's reasonable clearance requirements, whichever is more stringent.

3.8.2.6 RIVER CROSSINGS

The impact analysis for river crossings considers the operations of commercial or recreational activities, whether adequate clearance is available for the project or if the project would place restrictions on crossing activities. Each of the six alternatives cross the Mississippi River, including the USFWS-managed Upper Mississippi River National Wildlife and Fish Refuge. In addition, the Cassville car ferry connects the village of Cassville, Wisconsin, on the east side of the Mississippi River, with Iowa, the Refuge, and Oak Road on the west side of the Mississippi River. The Cassville car ferry landing is also used as a river access point, named the Turkey River landing. Other nearby river access points include Cassville Public Access launch and the Wisconsin Power and Light launch on the Wisconsin side of the

Mississippi River. The public park in Cassville also serves as a Refuge overlook. Commercial navigation passes through the Refuge.

Each of the alternatives has moderate impacts for the river crossings and river access points due to potential obstruction of the waterway during construction phases. The obstructions would be negligent but may include obstructed views from equipment during installation or there may be small delays at the river access points or launch areas while spanning wire or delays with the crossing of the car ferry. Adequate clearance would be available for the project during construction and during operation.

Each of the six alternatives crossing railroads would require coordination 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.

3.8.2.7 AIRPORTS

The impact analysis for airports considers the location of the airports in proximity to the project, future airport expansion projects, vertical clearance, and flight path limitations. There are 12 airports and two heliports within 5 miles of the project alternatives (USDOT 2017).

Previous analysis within the *April 2018 Application for PSCW Certificate of Public Convenience and Necessity and WDNR Utility Permit for the Cardinal-Hickory Creek Transmission Line Project* identified several airports with potential impacts related to the project. This report used the FAA criteria and surface requirements for aeronautical studies of proposed and existing structures within 0.5-mile of public and military facilities. Table 3.8-8 presents the potential project impacts for the airport and heliport facilities.

Table 3.8-8. Airport Impact Analysis

Airport Name	Type	County	Community	Impact
Cassville Municipal – C74	Airport/Public	Grant	Cassville	Runway is approximately 2,000 feet from the Stoneman crossing location. Due to the airport and the height of the bluff immediately east of Cassville, transmission line structures within in the airport's conical surface would likely require additional evaluation and design and may need to be limited in height.
Lancaster Municipal – 73C	Airport/Public	Grant	Lancaster	Notice to the FAA may be required for some of the closer structures that are 2 to 4 miles away, but it is unlikely structure heights would be limited by one of the obstruction surfaces that apply to this facility.
Platteville Municipal - PVB	Airport/Public	Grant	Platteville	One runway is approximately 1 mile from the project. Based on this distance, notice to the FAA would likely be required for multiple structures near Platteville Municipal. A preliminary review of this airport indicates that structure heights could be limited to less than 150-foot above ground level by one or more instrument approach obstruction surfaces that apply to this runway.
Iowa County – MRJ	Airport/Public	Iowa	Mineral Point	This airport is approximately 3.5 miles from the project. Preliminary structure locations and heights were filed with the FAA, who issued a no hazard for all preliminary structure locations.
Southwind – 22WN	Airport/Private	Iowa	Dodgeville	This airport is approximately 1 mile from the project. The proposed alignment does not impact the FAA regulations.

Airport Name	Type	County	Community	Impact
Forseth Field – WI61	Airport/Private	Iowa	Arena	This airport is approximately 0.5-mile from the project. The proposed alignment does show a possible issue with FAA requirements that must be addressed.
Hallick Farm – WI66	Airport-Heliport/Private	Dane	Black Earth	This airport is approximately 0.5-mile from the project. The proposed alignment does show a possible issue with FAA regulations in relation to the runway.
Memorial Hospital – WI44 / Upland Hills Health	Heliport/Private	Iowa	Dodgeville	The helipad is approximately 0.5-mile from the project. The proposed alignment does not impact the FAA regulations.
Atkins Ridge – WI43	Airport/Private	Dane	Daleyville	This airport is approximately 4 miles from the project. The proposed alignment does not impact the FAA regulations.
Docken Field – 37WI	Airport/Private	Dane	Mount Horeb	This airport is approximately 0.5-mile from the project. The proposed alignment may have a possible issue with FAA regulations. However, based on aerial imagery, this runway appears to have fallen out of use but is still on file with the FAA.
Hecklers' Strip – 2WI7	Airport/Private	Dane	Mount Vernon	This airport is approximately 2.5 miles from the project. The proposed alignment does not impact the FAA regulations.
Middleton Municipal – Morey Field – C29	Airport/Public	Dane	Middleton	This airport is approximately 2.4 miles from the project. Airport height limitation zoning restrictions for Morey Field are in place. Preliminary structure locations and heights were filed with the FAA, who issued determinations of no hazard for all preliminary structure locations.

Table 3.8-9 shows the airports and heliports within a 5-mile buffer for each of the proposed alternatives and the summary impact measure.

Table 3.8-9. Airports and Heliports

Alternative	Number of Facilities	Number of Airports	Number of Heliports	Impact Measure
Alternative 1	5	4	1	Moderate – due to the number of facilities within the project area, in addition to the impact factors listed in the previous tables.
Alternative 2	5	4	1	Moderate – due to the number of facilities within the project area, in addition to the impact factors listed in the previous tables.
Alternative 3	6	5	1	Moderate – due to the number of facilities within the project area, in addition to the impact factors listed in the previous tables.
Alternative 4	9	8	1	Moderate – due to the number of facilities within the project area, in addition to the impact factors listed in the previous tables.
Alternative 5	10	9	1	Moderate – due to the number of facilities within the project area, in addition to the impact factors listed in the previous tables.
Alternative 6	8	7	1	Moderate – due to the number of facilities within the project area, in addition to the impact factors listed in the previous tables.

Once the final project route is selected, notice would be provided to the FAA for all structures within the analysis area. The Utilities would coordinate with the appropriate local officials, Wisconsin Bureau of

Aeronautics, FAA, and the airport operator to mitigate any facility challenges. Additional airport impacts for each of the six alternatives are listed within the Impacts Common to All Alternatives.

3.8.3 *Summary of Impacts*

The following summary identifies the potential transportation impacts for the project. Table 3.8-10 provides a tabular comparison of the indicators for transportation for the six alternatives under detailed consideration. The primary transportation impacts associated with the proposed C-HC Project would be associated with construction time frame. Because of the dispersed nature of the construction phase, impacts to roadways are determined to be minor due to the low traffic volume projections for the project. Road improvements conducted as part of the project would decrease the potential for nuisance dust; however, dust would be monitored, and suppression measures incorporated into the proposed C-HC Project construction and operation plans.

Potential impacts to railways was determined to be moderate based on the number of project transmission line miles and segments within existing railroad carrier ROWs. Vertical and horizontal clearances and speed/weight restrictions would also be determined with final alignment of the C-HC Project.

The analysis of river crossings resulted in a determination of moderate impact due to the potential obstruction of the waterway during the construction phase. Delays at the river access points or launch areas while spanning wire, or delays with the crossing of the car ferry, would be infrequent and short-term. Once under operation, potential impacts to river crossings would be minor.

The analysis of airport facilities provided a determination of a potential moderate impact due to location of the alternatives near airport and heliport facilities.

Table 3.8-10. Transportation Impact Summary Table

Alternative	Roadway Segments	Major River Crossings	Railroad Segments	Airport/Heliport Facilities
Alternative 1	2,381	1	24	5
Impact	Minor – Negligible increases in daily traffic volumes resulting in perceived inconveniences to drivers, but no actual disruptions to traffic. Perceived inconveniences to drivers due to routine inspections by small vehicles or pickup trucks.	Moderate – Obstruction constructed within the navigable waterway; however, adequate clearance is available so as not to significantly impede navigation activities.	Moderate – No impact to existing and planned railroad operations; however, additional safety protections are required due to a lack of horizontal clearance	Moderate – No impact to flight paths, runway protection zones, or future airport expansion planes. The proposed path is within 5 miles of an airport.
Alternative 2	2,408	1	24	5
Impact	Minor – Negligible increases in daily traffic volumes resulting in perceived inconveniences to drivers, but no actual disruptions to traffic. Perceived inconveniences to drivers due to routine inspections by small vehicles or pickup trucks.	Moderate – Obstruction constructed within the navigable waterway; however, adequate clearance is available so as not to significantly impede navigation activities.	Moderate – No impact to existing and planned railroad operations; however, additional safety protections are required due to a lack of horizontal clearance	Moderate – No impact to flight paths, runway protection zones, or future airport expansion planes. The proposed path is within 5 miles of an airport.
Alternative 3	2,658	1	30	6
Impact	Minor – Negligible increases in daily traffic volumes resulting in perceived inconveniences to drivers, but no actual disruptions to traffic. Perceived inconveniences to drivers due to routine inspections by small vehicles or pickup trucks.	Moderate – Obstruction constructed within the navigable waterway; however, adequate clearance is available so as not to significantly impede navigation activities.	Moderate– No impact to existing and planned railroad operations; however, additional safety protections are required due to a lack of horizontal clearance	Moderate – No impact to flight paths, runway protection zones, or future airport expansion planes. The proposed path is within 5 miles of an airport.
Alternative 4	3,024	1	26	9
Impact	Minor – Negligible increases in daily traffic volumes resulting in perceived inconveniences to drivers, but no actual disruptions to traffic. Perceived inconveniences to drivers due to routine inspections by small vehicles or pickup trucks.	Moderate – Obstruction constructed within the navigable waterway; however, adequate clearance is available so as not to significantly impede navigation activities.	Minor – No impact to existing and planned railroad operations, with adequate horizontal and vertical clearances provided.	Moderate – No impact to flight paths, runway protection zones, or future airport expansion planes. The proposed path is within 5 miles of an airport.
Alternative 5	3,070	1	26	10
Impact	Minor – Negligible increases in daily traffic volumes resulting in perceived inconveniences to drivers, but no actual disruptions to traffic. Perceived inconveniences to drivers due to routine inspections by small vehicles or pickup trucks.	Moderate – Obstruction constructed within the navigable waterway; however, adequate clearance is available so as not to significantly impede navigation activities.	Moderate – No impact to existing and planned railroad operations; however, additional safety protections are required due to a lack of horizontal clearance	Moderate – No impact to flight paths, runway protection zones, or future airport expansion planes. The proposed path is within 5 miles of an airport.
Alternative 6	2,765	1	20	8
Impact	Minor – Negligible increases in daily traffic volumes resulting in perceived inconveniences to drivers, but no actual disruptions to traffic. Perceived inconveniences to drivers due to routine inspections by small vehicles or pickup trucks.	Moderate– Obstruction constructed within the navigable waterway; however, adequate clearance is available so as not to significantly impede navigation activities.	Moderate – No impact to existing and planned railroad operations; however, additional safety protections are required due to a lack of horizontal clearance	Moderate – No impact to flight paths, runway protection zones, or future airport expansion planes. The proposed path is within 5 miles of an airport.

3.9 Cultural and Historic Resources

NEPA recognizes that a unique character of an environment is its relation to “historic or cultural resources” and requires agency officials to consider the degree that an action might “adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places [NRHP]” (40 CFR 1508.27[b][3] and 40 CFR 1508.27[b][8]). However, under NEPA, no definition is provided for “cultural resources.”

The NRHP, which was established under the National Historic Preservation Act of 1966, as amended (NHPA) (54 U.S.C. 3001 et seq.), identifies historic properties (i.e., locations eligible for listing or listed in the NRHP) based on their relationship to significant historic events, individuals, architectural or engineering trends, or in their potential to provide important information about the local, regional, or national past (36 CFR 60[a–d]). In addition to being significant under one of the four National Register criteria (A, B, C, or D), properties must maintain sufficient integrity to convey their significance; the NPS has defined seven aspects of integrity, all or most of which must be present to convey the significance of the historic property (NPS 1997:44). These aspects include integrity of location, design, setting, materials, workmanship, feeling, and association. Different properties may display these aspects in unique ways.

Under Section 106 of the NHPA, agencies are required to make a reasonable and good faith effort to identify, in coordination with other interested parties including State Historic Preservation Offices (SHPOs) and Native American tribal groups, whether historic properties are present within the area of potential effects (APE) of an undertaking and whether they would be significantly impacted by that undertaking. Projects which are directed, overseen, funded, partially funded or permitted by a Federal agency are considered undertakings. The NEPA EA/EIS process may be coordinated with a Section 106 review, as long as the processes are substantially similar and involve the same parties (36 CFR 800.8).

In addition to NEPA and NHPA, other laws which may be considered in the protection of cultural and historic resources for this undertaking include:

- Wisconsin Historical Societies and Historical Preservation Statutes (Wisconsin Statutes Chapter 44) founded the Wisconsin Historical Society, provide policies for the review of all state agency actions that have the potential to impact historic properties, and prohibit archaeological excavation on state lands by unlicensed individuals.
- Miscellaneous Wisconsin County, Town, and City Historic Preservation Ordinances (Wisconsin Statutes Chapter 59.69, 60.64, and 62.23[7][em]). Cities, Towns, and Counties in Wisconsin may create local landmarks commissions to designate landmarks and establish historic districts, and may regulate the landmarks within their property.
- Wisconsin Burial Sites Preservation Statute (Wisconsin Statutes Chapter 157, Subchapter III). Prohibits the disturbance of any burial site or land adjacent to a burial site unless authorized by the director of the historical society.
- Wisconsin historic properties protections (Wisconsin Statute Chapter 943.01 and 943.14) prohibit damage to any rock art site. In addition, they prohibit the destruction of any historic buildings listed in the NRHP or on the state register of historic places without a permit issued by the city, village, county, or town.
- Iowa burial protection law (Iowa Code 263B and 716.5) establishes the office of state archaeologist of Iowa, and gives the state archaeologist the primary responsibility for preserving and investigating ancient human remains, and allows the state archaeologist to deny permission to exhume significant historically or scientifically significant human remains. The intentional disturbance of a burial site is an aggravated misdemeanor.

- Abandoned Shipwreck Act of 1987 (43 U.S.C. 2101–2106) establishes Federal ownership (and state custodianship) for shipwrecks located within navigable waters of each state.
- American Indian Religious Freedom Act (42 U.S.C. 1996) requires that Federal actions do not impede the free use or access to Native American religious sites and protects Native American religious practice.
- Antiquities Act of 1906 (54 U.S.C. 320301–320303 and 18 U.S.C. 1866[b]) provides for presidential designation of national monuments and provides protection from excavation of those sites unless authorized by a permit.
- Archaeological and Historic Preservation Act of 1974 as amended (54 U.S.C. 3125) requires the preservation of historic and archaeological data that might be destroyed by Federal construction projects or other federally licensed activities or programs and establishes treatment programs for the care of archaeological collections.
- Archaeological Resources Protection Act (16 U.S.C. 470aa-mm) prevents the excavation, damage, or defacement of archaeological sites on Federal or Native American land without permission from the land controlling agency and makes illegal the sale of artifacts recovered from Federal property.
- Historic Sites Act of 1935 (54 U.S.C. 320101) allows the establishment and protection of National Historic Landmarks (which are also protected under the NHPA).
- Native American Graves Protection and Repatriation Act (25 U.S.C. 3001–3013) protects cultural objects (Native American remains, funerary goods, sacred objects, or objects of cultural patrimony) to which modern Native groups can show lineal descent or cultural affiliation, when they are in control of a Federal land agency or museum controlling agency.
- EO 13007 stipulates that all Federal land agencies must attempt to accommodate access to Native American sacred sites and to avoid adversely affecting the physical integrity of such sites.

3.9.1 *Affected Environment*

This section provides a generalized statement of cultural and historic resources occurring within the vicinity of the C-HC Project. It begins with a discussion of the prehistory and history of the Upper Mississippi region around northeast Iowa and southwest Wisconsin. It then describes cultural and historic resources that occur within the APE for the C-HC Project. The Direct APE consists of a 300-foot-wide construction corridor. The Indirect APE, set as a 2,000-foot-wide buffer, is defined to identify potential historic properties that might suffer impacts to their setting or feeling due to visual or auditory impacts associated with the operation of the action alternatives.

3.9.1.1 GENERAL SETTING

Humans have occupied southwestern Wisconsin and northeastern Iowa for millennia, with the earliest occupations dating to approximately 9500 B.C., around the end of the Wisconsinan Glaciation. This period, dating until approximately 7500 B.C., is called the Paleoindian period. These earliest settlers were hunter-gathers who used a distinctive toolkit, including large, fluted, lanceolate projectile points called Clovis, and who may have exploited various now-extinct Pleistocene mega-fauna.

In the following Archaic period, dating to approximately 7500–500 B.C., hunter-gather lifestyles predominated, with most populations remaining relatively small. Population generally increased over time; increasing population pressure led to increased levels of sedentism, with Late Archaic populations living in somewhat permanent (or at least seasonally occupied), larger settlements. This may have been facilitated by the appearance of semi-domesticated plants, which appear in the archaeological record around 3,000 years ago.

The Woodland period, dating to approximately 500 B.C. to A.D. 1000, features some of the first evidence in the region of large scale social coordination and increasing social complexity, likely built upon technological adaptations such as the introduction of pottery, the development of the bow and arrow, and the increasing development of horticulture during this period. The Woodland period features the first mound construction in the area, with large numbers of elaborate burial mounds erected, often along the high bluffs adjacent to the Mississippi River. During the Middle Woodland period (100 B.C.–A.D. 300) sites up and down the Mississippi show evidence of interaction with distant cultures of the Hopewell Interaction Sphere out of the Ohio River Valley. Maize agriculture and the bow and arrow were introduced late in the Woodland period, and likely had a significant impact on social structures. Another Late Woodland introduction was the construction of elaborate geometric and zoomorphic mounds, such as those found at Effigy Mounds National Monument, north of the project area.

The period from A.D. 1000–1650 is identified as the Mississippian period. Along the Mississippi valley in the project vicinity, sites dating to this period are identified as Oneota. The Oneota culture built large villages and used similar pottery to cultures farther down the Mississippi River, and may have been related to the large mound center near St. Louis, Cahokia. The Azatlan site in southeastern Wisconsin was another important Oneota mound center, with multiple large, pyramidal mounds. However, mound construction was less common in the Mississippian period than in the preceding Woodland, and seemed to decline around A.D. 1200, concurrent with a general decline at sites like Azatlan and Cahokia.

The Native American cultures of the upper Mississippi River Valley first encountered Europeans in 1673, when the French explorers Marquette and Joilet led the first well-documented European exploration of the Mississippi River. They encountered numerous Native American groups, including the Illiniwek, Ioway, and Oto tribes, possible descendants of the Oneota. The European incursion began a long period of decline for Native American cultures; although contact with Europeans was sporadic, their influence would eventually drive the Native inhabitants from their land. European goods and guns flowed sporadically up the Mississippi with French and then Spanish traders who bartered them for pelts and hides, but European settlement in the region was sporadic, both through time and space. Still, European settlement farther east pushed other tribal groups, such as the Sauk, Pawnee, and Meskwaki, into the region, increasing competition. In 1803, the nascent United States bought the territory from France in the Louisiana Purchase. The territory would remain largely unsettled by Euro-Americans until a military defeat of the organized Meskwaki and Sauk led the defeated Native American groups to sell the land in eastern Iowa in 1832. The Wisconsin Territory, incorporating all of Iowa and Wisconsin (as well as Minnesota and portions of the Dakotas) was formed from portions of the former Northwest Territory in 1836. The Iowa territory was split off again in 1838. The states rapidly gained population as eastern farmers moved in to take advantage of cheap, productive cropland. Iowa gained statehood in 1846, and Wisconsin followed in 1848. Today, much of the region remains rural and largely dedicated to agriculture, much as it was in the early periods of statehood.

3.9.1.1.1 PREVIOUSLY RECORDED RESOURCES IN THE PROJECT VICINITY

In order to begin to identify cultural resources within the APE of the C-HC Project, the Utilities have commissioned a number of separate identification studies. Investigations focused on the Direct and Indirect APEs, and methodologies within the two APEs were distinct.

At present, studies have been composed of both background desktop reviews and limited field surveys of selected resources and locations. These studies include:

- a cultural resources background review of sites within portions of the action alternatives within Iowa conducted by Burns and McDonnell (Javers 2018; Kullen and House 2018),
- two archaeological surveys of the portion of the action alternatives within the Refuge also conducted by Burns and McDonnell (Kullen 2017, 2018),
- an archaeological survey of previously recorded archaeological sites and cemeteries along the portions of the action alternatives' Direct APE adjacent to existing public ROW conducted by Burns and McDonnell and Commonwealth Heritage Group (Watson and Kullen 2018),
- a review of cemeteries and prehistoric mound sites within the Indirect APE in Wisconsin conducted by Commonwealth Heritage Group (Watson 2018), and
- a review and reassessment of all previously recorded historic structures within the Indirect APE in Wisconsin conducted by Commonwealth Heritage Group (Rainka et al. 2018). The last assessment also identified a small number of new historic structures but did not attempt to conduct a full survey of all potential historic structures within the Indirect APE.

Background reviews of the action alternatives within Wisconsin and Iowa were designed to identify all previously recorded archaeological sites within the Direct APE of the action alternatives routes and all previously recorded potential aboveground resources (historic structures, cemeteries, archaeological sites with mounds) within the Indirect APE of the action alternatives. Archaeologists consulted the I-Sites website, maintained by the Iowa Office of the State Archaeologist, as well as Wisconsin Historic Preservation Database. Both are limited-access databases of archaeological sites, historic structures, and previous archaeological surveys. In addition, historic topographic, river chart, and survey maps were consulted to identify potential impacts to historic resources.

Although these earlier surveys have identified previously recorded sites and historic structures within the Direct and Indirect APEs of the action alternatives, only small portions of the Direct and Indirect APEs have been previously surveyed for cultural resources (Kullen 2017, 2018; Kullen and House 2018; Rainka et al. 2018). As such, a comprehensive effort has not yet been made to identify all cultural resources within the APE of the action alternatives. Additional cultural resources surveys may be required.

As a result of background reviews and completed cultural resources surveys of the analysis area, as defined above, at least 31 previously recorded archaeological sites or cemeteries have been identified within the Direct APE of all action alternatives. None of the previously recorded archaeological sites or cemeteries had been previously listed or determined eligible for the NRHP. However, at least eight prehistoric mound sites and four cemeteries lie within the Direct APE of all action alternatives. In addition, 64 previously recorded historic structures, 17 historic cemeteries, and 16 Native American mound sites have been documented within the Indirect APE of the action alternatives. That includes two structures (Jones House – NPS No. 94000447; Thomas Stone Barn – NPS No. 01000299) and one archaeological site (Fort Blue Mounds NPS No. 01001044) that are listed in the NRHP, two structures that have been determined eligible for the NRHP, and 13 that have been recommended eligible for the NRHP. Native American mound sites in the vicinity of the C-HC Project 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).

3.9.1.2 TRIBAL RIGHTS AND INTERESTS

The tribal consultation process for the project is ongoing. RUS identified 57 federally recognized tribes who may have interest in activities occurring within the vicinity of the project due to presence of

Traditional Cultural Properties (TCPs) or for some other reason. TCPs are locations which are eligible for inclusion in the NRHP due to their association with a practices or beliefs of a modern community that are tied to a community's sense of history, place, or identity (Parker and King 1998). Since 2016, RUS has invited the tribes to public scoping meetings, and has asked tribal authorities to identify properties (or general areas where properties may exist) that are sensitive to the tribes. As of August 1, 2018, RUS has received responses from 11 tribes. Of these, two tribes have stated that they have no further concerns with the C-HC Project. A total of seven tribes stated that they wished to receive additional consultation, including copies of cultural resources reports and information regarding any human remains, grave goods, or other Native American cultural materials discovered prior to or during construction. Both the Ho-Chunk Nation of Wisconsin and the Yankton Sioux Tribe stated that they have identified specific TCPs, cultural sites, or sensitive tribal areas in the vicinity of the C-HC Project. The location of these TCPs, cultural sites, or sensitive tribal areas has not been disclosed to RUS; as such, potential impacts to these locations are undetermined.

3.9.1.3 OTHER CONSIDERATIONS

During the public scoping period, RUS received 39 comments detailing public concerns about project impacts on cultural resources. These included general comments about potential adverse impacts on Native American and historical sites, mounds, cemeteries, and rock art in the vicinity of the C-HC Project. Others noted specific locations of concern:

- Nelson Dewey State Park and Home Site, which is the home of Nelson Dewey, first governor of Wisconsin, located northwest of Cassville. The State Park surrounds the Nelson Dewey farm, an NRHP-listed historic property, home of the first Governor of Wisconsin from the mid-1860s until he lost his fortune in the 1870s (NPS No. 70000034 [Anderson 1970]). Noted for the Gothic architecture of some of the surrounding buildings, the main house burned in 1873, and was rebuilt in Victorian style (Anderson 1970).

- First Norwegian Lutheran Church and Cemetery. The church is no longer present, and no grave markers remain at the cemetery (Mount Horeb Area Historical Society 2018). A monument to the approximately 50 burials in the vicinity was placed at the location in 1901 and lists the dead, whose graves date to between 1847 and 1863, when the nearby Springdale Lutheran Church founded a separate cemetery.

- Taliesin, the former home and studio of famed architect Frank Lloyd Wright, which is south of the Wisconsin River near Spring Green, Wisconsin. The home forms part of a historic district surrounding a number of buildings which has been listed in the NRHP (NPS No. 73000081 [Dean 1972]).

- the Platteville "M", a large, whitewashed letter M that stands as a monument to University of Wisconsin-Platteville College of Engineering (previously the School of Mines). First constructed by students in 1937, public comments noted the important role the "M" plays in the community of Platteville.

These specific locations of concern are addressed in relation to specific, nearby action alternatives.

3.9.2 *Environmental Consequences*

The following section details anticipated impacts to cultural resources associated with the construction, operation, and maintenance of the C-HC Project. Impacts are discussed in terms of potential disturbance to previously recorded sites and historic built environment resources that are listed in, eligible for listing in, or that are assumed to be eligible for listing in the NRHP (historic properties) and predicated on a number of historic properties not previously surveyed.

3.9.2.1 DATA SOURCES, METHODS, AND ANALYSIS ASSUMPTIONS

The following impact indicators were considered when analyzing potential impacts to cultural resources:

- Number of NRHP-listed, determined eligible, or assumed eligible cultural resources/historic properties (historic and prehistoric) to be directly or indirectly affected and acres to be disturbed at each historic property.
- Qualitative descriptions of changes in skylines or other visual settings in relation to cultural sites.

To help inform the impact analysis for cultural resources, RUS used the following sources to identify potential cultural resources and determine impacts:

National Park Service. 1997. *How to Apply the National Register Criteria for Evaluation*. National Register Bulletin 15. National Park Service, U.S. Department of the Interior, Washington, D.C.

Javers, A.C. 2018. *Cultural Resources within 1,000 Feet of Hickory Creek to Iowa State Line 345 KV Transmission Line Project Centerline.* Burns and McDonnel Engineering Company, Inc., Kansas City, Missouri.

Kullen, D. 2017. *Archaeological Investigation of the Cardinal to Hickory Creek 345 kV Transmission Line Project within the Upper Mississippi River National Wildlife and Fish Refuge, Clayton County, Iowa, and Grant County, Wisconsin. Draft.* Archaeological Resources Protection Act Permit Nos. 2017-IA/3-1 and DACW25-9-17-4062. Project 100247. Burns and McDonnell Engineering Company, Inc., Kansas City, Missouri.

Kullen, D. 2018. *Archaeological Investigation of the Cardinal to Hickory Creek 345 kV Transmission Line Project within the Upper Mississippi River National Wildlife and Fish Refuge, Clayton County, Iowa: Addendum 1. Draft.* Archaeological Resources Protection Act Permit Nos. 2017-IA/3-1 and DACW25-9-17-4062. Project 100247. Burns and McDonnell Engineering Company, Inc., Kansas City, Missouri.

Kullen, D., and K. House. 2018. Desktop Review of the Hickory Creek to Iowa State Line 345kV Transmission Line Project, Clayton and Dubuque Counties, Iowa. Project 100247. Burns and McDonnel Engineering Company, Inc., Kansas City, Missouri.

Rainka, G., S. Slagor, and B. Harris. 2018. *Architecture/History Survey of the Cardinal-Hickory Creek Transmission Line Project, Dane, Iowa, Grant, and Lafayette Counties, Wisconsin.* Commonwealth Heritage Group and. Milwaukee, Wisconsin and Burns and McDonnell, Downers Grove, Illinois.

Watson, R.J. 2018. Cemetery/Burial Site Review of Proposed Route Segments American Transmission Company Cardinal Hickory Creek Project Dane, Iowa, Lafayette, and Grant counties. Commonwealth Heritage Group, Milwaukee, Wisconsin.

The above sources were used to identify all previously recorded archaeological sites, historic structures, and cemeteries within the Direct APE. Some sites situated within public ROW within Wisconsin were revisited and reassessed, when accessible. These reports also identified all previously recorded historic standing structurers, cemeteries, and archaeological sites with above ground architecture (mounds, earthworks) within the Indirect APE. In Wisconsin, some of the previously recorded historic structures were revisited in order to assess their integrity and provide recommendations for further work or NRHP eligibility. In the course of these surveys, an additional 10 historic structures were identified.

Under the NHPA, buildings, structures, objects, sites, and districts, may be eligible for listing in the NRHP if they are significant under one or all of the four following criteria found within Federal regulations at 36 CFR 60.4 (a–d):

- Criterion A. Properties may be eligible for the NRHP if they are associated with events that have made a significant contribution to broad patterns of our history. These may be single events (battles, signing of a treaty, location of a significant speech) or trends (commercial development of a town, Native American removal, the oil boom).
- Criterion B. Properties may be eligible for the NRHP if they are associated with the lives of persons significant in our past.
- Criterion C. Properties may be eligible for the NRHP if they embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.
- Criterion D. Properties may be eligible for the NRHP if they have yielded, or may be likely to yield, information important to prehistory or history.

Ordinarily, certain types of sites, such as religious properties, reconstructed or relocated buildings, birthplaces or gravesites of significant individuals, cemeteries, commemorative properties, or properties younger than 50 years old are not considered as eligible for the NRHP (36 CFR 60.4). However, in special cases, these may be eligible. For instance, if a religious property drives its primary significance from its architectural or artistic elements or historical importance, it may be eligible. A cemetery may be eligible if it houses numerous extremely important individuals, if it is extraordinarily old, if its design or style is distinctive of a specific period, or if is associated with specific historic events. In addition, in order to be eligible for the NRHP, properties must be able to convey their significance. To do so, they must maintain several or most of seven aspects of integrity (36 CFR 60.4). Certain aspects of integrity may be more important than others, depending on the site (NPS 1990:44). The seven aspects of integrity are:

- Location – the property is in the place where it was constructed or the event occurred.
- Design – the property maintains integrity of organization, proportion, and layout.
- Setting – the environment around the property maintains the character of the time in which the property played a historic role.
- Materials – the property maintains the integrity of the historic materials with which it was created.
- Workmanship – the property displays evidence of a particular group of craftspeople or technologies of a specific time.
- Feeling – the property expresses or evokes a sense of its particular place in time.
- Association – the property maintains a direct and definable link with a historic person or event.

Under Section 106 of the NHPA, agencies, in coordination with other interested parties, are required to identify the areas of potential effects to historic properties, make a reasonable and good faith attempt to identify properties that may be eligible for the NRHP, and determine if those properties are eligible. Consulting archaeologists and architectural historians often provide recommendations for eligibility, but formal determinations of eligibility are made by the Keeper of the NRHP, or in consultation between SHPOs and federal agencies (36 CFR 800.4[c][1]).

For the purposes of this impact analysis, formal determinations of eligibility have not yet occurred for the majority of resources within the analysis area. Previously identified properties that have been formally determined not eligible (n=3) or are no longer extant within the APE (n=15), have been excluded from this impact's analysis. Locations that have not received formal determinations of eligibility are treated as eligible for the NRHP and are included within this impact analysis. When available, recommendations for eligibility provided by earlier researchers are included.

Under Section 106 of the NHPA, adverse effects on historic properties occur when "an undertaking may directly or indirectly alter characteristics of a historic property that qualify it for inclusion in the Register" (36 CFR 800.5[a][1]). In the terms of NEPA, impact thresholds may be summarized as shown in Table 3.9-1.

Table 3.9-1. Impact Threshold Definitions for Cultural and Historical Resources

	Minor Impact	Moderate Impact	Major Impact
Cultural and Historical Resources	Impacts would occur, but cultural resources would retain existing characteristics that make them eligible for the NRHP.	Impacts and alterations would occur, but overall, cultural resources would partially retain characteristics that make them eligible for the NRHP, or impacts would alter the characteristics that make them eligible for the NRHP.	Impacts would occur, that overall would substantially alter or destroy characteristics of cultural resources that make them eligible for the NRHP.

If moderate or major impacts to a historic property are identified, steps must be taken, in consultation with the Federal agencies, SHPO, other consulting parties, and potentially, the Advisory Council on Historic Preservation, to avoid, minimize, or mitigate the adverse effects. Avoidance and minimization may include changing construction parameters, instituting more restrictive BMPs, or other administrative or engineering controls. Mitigation of effects may include intensive investigations to glean all significant data from affected portions of the resource, or other more far-ranging programs such as purchase and preservation of other historic resources, creation of preservation easements, documentation of resources outside the area of effect, or even development of research or education programs related to historic preservation.

3.9.2.2 NO ACTION

Under the No Action Alternative, the C-HC Project would not be constructed. The existing environment in the analysis area would remain the same. Existing transmission lines would remain in place, but no new development would occur. No impacts to cultural resources would be expected.

3.9.2.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

Ground disturbance during construction is expected with all action alternatives and may result in damage to or loss of integrity of cultural resources within the Direct 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 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. Ground disturbance would be limited to the project corridor, access roads, laydown yards, and substation locations. Mechanized ROW clearing and grubbing would be considered a potential impact within wooded portions of the project corridor. Rutting and compaction of soils could occur wherever heavy equipment was mobilized. Construction impacts at pole locations would be much deeper, extending to the depth of footing installation. Grading, excavation, and filling would occur within access road and laydown yard locations. At the Hill Valley Substation, impacts would include grading, excavation, filling, rutting, and compaction. The number and types of cultural and historic resources affected would vary by alternative, and these impacts are presented below under each action alternative.

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. The number and type of properties affected would vary by alternative.

All six of the action alternatives follow the same corridor for approximately 0.9 miles near the community of Turkey River, Iowa. Archaeological sites 13CT4, 13CT3, and 13CT2 lie within the Direct APE of the project (Kullen and House 2018). All three sites are reported as prehistoric mound groups, but none has been formally determined eligible for the NRHP. However, all three 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).

In addition, within this same transmission line segment, one prehistoric mound site (13CT10) lies within the Indirect APE of Project. The site has not been formally determined eligible for the NRHP. The C-HC Project could result in minor to moderate impacts to this property, depending on the steps taken, in consultation with the Federal agencies, SHPO, other consulting parties, to avoid, minimize, or mitigate the adverse effects.

All six of the action alternatives again share the same corridor approximately 1 mile north of the Hickory Creek Substation in Iowa. Within this segment, one historic structure, 31-00306, lies within the Indirect APE of the C-HC Project. This structure, identified as a smokehouse of unknown age, has not been formally determined eligible for the NRHP, and is therefore assumed to be eligible for the purposes of this assessment.

Impacts at laydown yards, which would be common to all action alternatives, have not been evaluated. A cultural resources survey of all proposed laydown yards in consultation with the Iowa and/or Wisconsin SHPOs would be required prior to construction activity. In addition, no previously recorded sites are recorded within the proposed Hill Valley Substation locations; an attempt to identify potential cultural resources within the proposed substation locations would be required in consultation with the Wisconsin SHPO.

3.9.2.4 ALTERNATIVE 1

3.9.2.4.1 DIRECT APE

In addition to the sites impacted by all action alternatives, at least six assumed eligible cultural resources are present within the Direct APE of Alternative 1 (Table 3.9-2). This includes five archaeological sites and one historic cemetery. Within the archaeological sites, four contain prehistoric cultural materials and one contains historic materials. None of the potential cultural resources have been formally determined eligible for the NRHP.

Preliminary information and eligibility recommendations are available for some of these sites. Three sites were revisited in the course of preliminary studies for the C-HC Project, and no cultural materials were identified within the accessible portion of the project corridor. Resources may be present outside the accessible portion of project corridor.

Of note is the site of Wolenec (47IA0067/ BIA0115), a prehistoric campsite and mound site that may be eligible for the NRHP under the MPS, Prehistoric Mounds of the Quad State Region of the Upper Mississippi Valley (Stanley and Stanley 1988), and the Millville Pioneer Cemetery, which may hold as many as 80 graves, but which has not been formally defined or evaluated. Cemeteries may be eligible for the NRHP if they are extraordinarily old or associated with a specific time period. Interments are also protected from disturbance under Wisconsin and Iowa statutes. As formal determinations of eligibility are not provided, all properties are assumed eligible for listing in the NRHP. RUS, in coordination with the Iowa/Wisconsin SHPO and other interested parties, would formally determine NRHP eligibility of these potential historic properties prior to construction.

Under Alternative 1, the C-HC 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 SHPOs and other consulting parties, would identify steps to avoid, minimize, or mitigate the adverse effects to these sites, thereby diminishing the severity of impacts.

Table 3.9-2. Impacted Cultural Resources within the Direct APE of Alternative 1

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	Intersects/ Adjacent	NRHP Status/ Recommendations
Millville Pioneer Cemetery	N/A	IA	Clayton	Cemetery	At least 80 graves, dating to early founding	No	Intersects	Undetermined
13DB1043	N/A	IA	Dubuque	Historic farmstead	Late nineteenth to twentieth century	No	Adjacent	Undetermined, recommended not eligible
47GT0158	Withington Fluted Point Site	WI	Grant	Prehistoric lithic scatter	Lithic scatter	Yes	Intersects	Undetermined, possibly misplotted
47IA0067/ BIA0115	Wolenec	WI	Iowa	Prehistoric Campsite/ mound site	Multiple mounds, possible earthworks	Yes	Intersects	Undetermined, no resources identified in corridor
47DA1083	Charlie's House	WI	Dane	Prehistoric lithic scatter	Non-diagnostic lithic material	Yes	Adjacent	Undetermined, no resources identified in corridor
47DA0668	Twin Valley	WI	Dane	Prehistoric lithic scatter	Unknown	No	Adjacent	Undetermined

3.9.2.4.2 INDIRECT APE

In addition to the sites impacted by all action alternatives, a total of 18 aboveground, assumed eligible resources lie within the Indirect APE of Alternative 1 (Table 3.9-3). This includes seven historic structures, five historic cemeteries, and six prehistoric burial sites. Three of the prehistoric burial sites are recorded as mound sites. Of these resources, none has been formally determined eligible for the NRHP.

Preliminary information and eligibility recommendations are available for some sites. Six of the historic structures were visited in the course of preliminary studies for the C-HC Project. Based on this preliminary review, six were recommended not eligible for the NRHP. The seventh structure, Meadowvale School (236277) was recommended eligible for the NRHP. The five historic cemeteries and three non-mound prehistoric burial sites lie within the Indirect APE. These sites have not been evaluated for the NRHP but may be eligible if they are extraordinarily old or associated with a specific time period. RUS, in coordination with the Iowa SHPO, Wisconsin SHPO, and other interested parties, would formally evaluate these potential historic properties prior to construction. Long-term impacts to the properties within the Indirect APE are currently unknown but may be assumed to be adverse and moderate if the properties maintain integrity of feeling or setting and these aspects contribute to their significance.

Table 3.9-3. Impacted Cultural Resources within the Indirect APE of Alternative 1

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	NRHP Status/ Recommendations
47GT0022/ BGT0326	Dewey Mound Group 2	WI	Grant	Prehistoric mound group	Unknown	No	Undetermined
47GT0754	Boundary Mounds	WI	Grant	Prehistoric mound group	Unknown	No	Undetermined
47GT0792/ BGT0420	Rattlesnake Valley	WI	Grant	Prehistoric burials	Unknown	No	Undetermined
47GT0113/ BGT0350	Glassmaker Mounds	WI	Grant	Multicomponent site with mounds	Unknown	No	Undetermined
47GT0778/ GBT0407	Angles	WI	Grant	Prehistoric burials	Unknown	No	Undetermined
47GT0779/ BGT0408	Voltage View	WI	Grant	Prehistoric burials	Unknown	No	Undetermined
BGT0077	Pigeon Cemetery	WI	Grant	Historic cemetery	Unknown	No	Undetermined
BIA0033	Cutts Cemetery	WI	Grant	Historic cemetery	Unknown	No	Undetermined
47DA1270/ BDA0020	Old Peculiar Burying Ground	WI	Dane	Historic cemetery	Unknown	No	Undetermined
BDA0228	Original Vermont Lutheran Church Cemetery	WI	Dane	Historic cemetery	Unknown	No	Undetermined
BDA0044	Vermont Lutheran Church Cemetery	WI	Dane	Historic cemetery	Unknown	No	Undetermined
47291	House	WI	Iowa	Historic house	1½ story gabled ell building on a stone foundation	Yes	Undetermined, recommended not eligible
47284	House	WI	Iowa	Historic house	Updates to siding, windows, roof sheathing	Yes	Undetermined, recommended not eligible
47297	House	WI	Iowa	Historic house	ca. 1950 1-story Contemporary	Yes	Undetermined, recommended not eligible
4758	Vermont Lutheran Church	WI	Dane	Historic church	Modern additions to front, replacement windows	Yes	Undetermined, recommended not eligible
4789	Berry Haney Tavern	WI	Dane	Historic tavern	Modern additions, porch alterations, replacement sidings and windows	Yes	Undetermined, recommended not eligible
236277	Meadowvale School	WI	Iowa	Historic School	1864 schoolhouse, privy, and shed	Yes	Undetermined, recommended eligible
47GT0753	BM-ND-2	WI	Grant	Historic farmstead	Structure pads, walls, and vegetation	No	Undetermined, recommended not eligible

3.9.2.4.3 OTHER CONSIDERATIONS

Identified as a potential concern during public scoping, Nelson Dewey State Park and Home Site lies approximately 3,100 feet northwest of Alternative 1. As the home and historic district lie outside the defined Indirect APE, no visual impact on the property is expected.

In addition, Taliesin, home and studio of famed architect Frank Lloyd Wright, is approximately 3.8 miles north of Alternative 1. As the site lies outside the defined Indirect APE, visual impacts on the property are not expected.

3.9.2.5 ALTERNATIVE 2

3.9.2.5.1 DIRECT APE

In addition to the sites impacted by all action alternatives, at least five assumed eligible cultural resources are present within the Direct APE of Alternative 2 (Table 3.9-4). This includes four archaeological sites and one historic cemetery. Within the archaeological sites, three contain prehistoric cultural materials and one contains historic materials. None of the potential cultural resources have been formally determined eligible for the NRHP.

Preliminary information and eligibility recommendations are available for some of these sites. Three sites were revisited in the course of preliminary studies for the C-HC Project, and no cultural materials were identified within the accessible portion of the project corridor. Resources may be present outside the accessible portion of project corridor.

Of note is the site of Wolenec (47IA0067 / BIA0115), a prehistoric campsite and mound site that may be eligible for the NRHP under the MPS, *Prehistoric Mounds of the Quad State Region of the Upper Mississippi Valley* (Stanley and Stanley 1988). Cemeteries may be eligible for the NRHP if they are extraordinarily old or associated with a specific time period. Interments are also protected from disturbance under Wisconsin and Iowa statutes. As formal determinations of eligibility are not provided, all properties are assumed eligible for listing in the NRHP. RUS, in coordination with the Iowa/Wisconsin SHPO and other interested parties, would formally determine NRHP eligibility of these potential historic properties prior to construction.

Under Alternative 2, the C-HC Project could result in minor to moderate impacts to the cultural resources within the APE, if determined eligible for listing in the NRHP. The Federal agencies, in coordination with SHPOs and other consulting parties, would identify steps to avoid, minimize, or mitigate the adverse effects to these sites, thereby diminishing the severity of impacts.

Table 3.9-4. Impacted Cultural Resources within the Direct APE of Alternative 2

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	Intersects/ Adjacent	NRHP Status/ Recommendations
Goshen Cemetery	N/A	IA	Clayton	Historic cemetery	200+ interments, dating to 1860s to present	No	Adjacent	Undetermined
13DB1040	N/A	IA	Dubuque	Historic farmstead	Late nineteenth to twentieth century	No	Adjacent	Undetermined, recommended not eligible
47GT0158	Withington Fluted Point Site	WI	Grant	Prehistoric lithic scatter	Lithic scatter	Yes	Intersects	Undetermined, possibly misplotted

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	Intersects/ Adjacent	NRHP Status/ Recommendations
47IA0067/ BIA0115	Wolenec	WI	Iowa	Prehistoric campsite/ mound site	Multiple mounds, possible earthworks	Yes	Intersects	Undetermined, no resources identified in corridor
47DA1083	Charlie's House	WI	Dane	Prehistoric lithic scatter	Non-diagnostic lithic material	Yes	Adjacent	Undetermined, no resources identified in corridor

3.9.2.5.2 INDIRECT APE

In addition to the sites impacted by all action alternatives, a total of 29 aboveground, assumed eligible resources lie within the Indirect APE of Alternative 2 (Table 3.9-5). This includes 17 historic structures, five historic cemeteries, six prehistoric burial sites, and one multicomponent site (featuring historic materials and prehistoric burials). Four of the prehistoric burial sites are recorded as mound sites. Of these resources, none has been formally determined eligible for the NRHP.

Preliminary information exists for 15 of the 17 historic sites/structures that were visited in the course of preliminary studies for the C-HC Project. Based on this preliminary review, 10 were recommended eligible for the NRHP and five were recommended not eligible for the NRHP. In addition, one of the previously recorded sites has been previously recommended eligible for the NRHP.

Sites and structures that were recommended as eligible include site 13DB1037, a historic blacksmith shop, Meadowvale School (236277), St. Charles Borromeo Catholic Church (2362778), the Klindt-Geiger Canning Company (2362779), and a set of seven historic homes in downtown Cassville, Wisconsin (44243 and 236270–236275). Additionally, all four mound sites may be eligible for the NRHP under the MPS, *Prehistoric Mounds of the Quad State Region of the Upper Mississippi Valley* (Stanley and Stanley 1988). The five historic cemeteries and two non-mound prehistoric burial sites may be eligible for the NRHP if they are extraordinarily old or associated with a specific time period. RUS, in coordination with the Iowa/Wisconsin SHPO and other interested parties, would formally evaluate these potential historic properties prior to construction. Long-term impacts to the properties within the Indirect APE are currently unknown but may be assumed to be adverse and moderate if the properties currently maintain integrity of feeling or setting and these aspects contribute to their significance.

Table 3.9-5. Impacted Cultural Resources within the Indirect APE of Alternative 2

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	NRHP Status/ Recommendations
13CT70	Smith Mound Group II	IA	Clayton	Prehistoric mound group	Woodland period	No	Undetermined
13DB1037	N/A	IA	Dubuque	Historic blacksmith	Nineteenth century	No	Undetermined, recommended eligible
13DB1093	N/A	IA	Dubuque	Historic farmstead	Late nineteenth century to present	No	Undetermined
47GT0032/ BGT0238	Riverside Park Mounds	WI	Grant	Prehistoric mound group	Unknown	No	Undetermined
47GT0037/ BGT0241	Geiger Group	WI	Grant	Prehistoric mound group	Unknown	No	Undetermined
47GT0792/ BGT0420	Rattlesnake Valley	WI	Grant	Prehistoric burials	Unknown	No	Undetermined

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	NRHP Status/ Recommendations
47GT0113/ BGT0350	Glassmaker mounds	WI	Grant	Multicomponent site with mounds	Unknown	No	Undetermined
47GT0778/ GBT0407	Angles	WI	Grant	Prehistoric burials	Unknown	No	Undetermined
47GT0779/ BGT0408	Voltage View	WI	Grant	Prehistoric burials	Unknown	No	Undetermined
BGT0077	Pigeon Cemetery	WI	Grant	Historic cemetery	Unknown	No	Undetermined
BIA0033	Cutts Cemetery	WI	Grant	Historic cemetery	Unknown	No	Undetermined
47DA1270/ BDA0020	Old Peculiar Burying Ground	WI	Dane	Historic cemetery	Unknown	No	Undetermined
BDA0228	Original Vermont Lutheran Church Cemetery	WI	Dane	Historic cemetery	Unknown	No	Undetermined
BDA0044	Vermont Lutheran Church Cemetery	WI	Dane	Historic cemetery	Unknown	No	Undetermined
44243	House	WI	Grant	Historic house	Italianate style	Yes	Undetermined, recommended eligible (with 236270-236275)
236270	House	WI	Grant	Historic house	Italianate style	Yes	Undetermined, recommended eligible (with 236270-236275)
236271	House	WI	Grant	Historic house	Second Empire style	Yes	Undetermined, recommended eligible (with 236270-236275)
236272	House	WI	Grant	Historic house	Folk Victorian style	Yes	Undetermined, recommended eligible (with 236270-236275)
236273	House	WI	Grant	Historic house	American Foursquare style	Yes	Undetermined, recommended eligible (with 236270-236275)
236274	House	WI	Grant	Historic house	Queen Anne Victorian Style	Yes	Undetermined, recommended eligible (with 236270-236275)
236275	House	WI	Grant	Historic house	American Foursquare style	Yes	Undetermined, recommended eligible (with 236270-236275)
236277	Meadowvale School	WI	Iowa	Historic school	1864 schoolhouse, privy, and shed	Yes	Undetermined, recommended eligible
2362778	St. Charles Borromeo Catholic Church	WI	Grant	Historic church	1889 Victorian Gothic church	Yes	Undetermined, recommended eligible
236279	Klindt-Geiger Canning Co.	WI	Grant	Historic industrial	ca. 1890 2-story industrial facility	Yes	Undetermined, recommended eligible
47291	House	WI	Iowa	Historic house	1½ story gabled ell building on a stone foundation	Yes	Undetermined, recommended not eligible

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	NRHP Status/ Recommendations
47284	House	WI	Iowa	Historic house	Updates to siding, windows, roof sheathing	Yes	Undetermined, recommended not eligible
47297	House	WI	Iowa	Historic house	ca. 1950 1-story Contemporary	Yes	Undetermined, recommended not eligible
4758	Vermont Lutheran Church	WI	Dane	Historic church	Modern additions to front, replacement windows	Yes	Undetermined, recommended not eligible
4789	Berry Haney Tavern	WI	Dane	Historic tavern	Modern additions, porch alterations, replacement sidings and windows	Yes	Undetermined, recommended not eligible

3.9.2.5.3 OTHER CONSIDERATIONS

Identified as a potential concern during public scoping, Taliesin, home and studio of famed architect Frank Lloyd Wright, is approximately 3.8 miles north of Alternative 2. As the site lies outside the defined Indirect APE, visual impacts on the property are not expected.

3.9.2.6 ALTERNATIVE 3

3.9.2.6.1 DIRECT APE

In addition to the sites impacted by all action alternatives, at least 12 assumed eligible cultural resources are present within the Direct APE of Alternative 3 (Table 3.9-6). This includes 11 archaeological sites and one historic cemetery. Within the archaeological sites, eight contain prehistoric cultural materials and three contain historic materials. None of the potential cultural resources have been formally determined eligible for the NRHP.

Preliminary information and eligibility recommendations are available for some of these sites. Five sites were revisited in the course of preliminary studies for the C-HC Project, and no cultural materials were identified within the accessible portion of the project corridor. Resources may be present outside the accessible portion of the project corridor. Of note are Udelhoffen Mounds (47GT0437 / BGT0187), Wolenec (47IA0067 / BIA0115), Murphy Enclosure (47GT0089), and the Triumvirate site (47GT0788 / BGT0417, all of which may have had prehistoric age burial mounds or earthworks, and that may be eligible for the NRHP under the MPS, *Prehistoric Mounds of the Quad State Region of the Upper Mississippi Valley* (Stanley and Stanley 1988). The alternative also crosses the Millville Pioneer Cemetery, which may hold as many as 80 graves, but which has not been formally defined or evaluated. Cemeteries may be eligible for the NRHP if they are extraordinarily old or associated with a specific time period. Interments are also protected from disturbance under Wisconsin and Iowa statutes. As formal determinations of eligibility are not provided, all properties are assumed eligible for listing in the NRHP. RUS, in coordination with the Iowa/Wisconsin SHPO and other interested parties, would formally determine NRHP eligibility of these potential historic properties prior to construction.

Under Alternative 3, the C-HC Project could result in minor to moderate impacts to the cultural resources within the APE, if determined eligible for listing in the NRHP. The Federal agencies, in coordination with

SHPOs and other consulting parties, would identify steps to avoid, minimize, or mitigate the adverse effects to these sites, thereby diminishing the severity of impacts.

Table 3.9-6. Impacted Cultural Resources within the Direct APE of Alternative 3

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	Intersects/ Adjacent	NRHP Status/ Recommendations
Millville Pioneer Cemetery	N/A	IA	Clayton	Cemetery	At least 80 graves, dating to early founding	No	Intersects	Undetermined
13DB1043	N/A	IA	Dubuque	Historic farmstead	Late nineteenth to twentieth century	No	Adjacent	Undetermined, recommended not eligible
47GT0437/ BGT0187	Udelhoffen Mounds	WI	Grant	Prehistoric Burial Mounds	Sixteen reported on ridge crest	No	Intersects	Undetermined, recommended eligible
47IA0067/ BIA0115	Wolenec	WI	Iowa	Prehistoric campsite/ mound site	Multiple mounds, possible earthworks	Yes	Intersects	Undetermined, no resources identified in corridor
47DA1083	Charlie’s House	WI	Dane	Prehistoric lithic scatter	Non-diagnostic lithic material	Yes	Adjacent	Undetermined, no resources identified in corridor
47GT0788/ BG0417	Triumvirate Site	WI	Grant	Prehistoric burial mound group	Three or more conical mounds	No	Intersects	Undetermined, recommended eligible
47GT0665	Emery Lead Furnace	WI	Grant	Historic industrial site	Lead smelting furnace location interpreted from historic records	Yes	Intersects	Undetermined, no resources identified in corridor. Recommended not eligible
47GT0089	Murphy Enclosures	WI	Grant	Prehistoric earthworks	Earthen enclosure somewhere within 320-acre plot	Yes	Intersects	Undetermined, recommended not eligible within corridor
					Location from informant interview	Yes	Intersects	Undetermined, recommended not eligible within survey corridor
47GT0090	Gardner Camp	WI	Grant	Prehistoric campsite/ village	Location from informant interview	Yes	Intersects	Undetermined, recommended not eligible within survey corridor
47GT0685	Bellmeyer 1	WI	Grant	Prehistoric isolated find	Single galena chert secondary flake	No	Adjacent	Undetermined, recommended not eligible
47GT0687	Bellmeyer 3	WI	Grant	Historic artifact scatter	Brick fragments, whiteware, nails	No	Adjacent	Undetermined, recommended not eligible
47DA0668	Twin Valley	WI	Dane	Prehistoric lithic scatter	Unknown	No	Adjacent	Undetermined

3.9.2.6.2 INDIRECT APE

In addition to the sites impacted by all action alternatives, a total of 37 aboveground, assumed eligible resources lie within the Indirect APE of Alternative 3 (

Table 3.9-7). This includes 22 historic structures, seven historic cemeteries, and eight prehistoric burial sites. All eight of the prehistoric burial sites are recorded as mound sites. Of these resources, none has been formally determined eligible for the NRHP.

Preliminary information and eligibility recommendations are available for some of these sites. Of the 22 historic sites/structures, all were visited in the course of preliminary studies for the C-HC Project. Based on this preliminary review, nine were recommended eligible for the NRHP, and 13 were recommended not eligible for the NRHP. Sites and structures that were recommended as eligible include St. Charles Borromeo Catholic Church (2362778), the Klindt-Geiger Canning Company (2362779), and a set of seven historic homes in downtown Cassville, Wisconsin (44243 and 236270–236275). Additionally, the eight mound sites may be eligible for the NRHP under the MPS, *Prehistoric Mounds of the Quad State Region of the Upper Mississippi Valley* (Stanley and Stanley 1988). The seven historic cemeteries may be eligible for the NRHP if they are extraordinarily old or associated with a specific time period. As formal determinations of eligibility are not provided, all properties are assumed eligible for listing in the NRHP. RUS, in coordination with the Iowa/Wisconsin SHPO and other interested parties, would formally determine NRHP eligibility of these potential historic properties prior to construction. Long-term impacts to the properties within the Indirect APE are currently unknown but may be assumed to be adverse and moderate if the properties currently maintain integrity of feeling or setting and these aspects contribute to their significance.

Table 3.9-7. Impacted Cultural Resources within the Indirect APE of Alternative 3

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	NRHP Status/ Recommendations
47GT0032/ BGT0238	Riverside Park Mounds	WI	Grant	Prehistoric mound group	Unknown	No	Undetermined
47GT0037/ BGT0241	Geiger Group	WI	Grant	Prehistoric mound group	Unknown	No	Undetermined
BGT0029	St. Charles Catholic Cemetery	WI	Grant	Historic cemetery	Unknown	No	Undetermined
BGT0028	Cassville Seventh Adventist Cemetery	WI	Grant	Historic cemetery	Unknown	No	Undetermined
47GT0403/ BGT0188	Schupper Mounds	WI	Grant	Prehistoric mound group	Unknown	No	Undetermined
47GT0784/ BGT0415	Horseshoe Bench	WI	Grant	Prehistoric mound	Unknown	No	Undetermined
47GT0436/ BGT0186	Eckstein Ploessl Mounds	WI	Grant	Prehistoric mound group	Unknown	No	Undetermined
47GT0782/ BGT0412	Guardians of the Gate	WI	Grant	Prehistoric mound	Unknown	No	Undetermined
47GT0434/ BGT0411	Eckstein 1 Mounds	WI	Grant	Prehistoric mound ground	Unknown	No	Undetermined
47GT0727/ BGT0001	Burton Cemetery	WI	Grant	Historic cemetery	Unknown	No	Undetermined

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	NRHP Status/ Recommendations
47GT0441/ GBT0183	Eugene Reynolds Mound	WI	Grant	Prehistoric mound	Unknown	No	Undetermined
BIA0033	Cutts Cemetery	WI	Grant	Historic cemetery	Unknown	No	Undetermined
47DA1270/ BDA0020	Old Peculiar Burying Ground	WI	Dane	Historic cemetery	Unknown	No	Undetermined
BDA0228	Original Vermont Lutheran Church Cemetery	WI	Dane	Historic cemetery	Unknown	No	Undetermined
BDA0044	Vermont Lutheran Church Cemetery	WI	Dane	Historic cemetery	Unknown	No	Undetermined
44243	House	WI	Grant	Historic house	Italianate style	Yes	Undetermined, recommended eligible (with 236270-236275)
43629	Burton General Store	WI	Grant	Historic commercial	1904 Wood-frame, front-gabled store	Yes	Undetermined, recommended not eligible
43603	House	WI	Grant	Historic house	Modern alterations to siding, windows, roof sheathing, and porch	Yes	Undetermined, recommended not eligible
220502	House	WI	Grant	Historic house	Modern alterations to roof sheathing, windows, front entry	Yes	Undetermined, recommended not eligible
55762	Sanders House	WI	Grant	Historic house	Modern alterations to siding, roof sheathing, floorplan	Yes	Undetermined, recommended not eligible
43573	House	WI	Grant	Historic house	Modern alterations to windows, historic fabric	Yes	Undetermined, recommended not eligible
43575	House	WI	Grant	Historic house	Modern alterations to windows, porch	Yes	Undetermined, recommended not eligible
64645	House	WI	Grant	Historic house	Modern alterations to windows, roof sheathing, floorplan	Yes	Undetermined, recommended not eligible
64652	House	WI	Iowa	Historic house	Modern alterations to windows, siding, façade	Yes	Undetermined, recommended not eligible
47291	House	WI	Iowa	Historic house	1 and ½ story gabled ell building on a stone foundation	Yes	Undetermined, recommended not eligible
47284	House	WI	Iowa	Historic house	Updates to siding, windows, roof sheathing	Yes	Undetermined, recommended not eligible
47297	House	WI	Iowa	Historic house	ca. 1950 1-story Contemporary	Yes	Undetermined, recommended not eligible
4758	Vermont Lutheran Church	WI	Dane	Historic church	Modern additions to front, replacement windows	Yes	Undetermined, recommended not eligible

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	NRHP Status/ Recommendations
4789	Berry Haney Tavern	WI	Dane	Historic tavern	Modern additions, porch alterations, replacement sidings and windows	Yes	Undetermined, recommended not eligible
236270	House	WI	Grant	Historic house	Italianate style	Yes	Undetermined, recommended eligible (with 236270-236275)
236271	House	WI	Grant	Historic house	Second Empire style	Yes	Undetermined, recommended eligible (with 236270-236275)
236272	House	WI	Grant	Historic house	Folk Victorian style	Yes	Undetermined, recommended eligible (with 236270-236275)
236273	House	WI	Grant	Historic house	American Foursquare style	Yes	Undetermined, recommended eligible (with 236270-236275)
236274	House	WI	Grant	Historic house	Queen Anne Victorian Style	Yes	Undetermined, recommended eligible (with 236270-236275)
236275	House	WI	Grant	Historic house	American Foursquare style	Yes	Undetermined, recommended eligible (with 236270-236275)
236278	St. Charles Borromeo Catholic Church	WI	Grant	Historic church	1889 Victorian Gothic church	Yes	Undetermined, recommended eligible
236279	Klindt-Geiger Canning Co.	WI	Grant	Historic industrial	ca. 1890 2-story industrial facility	Yes	Undetermined, recommended eligible

3.9.2.6.3 OTHER CONSIDERATIONS

Identified as a potential concern during public scoping, the Platte Mound "M" lies approximately 1.25 miles west of Alternative 3. As the "M" lies on the west side of Platte Mound from Alternative 3 and is outside the defined Indirect APE, visual impacts on the property are not expected.

In addition, Taliesin, home and studio of famed architect Frank Lloyd Wright, is approximately 3.8 miles north of Alternative 3. As the site lies outside the defined Indirect APE, visual impacts on the property are not expected.

3.9.2.7 ALTERNATIVE 4

3.9.2.7.1 DIRECT APE

In addition to the sites impacted by all action alternatives, at least 18 assumed eligible cultural resources are present within the Direct APE of Alternative 4 (Table 3.9-8). This includes 17 archaeological sites and one historic cemetery. Within the archaeological sites, six contain prehistoric cultural materials, 10 contain historic materials, and one features both prehistoric and historic materials. None of the potential cultural resources have been formally determined eligible for the NRHP.

Preliminary information and eligibility recommendations are available for some of these sites. Six sites were revisited in the course of preliminary studies for the C-HC Project, and no cultural materials were identified within the accessible portion of the project corridor at four of the sites. Two sites yielded very light scatters of historic artifacts. Resources may be present outside the accessible portion of project corridor.

Of note are Udelhoffen Mounds (47GT0437/ BGT0187), Murphy Enclosure (47GT0089), and the Triumvirate site (47GT0788/ BGT0417), all of which may have had prehistoric age burial mounds or earthworks, and that may be eligible for the NRHP under the MPS, *Prehistoric Mounds of the Quad State Region of the Upper Mississippi Valley* (Stanley and Stanley 1988). The alternative intersects Gomers (47IA0061), a historic mine site which has been recommended as eligible for the NRHP. The alternative also crosses the Millville Pioneer Cemetery, which may hold as many as 80 graves, but which has not been formally defined or evaluated. Cemeteries may be eligible for the NRHP if they are extraordinarily old or associated with a specific time period. Interments are also protected from disturbance under Wisconsin and Iowa statutes. As formal determinations of eligibility are not provided, all properties are assumed eligible for listing in the NRHP. RUS, in coordination with the Iowa/Wisconsin SHPO and other interested parties, would formally evaluate these potential historic properties prior to construction.

Under Alternative 4, the C-HC Project could result in minor to moderate impacts to the cultural resources within the APE, if determined eligible for listing in the NRHP. The Federal agencies, in coordination with SHPOs and other consulting parties, would identify steps to avoid, minimize, or mitigate the adverse effects to these sites, thereby diminishing the severity of impacts.

Table 3.9-8. Impacted Cultural Resources within the Direct APE of Alternative 4

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	Intersects/ Adjacent	NRHP Status/ Recommendations
Millville Pioneer Cemetery	N/A	IA	Clayton	Cemetery	At least 80 graves, dating to early founding	No	Intersects	Undetermined
13DB1043	N/A	IA	Dubuque	Historic farmstead	Late nineteenth to twentieth century	No	Adjacent	Undetermined, recommended not eligible
47GT0437/ BGT0187	Udelhoffen Mounds	WI	Grant	Prehistoric Burial Mounds	Sixteen reported on ridge crest	No	Intersects	Undetermined, recommended eligible
47GT0788/ BG0417	Triumvirate Site	WI	Grant	Prehistoric burial mound group	Three or more conical mounds	No	Intersects	Undetermined, recommended eligible
47GT0665	Emery Lead Furnace	WI	Grant	Historic industrial site	Lead smelting furnace location interpreted from historic records	Yes	Intersects	Undetermined, Recommended not eligible
47GT0089	Murphy Enclosure	WI	Grant	Prehistoric earthworks	Earthen enclosure somewhere within 320 acre plot	Yes	Intersects	Undetermined, recommended not eligible within corridor
47GT0090	Gardner Camp	WI	Grant	Prehistoric campsite/ village	Location from informant interview	Yes	Intersects	Undetermined, recommended not eligible within corridor

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	Intersects/ Adjacent	NRHP Status/ Recommendations
47GT0685	Bellmeyer 1	WI	Grant	Prehistoric isolated find	Single galena chert secondary flake	No	Adjacent	Undetermined, recommended not eligible
47GT0687	Bellmeyer 3	WI	Grant	Historic artifact scatter	Brick fragments, whiteware, nails	No	Adjacent	Undetermined, recommended not eligible
47IA0416	Williams Diggins	WI	Iowa	Multi-component quarry	Tailings, pits, scattered rock	No	Intersects	Undetermined
47IA0061	Gomers	WI	Iowa	Historic mine site	Historic foundations, pits, and tailings piles	No	Intersects	Undetermined, recommended eligible
47IA0488	W-0322-04	WI	Iowa	Historic farmstead	Unknown	No	Intersects	Undetermined, recommended not eligible
47IA0487	W-0322-03	WI	Iowa	Historic mining area	Spoil pile	No	Adjacent	Undetermined, recommended not eligible
47IA0438	Ridge Pits	Wi	Iowa	Historic mining area	Mining pits	No	Adjacent	Undetermined, recommended not eligible
47IA0506	W-0322-08-2011	WI	Iowa	Historic artifact scatter	Unknown	Yes	Intersects	Undetermined, no resources identified in corridor
47IA0418	Ghost House Farm	WI	Iowa	Historic farmstead	Wood-framed house, concrete foundations,	Yes	Intersects	Undetermined, recommended not eligible
47IA0503	W-0322-04-2011	WI	IA	Historic farmstead	Artifact scatter with no structural remains	Yes	Intersects	Undetermined, recommended not eligible
47DA0668	Twin Valley	WI	Dane	Prehistoric lithic scatter	Unknown	No	Adjacent	Undetermined

3.9.2.7.2 INDIRECT APE

In addition to the sites impacted by all action alternatives, a total of three aboveground, NRHP-listed, and 46 assumed eligible resources lie within the Indirect APE of Alternative 4 (Table 3.9-9). This includes 32 historic structures, seven historic cemeteries, nine prehistoric burial sites, and one historic archaeological site. All nine of the prehistoric burial sites are recorded as mound sites. Of these resources, two historic structures (David and Maggie Jones House and the Thomas Stone Barn) and the historic archaeological site (Fort Blue Mounds) have been listed in the NRHP.

Preliminary information and eligibility recommendations are available for some of these sites. Of the other 30 historic structures, all were visited in the course of preliminary studies for the C-HC Project. Based on these preliminary reviews, 10 were recommended as eligible for the NRHP and 20 were recommended not eligible for the NRHP. Sites and structures that were recommended eligible include St. Charles Borromeo Catholic Church (2362778), the Klindt-Geiger Canning Company (2362779), Meadowvale School (236277), and a set of seven historic homes in downtown Cassville, Wisconsin (44243 and 236270–236275). Additionally, all nine mound sites may be eligible for the NRHP under the MPS, *Prehistoric Mounds of the Quad State Region of the Upper Mississippi Valley* (Stanley and Stanley 1988). The six historic cemeteries may be eligible for the NRHP if they are extraordinarily old or associated with a specific time period. As formal determinations of eligibility are not provided, all properties are assumed eligible for listing in the NRHP. RUS, in coordination with the Iowa/Wisconsin

SHPO and other interested parties, would formally determine NRHP eligibility of these potential historic properties prior to construction. Long-term impacts to the properties within the Indirect APE are currently unknown but may be assumed to be adverse and moderate if the properties currently maintain integrity of feeling or setting and these aspects contribute to their significance.

Table 3.9-9. Impacted Cultural Resources within the Indirect APE of Alternative 4

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	NRHP Status/ Recommendations
47GT0032/ BGT0238	Riverside Park Mounds	WI	Grant	Prehistoric mound group	Unknown	No	Undetermined
47GT0037/ BGT0241	Geiger Group	WI	Grant	Prehistoric mound group	Unknown	No	Undetermined
BGT0029	St. Charles Catholic Cemetery	WI	Grant	Historic cemetery	Unknown	No	Undetermined
BGT0028	Cassville Seventh Adventist Cemetery	WI	Grant	Historic cemetery	Unknown	No	Undetermined
47GT0403/ BGT0188	Schupper Mounds	WI	Grant	Prehistoric mound group	Unknown	No	Undetermined
47GT0784/ BGT0415	Horseshoe Bench	WI	Grant	Prehistoric mound	Unknown	No	Undetermined
47GT0436/ BGT0186	Eckstein Ploessl Mounds	WI	Grant	Prehistoric mound group	Unknown	No	Undetermined
47GT0782/ BGT0412	Guardians of the Gate	WI	Grant	Prehistoric mound	Unknown	No	Undetermined
47GT0434/ BGT0411	Eckstein 1 Mounds	WI	Grant	Prehistoric mound ground	Unknown	No	Undetermined
47GT0727/ BGT0001	Burton Cemetery	WI	Grant	Historic cemetery	Unknown	No	Undetermined
47GT0441/ GBT0183	Eugene Reynolds Mound	WI	Grant	Prehistoric mound	Unknown	No	Undetermined
BIA0034	Unnamed Cemetery	WI	Iowa	Historic cemetery	Unknown	No	Undetermined
BIA0032	St. Bridget's Cemetery	WI	Iowa	Historic cemetery	Unknown	No	Undetermined
BIA0057	Unnamed Cemetery	Wi	Iowa	Historic cemetery	Unknown	No	Undetermined
47DA0891/ BDA0187	Fort Blue Mounds	WI	Dane	Historic military	1832–1850 stockade	No	Listed in NRHP, 2001
BDA0041	St. Ignatius Cemetery	WI	Dane	Historic cemetery	Unknown	No	Undetermined
47DA0937/ BDA0432	Hollfelder Mound	WI	Dane	Prehistoric mound	Unknown	No	Undetermined
44243	House	WI	Grant	Historic house	Italianate style	Yes	Undetermined, recommended eligible (with 236270-236275)
236270	House	WI	Grant	Historic house	Italianate style	Yes	Undetermined, recommended eligible (with 236270-236275)

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	NRHP Status/ Recommendations
236271	House	WI	Grant	Historic house	Second Empire style	Yes	Undetermined, recommended eligible (with 236270-236275)
236272	House	WI	Grant	Historic house	Folk Victorian style	Yes	Undetermined, recommended eligible (with 236270-236275)
236273	House	WI	Grant	Historic house	American Foursquare style	Yes	Undetermined, recommended eligible (with 236270-236275)
236274	House	WI	Grant	Historic house	Queen Anne Victorian Style	Yes	Undetermined, recommended eligible (with 236270-236275)
236275	House	WI	Grant	Historic house	American Foursquare style	Yes	Undetermined, recommended eligible (with 236270-236275)
236277	Meadowvale School	WI	Iowa	Historic school	1864 schoolhouse, privy, and shed	Yes	Undetermined, recommended eligible
236278	St. Charles Borromeo Catholic Church	WI	Grant	Historic church	1889 Victorian Gothic church	Yes	Undetermined, recommended eligible
236279	Klindt-Geiger Canning Co.	WI	Grant	Historic industrial	ca. 1890 2-story industrial facility	Yes	Undetermined, recommended eligible
43629	Burton General Store	WI	Grant	Historic commercial	1904 wood-frame, front-gabled store	Yes	Undetermined, recommended not eligible
43603	House	WI	Grant	Historic house	Modern alterations to siding, windows, roof sheathing, and porch	Yes	Undetermined, recommended not eligible
220502	House	WI	Grant	Historic house	Modern alterations to roof sheathing, windows, front entry	Yes	Undetermined, recommended not eligible
55762	Sanders House	WI	Grant	Historic house	Modern alterations to siding, roof sheathing, floorplan	Yes	Undetermined, recommended not eligible
43573	House	WI	Grant	Historic house	Modern alterations to windows, historic fabric	Yes	Undetermined, recommended not eligible
43575	House	WI	Grant	Historic house	Modern alterations to windows, porch	Yes	Undetermined, recommended not eligible
64645	House	WI	Grant	Historic house	Modern alterations to windows, roof sheathing, floorplan	Yes	Undetermined, recommended not eligible
64652	House	WI	Iowa	Historic house	Modern alterations to windows, siding, façade	Yes	Undetermined, recommended not eligible
64652	House	WI	Iowa	Historic house	Modern alterations to windows, siding, façade	Yes	Undetermined, recommended not eligible
47075	Grain Elevator	WI	Iowa	Historic farming	Modern alterations to historic fabric	Yes	Undetermined, recommended not eligible

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	NRHP Status/ Recommendations
134159	Farmstead complex	WI	Iowa	Historic House	ca. 1890 house, ban barn, silo, shed, and gothic roofed barn	Yes	Undetermined, recommended not eligible
47092	Commercial Building	WI	Iowa	Historic commercial	ca.1880 commercial building	Yes	Undetermined, recommended not eligible
47091	Commercial Building	WI	Iowa	Historic commercial	Modern alterations to windows, storefront, floorplan	Yes	Undetermined, recommended not eligible
134158	House	WI	Iowa	Historic house	Modern alterations to windows, siding, floorplan	Yes	Undetermined, recommended not eligible
28412	David and Maggie Jones House	WI	Iowa	Historic house	1878–1908 Italianate dwelling	No	Listed in NRHP, 1994
47765	House	WI	Iowa	Historic house	Modern alterations to façade	Yes	Undetermined, recommended not eligible
47761	House	WI	Iowa	Historic house	Modern alterations to façade	Yes	Undetermined, recommended not eligible
47767	Iowa County Highway Garage	WI	Iowa	Historic governmental	1937 garage building	Yes	Undetermined, recommended not eligible
139838	Dodgeville United States Army Reserve Center	WI	Iowa	Historic governmental	1963 modernist brick building	Yes	Undetermined, recommended not eligible
47766	House	WI	Iowa	Historic house	Modern alterations to siding, windows, porch	Yes	Undetermined, recommended not eligible
89885	Thomas Stone Barn	WI	Iowa	Historic farming	1881 quarry-stone barn	No	Listed in NRHP, 2001
4522	Cheese Factory	WI	Dane	Historic industrial	Modern additions	Yes	Undetermined, recommended not eligible
4789	Berry Haney Tavern	WI	Dane	Historic tavern	Modern additions, porch alterations, replacement sidings and windows	Yes	Undetermined, recommended not eligible

3.9.2.7.3 OTHER CONSIDERATIONS

Identified as a potential concern during public scoping, the Platte Mound "M" lies approximately 1.25 miles west of Alternative 3. As the "M" lies on the west side of Platte Mound from Alternative 3 and is outside the defined Indirect APE, visual impacts on the property are not expected.

Additionally, the First Norwegian Lutheran Church Cemetery monument lies 1,900 feet northeast of the alternative. As the monument is outside the defined Indirect APE, visual impacts on the property are not expected.

3.9.2.8 ALTERNATIVE 5

3.9.2.8.1 DIRECT APE

In addition to the sites impacted by all action alternatives, a total of at least 22 assumed eligible cultural resources are present within the Direct APE of Alternative 5 (Table 3.9-10). This includes 19 archaeological sites and three historic cemeteries. Within the archaeological sites, seven contain prehistoric cultural materials, 11 contain historic materials, and one features both prehistoric and historic materials. None of the potential cultural resources have been formally determined eligible for the NRHP.

Preliminary information and eligibility recommendations are available for some of these sites. Seven sites were revisited in the course of preliminary studies for the C-HC Project. Of note are the N.D. Power Mounds (47GT0750 / BTG0395), Udelhoffen Mounds (47GT0437 / BGT0187), Murphy Enclosure (47GT0089), and the Triumvirate site (47GT0788 / BGT0417), all of which may have had prehistoric age burial mounds or earthworks., and that may be eligible for the NRHP under the MPS, *Prehistoric Mounds of the Quad State Region of the Upper Mississippi Valley* (Stanley and Stanley 1988). The alternative intersects Gomers (47IA0061), a historic mine site which has been recommended as eligible for the NRHP. Cemeteries may be eligible for the NRHP if they are extraordinarily old or associated with a specific time period. Interments are also protected from disturbance under Wisconsin and Iowa statutes. As formal determinations of eligibility are not provided, all properties are assumed eligible for listing in the NRHP. RUS, in coordination with the Iowa/Wisconsin SHPO and other interested parties, would formally determine NRHP eligibility of these potential historic properties prior to construction.

Under Alternative 5, the C-HC Project could result in minor to moderate impacts to the cultural resources within the APE, if determined eligible for listing in the NRHP. The Federal agencies, in coordination with SHPOs and other consulting parties, would identify steps to avoid, minimize, or mitigate the adverse effects to these sites, thereby diminishing the severity of impacts.

Table 3.9-10. Impacted Cultural Resources within the Direct APE of Alternative 5

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	Intersects/ adjacent	NRHP Status/ Recommendations
Goshen Cemetery	N/A	IA	Clayton	Historic cemetery	200+ interments, dating to 1860s to present	No	Adjacent	Undetermined
13DB1040	N/A	IA	Dubuque	Historic farmstead	Late nineteenth to twentieth century	No	Adjacent	Undetermined, recommended not eligible
47GT0753	BM-ND-2	WI	Grant	Historic farmstead	Structure pads, walls, and vegetation	No	Intersects	Undetermined, recommended not eligible
47GT0750/ BTG0395	N.D. Power Mounds	WI	Grant	Prehistoric mound group	Three intact mounds	Yes	Adjacent	Undetermined, recommended eligible
47GT0437/ BGT0187	Udelhoffen Mounds	WI	Grant	Prehistoric burial mounds	Sixteen reported on ridge crest	No	Intersects	Undetermined, recommended eligible
47GT0788/ BG0417	Triumvirate Site	WI	Grant	Prehistoric burial mound group	Three or more conical mounds	No	Intersects	Undetermined, recommended eligible
47GT0665	Emery Lead Furnace	WI	Grant	Historic industrial site	Lead smelting furnace location interpreted from historic records	Yes	Intersects	Undetermined, Recommended not eligible

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	Intersects/ adjacent	NRHP Status/ Recommendations
47GT0089	Murphy Enclosure	WI	Grant	Prehistoric earthworks	Earthen enclosure somewhere within 320-acre plot	Yes	Intersects	Undetermined, recommended not eligible within corridor
47GT0090	Gardner Camp	WI	Grant	Prehistoric campsite/ village	Location from informant interview	Yes	Intersects	Undetermined, recommended not eligible within corridor
47GT0685	Bellmeyer 1	WI	Grant	Prehistoric isolated find	Single galena chert secondary flake	No	Adjacent	Undetermined, recommended not eligible
47GT0687	Bellmeyer 3	WI	Grant	Historic artifact scatter	Brick fragments, whiteware, nails	No	Adjacent	Undetermined, recommended not eligible
BIA0037	Thomas Cemetery	Wi	Iowa	Historic cemetery	Two marked graves dating to 1856–1871	Yes	Adjacent	Undetermined, identified outside the Direct APE
BIA0019	Laxey Cemetery	WI	Iowa	Historic cemetery	1855–1930 cemetery	Yes	Adjacent	Undetermined, identified outside project area
47IA0416	Williams Diggins	WI	Iowa	Multi-component quarry	Tailings, pits, scattered rock	No	Intersects	Undetermined
47IA0061	Gomers	WI	Iowa	Historic mine site	Historic foundations, pits, and tailings piles	No	Intersects	Undetermined, recommended eligible
47IA0488	W-0322-04	WI	Iowa	Historic farmstead	Unknown	No	Intersects	Undetermined, recommended not eligible
47IA0487	W-0322-03	WI	Iowa	Historic mining area	Spoil pile	No	Adjacent	Undetermined, recommended not eligible
47IA0438	Ridge Pits	Wi	Iowa	Historic mining area	Mining pits	No	Adjacent	Undetermined, recommended not eligible
47IA0506	W-0322-08-2011	WI	Iowa	Historic artifact scatter	Unknown	Yes	Intersects	Undetermined, no resources identified in corridor
47IA0418	Ghost House Farm	WI	Iowa	Historic farmstead	Wood-framed house, concrete foundations,	Yes	Intersects	Undetermined, recommended not eligible
47IA0503	W-0322-04-2011	WI	Iowa	Historic farmstead	Artifact scatter with no structural remains	Yes	Intersects	Undetermined, recommended not eligible
447DA0668	Twin Valley	WI	Dane	Prehistoric lithic scatter	Unknown	No	Adjacent	Undetermined

3.9.2.8.2 INDIRECT APE

In addition to the sites impacted by all action alternatives, a total of two aboveground, NRHP-listed, and 33 assumed eligible resources lie within the Indirect APE of Alternative 5 (Table 3.9-11). This includes 15 historic structures, seven historic cemeteries, 10 prehistoric burial sites, and three historic archaeological sites. All 10 of the prehistoric burial sites are recorded as mound sites. Of these resources, one historic structure (Thomas Stone Barn) and a historic archaeological site (Fort Blue Mounds) have been listed in the NRHP.

Preliminary information and eligibility recommendations are available for some of these sites. Of the other 15 historic sites, all but one were visited in the course of preliminary studies for the C-HC Project. Based on these preliminary reviews, one, Springdale Lutheran Church (4562), a Gothic revival church dating to 1895, was recommended eligible for the NRHP. In addition, historic archaeological site 13DB1037, a blacksmith shop, has been recommended eligible for the NRHP. The 10 mound sites may be eligible for the NRHP under the MPS, *Prehistoric Mounds of the Quad State Region of the Upper Mississippi Valley* (Stanley and Stanley 1988). The seven historic cemeteries may be eligible for the NRHP if they are extraordinarily old or associated with a specific time period. As formal determinations of eligibility are not provided, all properties are assumed eligible for listing in the NRHP. RUS, in coordination with the Iowa/Wisconsin SHPO and other interested parties, would formally determine NRHP eligibility of these potential historic properties prior to construction. Long-term impacts to the properties within the Indirect APE are currently unknown but may be assumed to be adverse and moderate if the properties currently maintain integrity of feeling or setting and these aspects contribute to their significance.

Table 3.9-11. Impacted Cultural Resources within the Indirect APE of Alternative 5

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	NRHP Status/ Recommendations
13CT70	Smith Mound Group II	IA	Clayton	Prehistoric mound group	Woodland period	No	Undetermined
13DB1037	N/A	IA	Dubuque	Historic blacksmith	Nineteenth century	No	Undetermined, recommended eligible
13DB1093	N/A	IA	Dubuque	Historic farmstead	Late nineteenth century to present	No	Undetermined
47GT0022/ BGT0326	Dewey Mound Group 2	WI	Grant	Prehistoric mound group	Unknown	No	Undetermined
47GT0754	Boundary Mounds	WI	Grant	Prehistoric mound group	Unknown	No	Undetermined
BGT0028	Cassville Seventh Adventist Cemetery	WI	Grant	Historic cemetery	Unknown	No	Undetermined
47GT0403/ BGT0188	Schupper Mounds	WI	Grant	Prehistoric mound group	Unknown	No	Undetermined
47GT0784/ BGT0415	Horseshoe Bench	WI	Grant	Prehistoric mound	Unknown	No	Undetermined
47GT0436/ BGT0186	Eckstein Ploessl Mounds	WI	Grant	Prehistoric mound group	Unknown	No	Undetermined
47GT0782/ BGT0412	Guardians of the Gate	WI	Grant	Prehistoric mound	Unknown	No	Undetermined
47GT0434/ BGT0411	Eckstein 1 Mounds	WI	Grant	Prehistoric mound ground	Unknown	No	Undetermined
47GT0727/ BGT0001	Burton Cemetery	WI	Grant	Historic cemetery	Unknown	No	Undetermined
47GT0441/ GBT0183	Eugene Reynolds Mound	WI	Grant	Prehistoric mound	Unknown	No	Undetermined
BIA0018	Bloomfield Cemetery	WI	Iowa	Historic cemetery	Unknown	No	Undetermined

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	NRHP Status/ Recommendations
BIA0021	St. Joseph Cemetery	WI	Iowa	Historic cemetery	Unknown	No	Undetermined
BIA0032	St. Bridget's Cemetery	WI	Iowa	Historic cemetery	Unknown	No	Undetermined
BIA0057	Unnamed Cemetery	Wi	Iowa	Historic cemetery	Unknown	No	Undetermined
47DA0891/ BDA0187	Fort Blue Mounds	WI	Dane	Historic military	1832–1850 stockade	No	Listed in NRHP, 2001
47DA0937/ BDA0432	Hollfelder Mound	WI	Dane	Prehistoric mound	Unknown	No	Undetermined
43629	Burton General Store	WI	Grant	Historic commercial	1904 wood-frame, front-gabled store	Yes	Undetermined, recommended not eligible
43603	House	WI	Grant	Historic house	Modern alterations to siding, windows, roof sheathing, and porch	Yes	Undetermined, recommended not eligible
220502	House	WI	Grant	Historic house	Modern alterations to roof sheathing, windows, front entry	Yes	Undetermined, recommended not eligible
55762	Sanders House	WI	Grant	Historic house	Modern alterations to siding, roof sheathing, floorplan	Yes	Undetermined, recommended not eligible
43573	House	WI	Grant	Historic house	Modern alterations to windows, historic fabric	Yes	Undetermined, recommended not eligible
43575	House	WI	Grant	Historic house	Modern alterations to windows, porch	Yes	Undetermined, recommended not eligible
64645	House	WI	Grant	Historic house	Modern alterations to windows, roof sheathing, floorplan	Yes	Undetermined, recommended not eligible
64652	House	WI	Iowa	Historic house	Modern alterations to windows, siding, façade	Yes	Undetermined, recommended not eligible
46951	Sunny Slope School	WI	Iowa	Historic school	Modern alterations to historic fabric, cladding	Yes	Undetermined, recommended not eligible
46941	William J. Bennett House	WI	Iowa	Historic house	Modern alterations to windows, porch design	Yes	Undetermined, recommended not eligible
89885	Thomas Stone Barn	WI	Iowa	Historic farming	1881 quarry-stone barn	No	Listed in NRHP, 2001
4522	Cheese Factory	WI	Dane	Historic industrial	Modern additions	Yes	Undetermined, recommended not eligible

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	NRHP Status/ Recommendations
4562	Springdale Lutheran Church	WI	Dane	Historic church	1895 Gothic revival church	Yes	Undetermined, recommended eligible
BDA0039	Springdale Lutheran Church Cemetery	WI	Dane	Historic cemetery	Unknown	No	Undetermined
5635	Ridgeview School	WI	Dane	Historic school	1958 schoolhouse	Yes	Undetermined, recommended not eligible
4789	Berry Haney Tavern	WI	Dane	Historic tavern	Modern additions, porch alterations, replacement sidings and windows	Yes	Undetermined, recommended not eligible

3.9.2.8.3 OTHER CONSIDERATIONS

Identified as a potential concern during public scoping, Nelson Dewey State Park and Home Site lies approximately 3,600 feet northwest of Alternative 1. As the home and historic district lie outside the defined Indirect APE, no visual impact on the property is expected.

3.9.2.9 ALTERNATIVE 6

3.9.2.9.1 DIRECT APE

In addition to the sites impacted by all action alternatives, at least eight assumed eligible cultural resources are present within the Direct APE of Alternative 6 (Table 3.9-12). This includes seven archaeological sites and one historic cemetery. Within the archaeological sites, two contain prehistoric cultural materials and five contain historic materials. None of the potential cultural resources have been formally determined eligible for the NRHP.

Preliminary information and eligibility recommendations are available for some of these sites. Three sites were revisited in the course of preliminary studies for the C-HC Project, and cultural materials were identified within the accessible portion of the project corridor at only one site. Resources may be present outside the accessible portion of the project corridor. Of note is the Millville Pioneer Cemetery, which may hold as many as 80 graves, but which has not been formally defined or evaluated. Cemeteries may be eligible for the NRHP if they are extraordinarily old or associated with a specific time period. Interments are also protected from disturbance under Wisconsin and Iowa statutes. As formal determinations of eligibility are not provided, all properties are assumed eligible for listing in the NRHP. RUS, in coordination with the Iowa/Wisconsin SHPO and other interested parties, would formally determine NRHP eligibility of these potential historic properties prior to construction.

Under Alternative 6, the C-HC Project could result in minor to moderate impacts to the cultural resources within the APE, if determined eligible for listing in the NRHP. The Federal agencies, in coordination with SHPOs and other consulting parties, would identify steps to avoid, minimize, or mitigate the adverse effects to these sites, thereby diminishing the severity of impacts.

Table 3.9-12. Impacted Cultural Resources within the Direct APE of Alternative 6

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	Intersects/ Adjacent	NRHP Status/ Recommendations
Millville Pioneer Cemetery	N/A	IA	Clayton	Cemetery	At least 80 graves, dating to early founding	No	Intersects	Undetermined
13DB1043	N/A	IA	Dubuque	Historic farmstead	Late nineteenth to twentieth century	No	Adjacent	Undetermined, recommended not eligible
47GT0158	Withington Fluted Point Site	WI	Grant	Prehistoric lithic scatter	Lithic scatter	Yes	Intersects	Undetermined, possibly misplotted
47IA0504	W-0322-06-2011	WI	Iowa	Prehistoric lithic scatter	High-density scatter	No	Adjacent	Undetermined, further work recommended
47IA0438	Ridge Pits	Wi	Iowa	Historic mining area	Mining pits	No	Adjacent	Undetermined, recommended not eligible
47IA0506	W-0322-08-2011	WI	Iowa	Historic artifact scatter	Unknown	Yes	Intersects	Undetermined, no resources identified in corridor
47IA0418	Ghost House Farm	WI	Iowa	Historic farmstead	Wood-framed house, concrete foundations	Yes	Intersects	Undetermined, recommended not eligible
47IA0503	W-0322-04-2011	WI	Iowa	Historic farmstead	Artifact scatter with no structural remains	Yes	Intersects	Undetermined, recommended not eligible

3.9.2.9.2 INDIRECT APE

In addition to the sites impacted by all action alternatives, two aboveground, NRHP-listed, and 26 assumed eligible resources lie within the Indirect APE of Alternative 6 (Table 3.9-13). This includes 15 historic structures, five historic cemeteries, six prehistoric burial sites, one multicomponent archaeological site with prehistoric mounds and historic artifacts, and one historic archaeological site. Three of the six prehistoric burial sites and the single multicomponent site are recorded as mound sites. Of the aboveground resources, two historic structures (David and Maggie Jones House and the Thomas Stone Barn) and the historic archaeological site (Fort Blue Mounds) have been listed in the NRHP.

Preliminary information and eligibility recommendations are available for some of these sites. Of the other 13 historic sites/structures, all were visited in the course of preliminary studies for the C-HC Project. Based on these preliminary review, one, Meadowvale School (23627), a mid-nineteenth century schoolhouse and privy, was recommended eligible for the NRHP; the remaining 12 sites were recommended not eligible for the NRHP. The three prehistoric mound sites and one multicomponent mound may be eligible for the NRHP under the MPS, *Prehistoric Mounds of the Quad State Region of the Upper Mississippi Valley* (Stanley and Stanley 1988). The five historic cemeteries and three non-mound prehistoric burial sites may be eligible for the NRHP if they are extraordinarily old or associated with a specific time period. As formal determinations of eligibility are not provided, all properties are assumed eligible for listing in the NRHP. RUS, in coordination with the Iowa/Wisconsin SHPO and other interested parties, would formally determine NRHP eligibility of these potential historic properties prior to construction. Long-term impacts to the properties within the Indirect APE are currently unknown but may be assumed to be adverse and moderate if the properties currently maintain integrity of feeling or setting and these aspects contribute to their significance.

Table 3.9-13. Impacted Cultural Resources within the Indirect APE of Alternative 6

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	NRHP Status/ Recommendations
47GT0022/ BGT0326	Dewey Mound Group 2	WI	Grant	Prehistoric mound group	Unknown	No	Undetermined
47GT0754	Boundary Mounds	WI	Grant	Prehistoric mound group	Unknown	No	Undetermined
47GT0792/ BGT0420	Rattlesnake Valley	WI	Grant	Prehistoric burials	Unknown	No	Undetermined
47GT0113/ BGT0350	Glassmaker mounds	WI	Grant	Multicomponent site with mounds	Unknown	No	Undetermined
47GT0778/ GBT0407	Angles	WI	Grant	Prehistoric burials	Unknown	No	Undetermined
47GT0779/ BGT0408	Voltage View	WI	Grant	Prehistoric burials	Unknown	No	Undetermined
BGT0077	Pigeon Cemetery	WI	Grant	Historic cemetery	Unknown	No	Undetermined
BIA0034	Unnamed Cemetery	WI	Iowa	Historic cemetery	Unknown	No	Undetermined
BIA0032	St. Bridget's Cemetery	WI	Iowa	Historic cemetery	Unknown	No	Undetermined
BIA0057	Unnamed Cemetery	Wi	Iowa	Historic cemetery	Unknown	No	Undetermined
47DA0891/ BDA0187	Fort Blue Mounds	WI	Dane	Historic military	1832–1850 stockade	No	Listed in NRHP, 2001
BDA0041	St. Ignatius Cemetery	WI	Dane	Historic cemetery	Unknown	No	Undetermined
47DA0937/ BDA0432	Hollfelder Mound	WI	Dane	Prehistoric mound	Unknown	No	Undetermined
47075	Grain Elevator	WI	Iowa	Historic farming	Modern alterations to historic fabric	Yes	Undetermined, recommended not eligible
134159	Farmstead complex	WI	Iowa	Historic house	ca. 1890 house, ban barn, silo, shed, and gothic roofed barn	Yes	Undetermined, recommended not eligible
47092	Commercial Building	WI	Iowa	Historic commercial	ca. 1880 commercial building	Yes	Undetermined, recommended not eligible
47091	Commercial Building	WI	Iowa	Historic commercial	Modern alterations to windows, storefront, floorplan	Yes	Undetermined, recommended not eligible
134158	House	WI	Iowa	Historic house	Modern alterations to windows, siding, floorplan	Yes	Undetermined, recommended not eligible
28412	David and Maggie Jones House	WI	Iowa	Historic house	1878–1908 Italianate dwelling	No	Listed in NRHP, 1994
47765	House	WI	Iowa	Historic house	Modern alterations to façade	Yes	Undetermined, recommended not eligible

Resource Identification	Resource Common Name	State	County	Resource Type	Resource Details	Visited for Current Effort?	NRHP Status/ Recommendations
47761	House	WI	Iowa	Historic house	Modern alterations to façade	Yes	Undetermined, recommended not eligible
47767	Iowa County Highway Garage	WI	Iowa	Historic governmental	1937 garage building	Yes	Undetermined, recommended not eligible
139838	Dodgeville United States Army Reserve Center	WI	Iowa	Historic governmental	1963 modernist brick building	Yes	Undetermined, recommended not eligible
47766	House	WI	Iowa	Historic house	Modern alterations to siding, windows, porch	Yes	Undetermined, recommended not eligible
89885	Thomas Stone Barn	WI	Iowa	Historic farming	1881 quarry-stone barn	No	Listed in NRHP, 2001
4522	Cheese Factory	WI	Dane	Historic industrial	Modern additions	Yes	Undetermined, recommended not eligible
4789	Berry Haney Tavern	WI	Dane	Historic tavern	Modern additions, porch alterations, replacement sidings and windows	Yes	Undetermined, recommended not eligible
23627	Meadowvale School	WI	Iowa	Historic school	1864 schoolhouse, privy, and shed	Yes	Undetermined, recommended eligible

3.9.2.9.3 OTHER CONSIDERATIONS

Identified as a potential concern during public scoping, Nelson Dewey State Park and Home Site lies approximately 3,100 feet northwest of Alternative 1. As the home and historic district lie outside the defined Indirect APE, no visual impact on the property is expected.

Additionally, the First Norwegian Lutheran Church Cemetery monument lies 1,900 feet northeast of the alternative. As the monument is outside the defined Indirect APE, visual impacts on the property are not expected.

3.9.3 *Summary of Impacts*

Known cultural resources that are of undetermined NRHP eligibility or are listed in the NRHP are present within both the Direct and Indirect APE of the action alternatives (Table 3.9-14). In addition, as a comprehensive cultural resources survey has not been conducted, any number of unknown resources may be present within the Direct APE. Prior to construction, RUS would attempt to identify and evaluate additional resources within the Direct APE. If, through consultation with the Iowa and/or Wisconsin SHPOs, RUS, the Utilities, and affected Tribal groups, measures cannot be taken to avoid impacts to the characteristics that qualify any identified resource for inclusion in the NRHP, that may constitute a major impact. These impacts may be irreversible. However, the Federal agencies, SHPOs, and other consulting parties would identify steps to avoid, minimize, or mitigate the adverse effects to sites eligible for listing in the NRHP; therefore impacts to those sites where adverse effects are mitigated would be minor or moderate.

Table 3.9-14. Impact Summary Table

	NRHP-Listed, Determined Eligible, or Assumed Eligible Resources within Direct APE	NRHP-Listed, Determined Eligible, or Assumed Eligible Resources within Indirect APE	Total NRHP-Listed, Determined Eligible, or Assumed Eligible Resources
Alternative 1	9	20	29
Alternative 2	8	31	39
Alternative 3	15	39	54
Alternative 4	21	51	72
Alternative 5	25	37	62
Alternative 6	11	30	41

For resources within the Indirect APE, the impacts to affected resources would be evaluated on a case-by-case basis. Impacts to the setting and character of historic properties may range from minor to major, depending on the proximity of the resource to the line, the resource position on the landscape, vegetation cover in the resource vicinity, and the remaining ability of the resource to convey its historic significance. Additionally, these impacts would reversible, as the poles could be removed and vegetation restored, returning the area to its preconstruction characteristics.

Finally, two tribal groups, the Ho-Chunk Nation of Wisconsin and the Yankton Sioux Tribe, have given notice to RUS that specific TCPs, cultural sites, or sensitive tribal areas are present within the Direct or Indirect APE of the action alternatives. However, the specific number, nature, and location of these sites has not been identified. As such, their eligibility for the NRHP is undetermined, and impacts to the sites cannot be defined. Further consultation with affected tribal groups would be necessary to refine the location, character, NRHP eligibility, and impacts to these sites.

Due to the constraints of the NEPA process and the preliminary nature of this document, incomplete information has been utilized to attempt to identify impacts of the C-HC Project on cultural resources. Accordingly, all known cultural resources, regardless of significance, have been assumed to be eligible for the NRHP. As such, this impacts analysis may overestimate the severity of impacts among all action alternatives. If, in the course of resource identification and evaluation, sites are determined not eligible for the NRHP, then they would not be considered historic properties and impacts to the sites would not be considered adverse, eliminating them from the consideration of impacts. In addition, the Federal agencies, in coordination with SHPOs and other consulting parties, would take steps to avoid, minimize, or mitigate impacts to historic properties in accordance with Section 106 of the NHPA, thereby diminishing the severity of impacts.

3.10 Land Use, including Agriculture and Recreation

This section describes land use classifications, including agricultural lands, as well as recreational uses that occur across the C-HC Project.

Land use is defined as the human use of areas for economic, residential, recreational, conservational, and government purposes. Land use in the project area is primarily dominated by agricultural uses, such as croplands and farmsteads. Other uses include recreational areas such as state parks and trails, urban development, natural areas, and conservation lands.

3.10.1 *Affected Environment*

The analysis area includes portions of six counties in southwestern Wisconsin and east-central Iowa: Dane, Grant, Iowa, Lafayette, Clayton, and Dubuque. The C-HC Project is mostly within the Wisconsin Driftless Area. This area is characterized as unglaciated terrain dominated by sedimentary formations. The topography of the area has been impacted by erosion by dissecting river valleys and tributaries of the Mississippi River. The region surrounding the proposed project contains large expanses of rural lands comprising a mixture of agricultural lands and woodlands with rural residences scattered throughout the area.

Landownership in the analysis area is composed of Federal lands associated with the Refuge, State lands, county and municipal parcels, and private ownership.

3.10.1.1 LAND COVER IN THE ANALYSIS AREA

Land use and land cover data were obtained from the USGS NLCD (USGS 2011). Land cover data are derived from satellite imagery and describe general categories of land use. Land cover types within the analysis area include: urban, agriculture, grassland, forest, wetland, barren, shrubland, and open water. Approximately 51% of the analysis area is agricultural lands consisting of cultivated crops and pasture/hay fields. Approximately 18% of the area is forested, and these areas occur interspersed throughout but are generally associated with water bodies and rivers within the area. Approximately 13% of the analysis area is grasslands, which also occur throughout the area. Approximately 10% of the analysis area is urban development associated with the communities of Mount Horeb, Barneveld, Ridgeway, Dodgeville, Cobb, Montfort, and Cassville, Wisconsin. The remaining land cover types are extremely limited within the analysis area and combined cover less than 8% of the total area.

3.10.1.2 AGRICULTURAL LANDS

Wisconsin and Iowa boast a diverse and dynamic agriculture industry. In 2016, Wisconsin was number one in the United States in production of cheddar and total cheese, dry whey for human consumption, milk goat inventory, mink pelts produced, corn harvested for silage, snap beans for processing, and cranberry production. Wisconsin cows produced 14% of the nation’s milk supply and ranked second in the United States in the number of organic farms (USDA National Agricultural Statistics Service [NASS] 2017a). In 2017, Iowa was number one in the United States in production of corn for grain, egg production, hogs and pigs inventory and value, pig crop, sows farrowed, and commercial hog slaughter. Iowa is also ranked second in soybean production and red meat production (USDA NASS 2017b).

Lands owned and managed as farmland account for more than 65% of the counties within the analysis area (Table 3.10-1). Selected agricultural products by county are presented in Table 3.10-2.

Table 3.10-1. Percentage of Farmland, Number of Farms, and Average Size of Farm by County

County	Farmland (acres)	Percent of County	Number of Farms	Average Size of Farms (acres)
Dane, WI	504,420	66	2,749	183
Grant, WI	587,587	80	2,436	241
Iowa, WI	350,813	72	1,588	221
Lafayette, WI	368,501	91	1,252	294
Clayton, IA	398,022	78	1,577	252
Dubuque, IA	291,441	74	1,462	199

Data were obtained from USDA Census of Agriculture (2012).

Table 3.10-2. Selected Agricultural Product Totals for Each County

County	Corn (acres planted)	Soybeans (acres planted)	Alfalfa (acres harvested)	All Cattle and Calves (head)	Hogs and Pig Inventory (head)*
Dane, WI	193,500	86,900	24,300	135,000	27,872
Grant, WI	162,500	73,500	33,300	175,000	54,798
Iowa, WI	77,000	49,100	18,000	93,000	2,918
Lafayette, WI	138,000	59,700	26,000†	110,000	14,267
Clayton, IA	151,000	57,800	20,000	70,000	261,084
Dubuque, IA	151,500	40,600	25,000	135,000	137,271

Data were obtained from USDA NASS (2017c).

* 2012 data used, as these are the most current available.
† Most recent data available are 2016 data.

Soil is the foundation of agricultural production as it not only provides the physical medium for growing plants, but also supplies the nutrients and moisture required for healthy plant growth. In an effort to identify the extent and location of important farmlands, the NRCS, in cooperation with other interested Federal, State, and local government organizations, has inventoried lands that can be used for the production of the nation's food supply. Farmland is a unique resource and lands with the highest productivity potential are classified by the NRCS as Prime Farmland, Unique Farmland, or Farmland of Statewide or Local Importance (USDA NRCS n.d.). Only Prime Farmland and Farmland of Statewide Importance classifications occur within the analysis area. These classifications are defined as follows:

> *Prime Farmland: is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. The water supply is dependable and of adequate quality. Prime farmland is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent.*

> *Farmland of Statewide Importance: is land that does not meet the criteria for prime or unique farmland, but is determined by the appropriate State agencies as lands that are used for the production of food, feed, fiber, forage, and oilseed crops. Generally, this land includes areas of soils that nearly meet the requirements for prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some areas may produce as high a yield as prime farmland if conditions are favorable. Farmland of statewide importance may include tracts of land that have been designated for agriculture by State law.*

Acres of prime farmland range from approximately 300 to 879 within the analysis area. An additional 4 to 6 acres are within the analysis area for the proposed substation. Acres of farmland of statewide importance range from approximately 426 to 654 within the analysis area, and an additional 4.7 acres are within the analysis area for the proposed substation.

3.10.1.3 RECREATION AREAS

Various developed and undeveloped outdoor recreational facilities exist within the vicinity of the project. These include state parks, trails, wildlife and natural areas, and the Refuge. The recreational areas presented below overlap the analysis area or were raised as a concern during the public scoping period.

3.10.1.3.1 BLACK EARTH CREEK WILDLIFE – SUNNYSIDE UNIT

The Black Earth Creek Wildlife Area, Sunnyside Unit is a 292-acre designated county wildlife area in Dane County. This area is open to public hunting (all types), and other activities such as fishing, hiking and cross-country skiing (Dane County Parks n.d.).

3.10.1.3.2 BLACKHAWK LAKE RECREATION AREA

Blackhawk Lake Recreation Area consists of over 2,050 acres, including the lake, recreation areas, and designated wildlife areas. Blackhawk Lake is a 220-acre human-made lake with a maximum depth of 42 feet, which offers fishing and other recreational opportunities. The recreation areas include 150 campsites, cabins, picnic shelters, fishing piers, sand beach, sand volleyball courts, playgrounds, hiking trails, and boat launches. Hunting is permitted in the designated wildlife areas. The Blackhawk Lake Recreation Area is owned by the WDNR with an operational easement granted to Iowa County (Blackhawk Lake Recreation Area n.d.).

3.10.1.3.3 GOVERNOR DODGE STATE PARK, PLEASANT RIDGE –DRIFTLESS AREA

Located outside Dodgeville in Iowa County, Governor Dodge State Park is one of the state’s largest parks, with 5,350 acres of steep hills, bluffs, and deep valleys plus two lakes and a waterfall. The park offers camping, picnicking, hiking, canoeing, biking, hunting, fishing, off-road biking, cross-country skiing, and horseback riding within Wisconsin’s Driftless Area. In fiscal year 2016, the total attendance of Governor Dodge State Park was 496,847 (WDNR 2018g).

The park is home to numerous species of wildlife and over 150 species of birds. Additionally, the tremendous variations in topography, exposures to sunlight and soil types provide a diverse array of habitats that support hundreds of plant species. The forests are oak-hickory in type, with many dozens of other tree species and shrubs mixed in. The sandstone areas support white pine, red pine, and Jack pine, and the spring wildflowers of the forests include bloodroot, hepatica (*Hepatica nobilis*), and Dutchman’s breeches (*Dicentra cucullaria*). The soil slopes produce almost solid communities of ferns, including giant interrupted ferns (*Osmunda claytoniana* L.) (WDNR 2018g).

3.10.1.3.4 ICE AGE TRAIL AND THE ICE AGE COMPLEX AT CROSS PLAINS

The Ice Age Trail is one of 11 National Scenic trails occurring entirely within Wisconsin, and is one of 42 designated Wisconsin state trails and the only one designated as a State Scenic Trail. Highlighting unique glacial features, the trail is a 1,200-mile footpath that traverses 31 counties with endpoints in Interstate State Park in St. Croix Falls, Polk County and Potawatomi State Park in Sturgeon Bay, Door County. The trail provides opportunities for people to immerse themselves in a large natural landscape, enjoy outdoor education and recreation, and experience expansive views that provide a visual display between unglaciated driftless areas and lands shaped by continental glaciation. Activities permitted along the trail include hiking, backpacking, snowshoeing, and cross-country skiing. Additionally, biking and motorized vehicles are permitted in a few designated sections. The Ice Age Trail is meant to connect people and communities crossing private lands; city and state parks; county, state, and national forests; as well as many state wildlife, fishery, and natural areas (Ice Age Trail Alliance 2018; WDNR 2018h).

The lands and landscape of the Ice Age Complex have been deemed nationally significant under two related, but distinct, Federal designations. The first enacted in 1964 created the Ice Age National Scientific Reserve as a network of distinct areas, one of which is the Cross Plains unit, each exhibiting an example of one type of landscape or landform resulting from continental glaciation. The second enacted in 1980 amended the National Trails System Act to authorize and establish the Ice Age National Scenic Trail as a component of the National Trails System. The Complex is a 1,700-acre unit of the NPS located west of Madison, southeast of Cross Plains, and south of Highway 14. Within the Complex are lands owned and managed by the NPS, the WDNR, Dane County Parks, the USFWS, the Ice Age Trail Alliance, and private citizens. The Ice Age Complex at Cross Plains, Wisconsin also includes the interpretive site for the Ice Age National Scenic Trail (NPS and WDNR 2013). The intent of the Complex is to provide visitors with interpretation of its evolution from the last glacial retreat, with opportunities to enjoy low impact outdoor recreation. There is currently no visitor infrastructure at the Complex other than parking along an existing road, an old farmhouse, and a barn. Current development plans include the installation of a new sustainable visitor center, new protected Ice Age National Scenic Trail segments, additional interpretive and recreational sites, administrative and maintenance facilities, and expansion to complete the park out to State Highway 14. In 2018, the NPS is slated to work with WDNR, Dane County Parks, and the USFWS to develop a Use Management Plan, which will identify locations for visitor infrastructure. Once completed, the NPS anticipates up to 250,000 annual visitors per year at the Ice Age Complex (NPS 2017a).

3.10.1.3.5 MILITARY RIDGE STATE TRAIL

The 40-mile Military Ridge State Trail in Iowa and Dane Counties, Wisconsin, connects Dodgeville and Madison by way of an 1855 military route. The trail runs along the southern borders of Governor Dodge and Blue Mound State Parks passing by agricultural lands, woods, wetlands, and prairies. Most of the trail follows the former Chicago and North Western Railroad corridor, which has a gentle grade of only 2 %to 5%. Between Dodgeville and Mount Horeb it runs along the top of the Military Ridge, the divide between the Wisconsin River watershed to the north and the Pecatonica and Rock River watershed to the south. Between Mount Horeb and Fitchburg, the trail goes through the Sugar River valley.

Recreational opportunities include several observation platforms adjacent to the trail for viewing wildlife and other natural features, and in Ridgeway, the trail passes by a historic railroad depot. Additionally, the level grade and smooth limestone and asphalt surfaces make this 40-mile trail suitable for bicyclists, walkers and joggers. The 2.5-mile section between Fitchburg and Verona has been paved with asphalt making it suitable for in-line skating. In winter, snowmobiles are permitted on the limestone section of the trail, but not the paved asphalt section (WDNR 2018i).

3.10.1.3.6 UPPER MISSISSIPPI RIVE NATIONAL WILDLIFE AND FISH REFUGE

Established in 1924, the Refuge is approximately 260 river-miles long, stretching from the confluence of the Chippewa River in Wisconsin to Rock Island, Illinois. It is an important habitat for migratory birds, fish, and other wildlife, as well as many species of plants (USFWS 2013). The Refuge is also an important area for tourists. The area receives nearly 3.7 million annual visits (USFWS 2006a).

Pool 11 of the Upper Mississippi River extends 32.1 miles from Lock and Dam 11 in Dubuque, Iowa, to Lock and Dam 10 in Guttenberg, Iowa. Pool 11 contains 19,875 acres of aquatic habitat and the upper and middle portions of the pool contain many islands, side channels, and backwaters while the lower pool is a broad expanse of open water. Pool 11 encompasses the majority of the natural river floodplain and is bounded by limestone bluffs. Major tributaries that enter the Mississippi River in Pool 11 are the Turkey and Little Maquoketa Rivers in Iowa and the Grant and Platte Rivers in Wisconsin.

Pool 11 is also part of the Upper Mississippi River Restoration (UMRR) Program. The UMRR Program was the first environmental restoration and monitoring program undertaken on a large river system in the United States. The UMRR Program has come to be recognized as the single most important effort committed to ensuring the viability and vitality of the Upper Mississippi River System's diverse and significant fish and wildlife resources. This systemic program provides a well-balanced combination of habitat restoration activities, along with monitoring and research (USACE Rock Island District 2017).

Recreational uses of this area are varied and include hunting, fishing, wildlife observation and photography, boating, camping, and beach-related uses. Hunting for big-game, upland game, and migratory waterfowl are common uses. Fishing is also common in this area with several fishing tournaments hosted annually. Additionally, there is a long history of beach use on the Upper Mississippi River as the public takes advantage of beach areas created by placement of dredged sand during navigation and maintenance operations (USFWS 2006a).

3.10.1.3.7 PECATONICA STATE TRAIL

Running 10 miles through the picturesque Bonner Branch Valley, this County-operated trail links Belmont with the 47-mile Cheese Country Trail in Calamine, Wisconsin. The Pecatonica State Trail follows the old Milwaukee Road railroad corridor. Trail activities include horseback riding, walking, and bicycling. The use of all-terrain vehicles, off-highway motorcycles, and snowmobiles is permitted on the trail (WDNR 2017b).

3.10.1.4 NATURAL AREAS

3.10.1.4.1 THOMPSON MEMORIAL PRAIRIE NATURAL AREA

Thompson Memorial Prairie State Natural Area is the only designated State Natural Area to occur within the ROW and Analysis Area. State Natural Areas protect outstanding examples of Wisconsin’s native landscape of natural communities, significant geological formations, and archeological sites. Encompassing nearly 400,000 acres, Wisconsin’s 687 natural areas are valuable for research and educational use, the preservation of genetic and biological diversity, and for providing benchmarks for determining the impact of use on managed lands. They also provide some of the last refuges for rare plants and animals (WDNR 2018j).

3.10.1.4.2 PUBLIC ACCESS AREAS

The REM Little Platte River and REM Otters Creek fishery areas occur within the analysis area. Remnant Fishery Habitat (REM) areas protect individual tracts of land of fish habitat for cold-water species. These usually occur in widely scattered areas along trout streams and include the most important spawning areas and springs. These areas are a part of the 500 existing Wisconsin state parks and trails, flowages, fishery, wildlife, state forest, and rivers projects that preserve valuable natural areas and wildlife habitat, protect water quality and fisheries, and expand opportunities for outdoor recreation. The REM Little Platte River and REM Otters Creek fishery areas are funded by the Knowles-Nelson Stewardship Program (WDNR 2018k).

3.10.1.4.3 OTHER CONSERVATION LAND USES

Several conservation easements and parcels managed for land conservation occur within the analysis areas. These lands could be private conservation easements or associated with agency conservation programs such as the WDNR Landowner Incentive Program, IDNR Resource Enhancement and Protection program, or other various USDA conservation programs. Conservation lands are managed to maintain and enhance the health and diversity of habitats by working with landowners and organizations to protect and preserve areas through land management practices. Examples of conservation lands include the Thomas Tract, easements held by Driftless Area Land Conservancy, and other conservation easements.

3.10.1.5 COMPREHENSIVE LAND USE PLANS/DESIGNATIONS

Zoning is a regulatory device used by local governments to geographically restrict or promote certain types of land uses. Local government units can regulate locations of transmission lines to an extent. County comprehensive plans for Dane, Grant, Iowa, Lafayette, Clayton, and Dubuque as well as municipal plans for Mount Horeb, Cassville, Barneveld, and Montfort were reviewed for policies or recommendations for power line ROWs and siting of transmission lines. The Dane County plan includes the need to develop procedures and standards to ensure that any future siting decisions for energy generation, transmission, and distribution facilities will be evaluated to ensure consistency with community and regional development objectives, and the overall protection of public health, safety and the environment (Dane County 2012). Additionally, the Mount Horeb plan includes strategies for promoting electric transmission and high-speed technology to promote local businesses and promotes corridor sharing or the use of existing linear ROWs to minimize the amount of land affected by new easements (Village of Mount Horeb 2015). The Iowa County plan included municipal land use policies for Dodgeville and Ridgeway. Both towns include provisions limiting or prohibiting the placement of power lines across productive farmlands in a manner that would disrupt farming activities (Iowa County 2005). There are no municipalities within the Iowa portion of the analysis area.

3.10.2 *Environmental Consequences*

This section describes impacts to land use, including agriculture and recreation, associated with the construction, operation, and maintenance of the C-HC Project. Impacts to land use are discussed in terms of changes to land cover classes, farmland categories, and areas used for recreational purposes.

3.10.2.1 DATA SOURCES, METHODS, AND ANALYSIS ASSUMPTIONS

The following impact indicators were considered when analyzing impacts to land use:

- Acres of disturbance within designated prime farmland, unique farmland, or farmland that is of state or local importance.
- Acres of disturbance within specially designated lands, including state parks, Ice Age National Scenic Trail, and Military Ridge Trail.
- Qualitative descriptions of consistency or inconsistency with local land use plans and ordinances.
- Qualitative descriptions of other potential land use conflicts.

Land use and land cover data were obtained from the USGS NLCD (USGS 2011). These datasets were overlaid with the C-HC Project alternative ROWs, analysis areas, and substation footprints to determine acres of overlap in land cover classes and farmland designations.

Permanent acres of disturbance for the transmission line structures were calculated using known number of structures per action alternative multiplied by the known maximum area of disturbance (113 square feet) for each structure. This number was then converted to acres by dividing by a conversion factor of 43,560.

Publicly available GIS information was gathered for recreation and natural areas within the C-HC Project analysis area. These datasets were overlaid with the C-HC Project alternative ROWs, analysis areas, and substation footprints to determine areas and acres of overlap for each recreation and natural area.

Table 3.10-3 defines the impact thresholds for defining impacts to land use. These thresholds are used throughout this section to characterize the intensity of impacts that are estimated for each action alternative.

Table 3.10-3. Impact Thresholds and Descriptions for Land Use, including Agriculture and Recreation

	Minor Impact	Moderate Impact	Major Impact
Land Use, Including Agriculture and Recreation	Other than at the footprint of project features (e.g., transmission structures, substations, access roads), previous land uses would continue without interruption. Existing land uses such as agriculture, grazing, and special use areas might experience temporary construction-related disturbances and intermittent, infrequent interruptions from operation and maintenance. There would be no conflicts with local zoning. For recreation, the same site capacity and visitor experience would remain unchanged after construction.	Previous land uses | (e.g., agriculture, grazing, and special use areas) would be diminished or required to change on a portion of the project area, to be compatible with the C-HC Project. Only a few parcels within the project area would require zoning changes to be consistent with local plans. Some parcels within the project area (e.g., transmission ROW, substation, access roads) might require a change in land ownership through purchases or condemnation. For recreation, the visitor experience would be slightly changed but would still be available.	More than 25% of the project area (e.g., transmission ROW, substations, access roads) would require a change in land ownership through purchases or condemnation. All land use (e.g., agriculture, grazing, and special use areas) on these parcels would be discontinued. Most parcels of land within the project area would require zoning changes to be consistent with local plans. For recreation, visitors would be displaced to facilities at other regional or local locations and the visitor experience would no longer be available at this location.

3.10.2.2 NO ACTION

Under the No Action Alternative, the proposed Project would not be built, and there would be no impacts on land use, including agriculture and recreation.

3.10.2.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

This section discusses potential impacts on land use within the analysis area as a result of the construction and operation of any of the action alternatives. Common impacts to all alternatives are categorized into the following groups: land cover, agricultural lands, recreational areas, natural areas, and comprehensive land use plans/designations.

3.10.2.3.1 LAND COVER

Temporary impacts would occur during construction to land cover types within the ROW. Impacts would result from vegetation clearing, transporting materials to and from construction sites, and construction of transmission line structures, substation, and support facilities (e.g., laydown yards, access roads, etc.). Impacts would be localized within the ROW and would include rutting, soil mixing, soil compaction, and the potential spread of invasive plant species, plant disease, and/or pest species. Land cover change would be temporarily altered at support laydown yards and access roads, but would be reclaimed to previous conditions once construction has completed.

Permanent impacts to land cover types would occur as a result of the C-HC Project within the ROW. Impacts would result from vegetation clearing and the construction of transmission line structures, substation, and support facilities. Impacts would be localized within the ROW and would include permanent land cover change. Land cover change would be permanently altered from current land use conditions to a developed land cover for utility purposes at transmission line structure locations and the Hill Valley Substation site.

The agricultural land cover type would be temporarily and permanently impacted as a result of the C-HC Project. Temporary minor impacts as described above would occur during construction, but once construction is complete most of the ROW in this land cover type would return to existing conditions. At transmission line structure locations and the Hill Valley Substation location, permanent land cover type would change from agricultural land cover to a developed land cover for utility purposes.

The forest land and shrubland cover types would be permanently impacted as a result of the C-HC Project. Temporary impacts as described above would occur during construction. Additionally, in this landscape, trees, shrubs, and brush would be cleared for the full width of the ROW to facilitate construction equipment access and ensure safe clearances between vegetation and the transmission line. Permanent major impacts would result from a permanent change in land cover type from forest and shrubland to grassland in much of the ROW and to developed land cover at transmission line structures. The spread of disease such as oak wilt or spread of pest species such as emerald ash borer or gypsy moth could result from construction activities in these areas.

Grassland cover type would be temporarily and permanently impacted as a result of the C-HC Project. Temporary minor impacts as described above would occur during construction, but once construction is complete most of the ROW in this land cover type would return to existing conditions. At transmission line structure locations permanent land cover type would change from grassland cover to a developed land cover for utility purposes. See Section 3.3 Vegetation, including Wetlands and Special Status Plants, for a detailed discussion of non-native, invasive plant species and potential impacts to grassland cover types from invasive species.

Urban areas are already considered developed areas and therefore no impacts to land cover in these areas are anticipated from the construction and operation of this project.

Wetlands and open water would also be impacted during construction; although the Utilities would work to avoid construction activities in these areas where possible. See Sections 3.3 and 3.5 for a detailed discussion of wetlands and open water and the potential impacts to these areas.

The implementation of environmental commitments would reduce the temporary impacts. Environmental commitments to prevent the spread of invasive species, plant disease, and pest species would be implemented as needed. Best management practices for soils would be implemented to mitigate impacts to soil mixing, soil compaction, and rutting. See Table 3.1-4 for a complete list of environmental commitments and Appendix D for a description of best management practices.

3.10.2.3.2 AGRICULTURE LANDS

Between 66% and 91% of the land base in the analysis area is used for agricultural purposes (see Table 3.10-1). Existing agricultural activities taking place within the ROW are likely to experience temporary and localized interruptions during construction. Impacts to agricultural operations, prime farmland, and farmland of statewide importance would result from ROW clearing and maintenance, transporting materials to and from construction sites, and construction of transmission line structures, substation, and support facilities (e.g., laydown yards, access roads, etc.). Impacts to agricultural operations would include temporary loss of use of lands within the ROW, interference with movement of machinery and equipment, irrigation implements, obstacles for aerial seeding and spraying, and interference with the movement of livestock for grazing. Additionally, livestock grazing would need to be restricted within the ROW until after construction is complete to allow grass to reestablish. Potential crop loss could occur depending on the crop type and construction timing. Impacts on prime farmland and farmland of statewide importance within the ROW would include soil mixing, rutting, and soil compaction. Once construction and reclamation are complete, agricultural activities would resume within the ROW and under the power line. Impacts would be minimized by providing compensation to land owners and restoring agricultural lands where practicable by using techniques such as topsoil replacement and deep tilling. Additionally, the Utilities would coordinate with landowners to schedule construction activities to minimize disturbances to farming operations and crop growing cycles.

Long-term impacts would occur at transmission line structure locations and the Hill Valley Substation site where agricultural lands would be permanently converted for utility use. However, long-term impacts would be minimized by siting along fence lines, between fields, or along existing public ROWs. This would minimize loss of tillable or grazing lands and associated interference with equipment operation. Additionally, property owners would be consulted to accommodate property owner needs to the extent practicable.

Additional impacts to organic farming could occur due to siting and construction of the project that could jeopardize the farm's organic status. The introduction of foreign plant species or chemicals could occur from construction equipment moving through the area and ROW clearing activities. These impacts would be reduced by coordinating with the landowner on siting to ensure buffers between the power line and farm are maintained, washing construction equipment prior to entering the property, and not using herbicides as vegetation control measures within the ROW.

3.10.2.3.3 RECREATION AREAS

Temporary impacts to recreation areas and recreational users would occur during the construction activities for the C-HC Project. Construction of the project is not expected to permanently impede the use of or access to any existing recreation opportunities or activities, but some short-term impacts to these resources would occur during construction activities. Impacts to recreation areas would include disruption of recreational activities from construction activities and movement of construction materials and workers. Impacts to recreational users at established recreation areas would include industrial noise from construction activities, increase in traffic from construction vehicles, equipment and workers, dust from construction activities, wildlife disruption, and viewshed enjoyment.

Permanent impacts to recreation areas and recreational users would occur in limited areas within the analysis area. Where the project does not follow existing ROWs, the recreation setting would change from the existing conditions of undeveloped landscape to a developed landscape. Visual impacts to recreational users from a newly constructed high-voltage power line would occur (see Section 3.11 for more details). Additionally, recreational opportunities and recreational pursuits would still be available where authorized within the ROW, but would no longer be permitted in the footprints of the towers and substation.

The Ice Age National Scenic Trail corridor, which generally runs north to south in the vicinity of the C-HC Project, overlaps the analysis area for all alternatives of the C-HC Project, which generally runs east to west in the vicinity of the trail. Adverse impacts would occur from the all action alternatives to the Ice Age National Scenic Trail and recreational users on this trail system. Temporary impacts would occur from the presence of construction equipment and employees, noise from construction activities, and ground disturbance near segments of the Ice Age National Scenic Trail. These activities would impact recreational users' experiences during the construction period. Once construction is complete, the presence of the transmission line would adversely impact the character of the Ice Age National Scenic Trail where there is overlap with the analysis area creating visual impacts to trail users. Because portions of the Ice Age National Scenic Trail have not been built within the vicinity of the C-HC Project, it is difficult to identify specific locations where the C-HC Project would cross the trail. Additional details for how the C-HC Project would potentially cross-existing and proposed segments of the Ice Age National Scenic Trail are provided in Section 3.11 (see Figure 3.11-2). The primary adverse impacts to recreation users along the trail would be from viewing the C-HC Project while using the trail or viewing the landscape from scenic overlooks at the Cross Plains Complex. Refer to Section 3.11, Visual Quality and Aesthetics, for additional details.

3.10.2.3.4 NATURAL AREAS

There are lands throughout the analysis area that are considered conservation lands. However, easements typically remain in private ownership and as such information about the specific location and scope of potential impacts to these resources is limited. The Utilities would coordinate with landowners and agencies administering conservation land programs on a site-by-site basis to minimize impacts to conservation lands and associated management of these properties.

3.10.2.3.5 COMPREHENSIVE LAND USE PLANS/DESIGNATIONS

The project would extend through multiple municipal jurisdictions and would cross lands in zoning districts where transmission line ROW development is not prohibited. Under the applicable zoning ordinances and comprehensive plans, transmission lines are either a permitted or conditional use in all jurisdictions traversed by the proposed ROW. All applicable zoning and land use approvals would need to be obtained prior to construction.

The C-HC Project would require ROW easements from private property owners, which could encumber the ROW area with land use restrictions. Each easement would specify the present and future right to clear the ROW and to keep it clear of all trees, whether natural or cultivated; all structure-supported crops; other structures; brush; vegetation; and fire and electrical hazards, with the exception of non-structure supported agricultural crops less than 10 feet in height.

3.10.2.4 ALTERNATIVE 1

3.10.2.4.1 LAND COVER

Temporary minor impacts would occur to agriculture, grassland, and barren land cover classes as a result of the C-HC Project. Areas within the ROW, access roads, and laydown yards would return to existing conditions in these land cover types with only the areas in the transmission line structure and substation footprints being permanently affected (Table 3.10-4).

Permanent major impacts would occur to forest and shrubland land cover types as these areas within the ROW would be cleared prior to construction and low vegetation would be maintained throughout the life of the project, resulting in a permanent change from forest and shrubland land cover to grassland land cover type in these areas. Permanent major impacts would also occur to land cover types at transmission line structure and substation footprints where existing land cover would be converted to a developed area (see Table 3.10-4).

Table 3.10-4. Land Cover Class Acreage for Alternative 1

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Total Analysis Area	**1,891**	**1,699**	**22**	**204**	**213**
Land Cover Class					
Agriculture	868	792	22	100	106
Forest	524	496	0	11	0
Grassland	228	153	0	40	0
Urban	73	62	0	44	0
Barren	64	106	0	0	107
Shrubland	10	6	0	0	0
Wetlands	110	73	0	4	0
Open Water	15	10	0	0	0

3.10.2.4.2 AGRICULTURAL LANDS

Temporary minor impacts would occur to prime farmland and farmland of statewide importance during construction activities within the ROW (Table 3.10-5.). These would include soil mixing, rutting, and soil compaction. However, these areas would be restored to existing conditions except within the transmission line structure footprints.

Permanent major impacts would occur to prime farmland and farmland of statewide importance at transmission line structures and within the Hill Valley Substation where existing farmland would be converted to a developed utility use (see Table 3.10-5).

Table 3.10-5. Acres of Farmland by Farmland Classification for Alternative 1

	Prime Farmland	Farmland of Statewide Importance
Total Analysis Area	**1,891**	**1,699**
Temporary Disturbance Within ROW	372	510
Temporary Disturbance from Access Roads	27	43
Temporary Disturbance from Laydown Yards	0	0
Permanent Disturbance from the Transmission Line	>1	>1
Permanent Disturbance from the Hill Valley Substation Option 1	11	11
Outside ROW within 300 feet analysis area	301	426

3.10.2.4.3 RECREATION AREAS

Table 3.10-6 summarizes the area of overlap of recreational areas and the C-HC Project ROW and analysis area.

Table 3.10-6. Acres of Overlap with Recreational Areas for Alternative 1

	Within ROW	Outside ROW within 300 feet Analysis Area
Black Earth Creek Wildlife Area, Sunnyside Unit	9	9
Blackhawk Lake Recreation Area	9	8
Governor Dodge State Park	0	0.06
Refuge	44	6

Temporary minor impacts would occur to the Black Earth Creek Wildlife Area, Sunnyside Unit, during construction. Construction activities would detract from the recreational user experience; however, Alternative 1 would occur in an existing power line ROW. Therefore, no permanent impacts to the recreational area or users is anticipated.

Temporary minor impacts would occur to the Blackhawk Lake Recreation Area during construction. Construction activities would detract from the recreational user experience north and west of the lake power line ROW within the Blackhawk Lake Recreation Area. Therefore, no permanent impacts to the recreational area or user is anticipated.

Temporary minor impacts would occur to the Governor Dodge State Park during construction. Whereas the project ROW follows an existing rural road north of the Park, there is currently not a major utility line ROW in this area, so land-clearing activities would occur in forested areas limiting access to these areas during construction. Construction activities would likely impact recreational experience on the north side of the Governor Dodge State Park temporarily. The duration of the impact would last as long as construction occurs in this area. Permanent minor impacts would occur as a new high-voltage power line through this area would change the character of the local vicinity, just north of the Park. The transmission line would not be visible from key observation points within the park.

Temporary moderate impacts would occur to the Refuge during construction. Approximately 44 acres of new ROW would be constructed through the Refuge under Alternative 1. Alternative 1 would adversely impact recreational users during construction by limiting access to a small portion of the Refuge and the Mississippi River, introducing noise from construction equipment and contractors, changing the land use of the ROW area, and altering the visual environment from an undeveloped landscape to a developed landscape. Most of these adverse impacts would last the duration of construction. Recreation activities are expected to return to preconstruction levels after construction ends. Permanent moderate impacts would occur in the Refuge from the C-HC Project as the character of the area near Oak Road would be changed and user experience would be impacted. However, beneficial impacts would also occur to the Refuge under Alternative 1. The existing transmission line ROW near the Stoneman would be removed and reclaimed. Decommissioning and removing the existing utility line would limit users access and recreational opportunities to this area during reclamation activities. 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.

3.10.2.4.4 NATURAL AREAS

Table 3.10-7 summarizes the area of overlap of natural areas and the C-HC Project ROW and analysis area.

Table 3.10-7. Acres of Overlap with Natural Areas for Alternative 1

	Within ROW	Outside ROW within 300 feet of Analysis Area
REM – Otters Creek Fishery Area	0.5	0.4

Temporary major impacts would occur to the Otters Creek Fishery Area during construction. Alternative 1 would create a new utility ROW through this area, which would impact recreational users during construction by limiting access to the ROW, changing the land use of the ROW area, and altering the visual environment from an undeveloped landscape to a developed landscape. Permanent major impacts would occur in the new utility ROW as the character of this area would be changed, wooded areas would be cleared, and user experience would be impacted.

3.10.2.5 ALTERNATIVE 2

3.10.2.5.1 LAND COVER

Temporary minor impacts would occur to agriculture, grassland, and barren land cover classes as a result of the C-HC Project. Areas within the ROW, access roads, and laydown yards would return to existing conditions in these land cover types with only the areas in the transmission line structure and substation footprints being permanently affected (Table 3.10-8).

Permanent major impacts would occur to forest and shrubland land cover types as these areas within the ROW would be cleared prior to construction and low vegetation would be maintained throughout the life of the project, resulting in a permanent change from forest and shrubland land cover to grassland land cover type in these areas. Permanent major impacts would also occur to land cover types at transmission line structure and substation footprints where existing land cover would be converted to a developed area (see Table 3.10-8).

Table 3.10-8. Land Cover Class Acreage for Alternative 2

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Total Analysis Area	**2,008**	**1,766**	**22**	**210**	**213**
Land Cover Class					
Agriculture	916	810	22	102	106
Forest	530	500	0	11	0
Grassland	249	171	0	42	0
Urban	102	89	0	46	0
Barren	69	105	0	0	107
Shrubland	9	5	0	0	0
Wetlands	121	77	0	3	0
Open Water	13	8	0	0	0

3.10.2.5.2 AGRICULTURAL LANDS

Temporary minor impacts would occur to prime farmland and farmland of statewide importance during construction activities within the ROW (Table 3.10-9). These would include soil mixing, rutting, and soil compaction. However, these areas would be restored to existing conditions except within the transmission line structure footprints.

Permanent major impacts would occur to prime farmland and farmland of statewide importance at transmission line structure and substation footprints where existing farmland would be converted to a developed area (see Table 3.10-9).

Table 3.10-9. Acres of Farmland by Farmland Classification for Alternative 2

	Prime Farmland	Farmland of Statewide Importance
Total Analysis Area	**2,008**	**1,766**
Temporary Disturbance Within ROW	349	587
Temporary Disturbance from Access Roads	26	43
Temporary Disturbance from Laydown Yards	0	0
Permanent Disturbance from Transmission Line	>1	>1
Permanent Disturbance from the Hill Valley Substation Option 2	22	0
Outside ROW within 300 feet analysis area	307	467

3.10.2.5.3 RECREATION AREAS

Table 3.10-10 summarizes the area of overlap of recreational areas and the C-HC Project ROW and analysis area.

Table 3.10-10. Acres of Overlap with Recreational Areas for Alternative 2

	Within ROW	Outside ROW within 300 feet Analysis Area
Black Earth Creek Wildlife Area, Sunnyside Unit	9	6
Blackhawk Lake Recreation Area	9	8
Governor Dodge State Park	0	0.06
Refuge	46	53

Temporary moderate impacts would occur to the Black Earth Creek Wildlife Area, Sunnyside Unit during construction. Alternative 2 would follow an existing railroad ROW, but would create a new high-voltage utility line ROW that would pass over the parking lot to this area. User access and experience would be limited during construction. Permanent minor impacts would occur as areas within the ROW are already developed and recreational use of this area would continue unimpeded after construction completion.

Impacts to Blackhawk Lake Recreation Area and Governor Dodge State Park would be the same as presented under Alternative 1.

Temporary minor impacts would occur within the Refuge during construction. Approximately 46 acres of ROW would be constructed through the Refuge under Alternative 2, following the existing transmission line ROW. Construction activities would temporarily impact both land cover and recreational users by limiting access to a small portion of the Refuge and the Mississippi River, generating noise associated with construction equipment, changing the land use of the ROW area, and altering the visual environment. Most of these adverse impacts would last the duration of construction. Recreation activities are expected to return to preconstruction levels after construction ends and land use with the transmission

line ROW would not change since Alternative 2 follows an existing transmission line ROW.
No permanent impacts would occur as the new power line would occur in an existing power line ROW.

3.10.2.5.4 NATURAL AREAS

Table 3.10-11 summarizes the area of overlap of natural areas and the C-HC Project ROW and analysis area.

Table 3.10-11. Acres of Overlap with Natural Areas for Alternative 2

	Within ROW	Outside ROW within 300 feet Analysis Area
REM – Otters Creek Fishery Area	0.5	0.4

Impacts to REM – Otters Creek Fishery Area would be the same as presented under Alternative 1.

3.10.2.6 ALTERNATIVE 3

3.10.2.6.1 LAND COVER

Temporary minor impacts would occur to agriculture, grassland, and barren land cover classes as a result of the C-HC Project. Areas within the ROW, access roads, and laydown yards would return to existing conditions in these land cover types with only the areas in the transmission line structure and substation footprints being permanently affected (Table 3.10-12).

Permanent major impacts would occur to forest and shrubland land cover types as these areas within the ROW would be cleared prior to construction and low vegetation would be maintained throughout the life of the project, resulting in a permanent change from forest and shrubland land cover to grassland land cover type in these areas. Permanent major impacts would also occur to land cover types at transmission line structure and substation footprints where existing land cover would be converted to a developed area (see Table 3.10-12).

Table 3.10-12. Land Cover Class Acreage for Alternative 3

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Total Analysis Area	**2,210**	**2,016**	**22**	**157**	**213**
Land Cover Class					
Agriculture	1,098	1,081	22	73	106
Forest	504	504	0	12	0
Grassland	302	198	0	27	0
Urban	129	88	0	37	0
Barren	50	65	0	0	107
Shrubland	10	8	0	0	0
Wetlands	107	66	0	3	0
Open Water	11	6	0	0	0

3.10.2.6.2 AGRICULTURAL LANDS

Temporary minor impacts would occur to prime farmland and farmland of statewide importance during construction activities within the ROW (Table 3.10-13). These would include soil mixing, rutting, and soil compaction. However, these areas would be restored to existing conditions except within the transmission line structure footprints.

Permanent major impacts would occur to prime farmland and farmland of statewide importance at transmission line structure and substation footprints where existing farmland would be converted to a developed area (see Table 3.10-13).

Table 3.10-13. Acres of Farmland-by-Farmland Classification for Alternative 3

	Prime Farmland	Farmland of Statewide Importance
Total Analysis Area	**2,210**	**2,016**
Temporary Disturbance Within ROW	614	616
Temporary Disturbance from Access Roads	22	45
Temporary Disturbance from Laydown Yards	0	0
Outside ROW within 300 feet analysis area	573	514
Permanent Disturbance from Transmission Line	>1	>1
Permanent Disturbance from the Hill Valley Substation Option 2	22	0

3.10.2.6.3 RECREATION AREAS

Table 3.10-14 summarizes the area of overlap of recreational areas and the C-HC Project ROW and analysis area.

Table 3.10-14. Acres of Overlap with Recreational Areas for Alternative 3

	Within ROW	Outside ROW within 300 feet Analysis Area
Black Earth Creek Wildlife Area, Sunnyside Unit	9	9
Blackhawk Lake Recreation Area	9	8
Governor Dodge State Park	0	0.06
Refuge	46	53
Pecatonica State Trail	0.3	0.3

Impacts to the Black Earth Creek Wildlife Area, Sunnyside Unit would be the same as presented under Alternative 1.

Impacts to Blackhawk Lake Recreation Area and Governor Dodge State Park would be the same as presented under Alternative 1.

Impacts to the Refuge would be the same as presented under Alternative 2.

Temporary moderate impacts would occur to the Pecatonica State Trail during construction. There is currently not a major utility line ROW in this area, but much of the area is agricultural fields, so vegetation clearing activities would be minimal. Construction activities would impact the Trail and user experience in limited areas. Permanent moderate impacts would occur as a new high-voltage power line through this area would change the character of the Trail and impact the recreational experience in this area.

3.10.2.6.4 NATURAL AREAS

Table 3.10-15 summarizes the area of overlap of natural areas and the C-HC Project ROW and analysis area.

Table 3.10-15. Acres of Overlap with Natural Areas for Alternative 3

	Within ROW	Outside ROW within 300 feet of Analysis Area
REM – Little Platte River Fishery Area	9	0.3
REM – Otters Creek Fishery Area	0.5	0.4

Temporary minor impacts would occur to the Little Platte River fishery area during construction. Construction activities would detract from the recreational user experience; however, Alternative 3 would occur in an existing power line ROW. Therefore, no permanent impacts to the fishery area or users is anticipated.

Impacts to REM – Otters Creek Fishery Area would be the same as presented under Alternative 1.

3.10.2.7 ALTERNATIVE 4

3.10.2.7.1 LAND COVER

Temporary minor impacts would occur to agriculture, grassland, and barren land cover classes as a result of the C-HC Project. Areas within the ROW, access roads, and laydown yards would return to existing conditions in these land cover types with only the areas in the transmission line structure and substation footprints being permanently affected (Table 3.10-16).

Permanent major impacts would occur to forest and shrubland land cover types as these areas within the ROW would be cleared prior to construction and low vegetation would be maintained throughout the life of the project, resulting in a permanent change from forest and shrubland land cover to grassland land cover type in these areas. Permanent major impacts would also occur to land cover types at transmission line structure and substation footprints where existing land cover would be converted to a developed area (see Table 3.10-16).

Table 3.10-16. Land Cover Class Acreage for Alternative 4

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Total Area	**2,246**	**2,083**	**22**	**116**	**213**
Land Cover Class					
Agriculture	1,175	1,103	22	58	106
Forest	236	216	0	7	0
Grassland	433	317	0	19	0
Urban	263	343	0	27	0
Barren	45	59	0	0	107

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Shrubland	16	10	0	0	0
Wetlands	69	28	0	2	0
Open Water	11	6	0	0	0

3.10.2.7.2 AGRICULTURAL LANDS

Temporary minor impacts would occur to prime farmland and farmland of statewide importance during construction activities within the ROW (Table 3.10-17). These would include soil mixing, rutting, and soil compaction. However, these areas would be restored to existing conditions except within the transmission line structure footprints.

Permanent major impacts would occur to prime farmland and farmland of statewide importance at transmission line structure and substation footprints where existing farmland would be converted to a developed area (see Table 3.10-17).

Table 3.10-17. Acres of Farmland-by-Farmland Classification for Alternative 4

	Prime Farmland	Farmland of Statewide Importance
Total Analysis Area	**2,246**	**2,083**
Temporary Disturbance Within ROW	855	685
Temporary Disturbance from Access Roads	17	40
Temporary Disturbance from Laydown Yards	0	0
Outside ROW within 300 feet of Analysis Area	839	589
Permanent Disturbance from the Transmission Line	>1	>1
Permeant Disturbance from the Hill Valley Substation Option 2	22	0

3.10.2.7.3 RECREATION AREAS

Table 3.10-18 summarizes the area of overlap of recreational areas and the C-HC Project ROW and analysis area.

Table 3.10-18. Acres of Overlap with Recreational Areas for Alternative 4

	Within ROW	Outside ROW within 300 feet Analysis Area
Black Earth Creek Wildlife Area, Sunnyside Unit	9	9
Military Ridge State Trail	0.5	0.5
Refuge	46	53
Pecatonica State Trail	0.3	0.3

Impacts to Black Earth Creek Wildlife Area, Sunnyside Unit would be the same as presented under Alternative 1.

Temporary minor impacts would occur to the Military Ridge State Trail during construction. Construction of the ROW would occur on the opposite side of a four-lane state highway from the Trail system. Impacts from construction activities would detract somewhat from user experience, but highway traffic and other development in the area would minimize these impacts. Permanent moderate impacts would occur as a new high-voltage power line ROW would alter the character of the Trail system, but existing developed conditions in this area would minimize this impact.

Impacts to the Refuge would be the same as presented under Alternative 2.

Impacts to Pecatonica State Trail would be the same as presented under Alternative 3.

3.10.2.7.4 NATURAL AREAS

Table 3.10-19 summarizes the area of overlap of natural areas and the C-HC Project ROW and analysis area.

Table 3.10-19. Acres of Overlap with Natural Areas for Alternative 4

	Within ROW	Outside ROW within 300 feet Analysis Area
REM – Little Platte River Fishery Area	9	0.3
Thompson Memorial Prairie State Natural Area	4	3

Impacts to REM – Little Platte River Fishery Area would be the same as presented under Alternative 3.

Temporary moderate impacts would occur to the Thompson Memorial State Natural Area during construction. Alternative 4 would follow an existing four-lane highway ROW, but would create a new high-voltage utility line ROW that would pass through agricultural fields in this area. User access and experience would be limited during construction. Permanent moderate impacts would occur as a new power line would change the character of this area; however, the close proximity to the highway would help minimize impacts to use of this area.

3.10.2.8 ALTERNATIVE 5

3.10.2.8.1 LAND COVER

Temporary minor impacts would occur to agriculture, grassland, and barren land cover classes as a result of the C-HC Project. Areas within the ROW, access roads, and laydown yards would return to existing conditions in these land cover types with only the areas in the transmission line structure and substation footprints being permanently affected (Table 3.10-20).

Permanent major impacts would occur to forest and shrubland land cover types as these areas within the ROW would be cleared prior to construction and low vegetation would be maintained throughout the life of the project, resulting in a permanent change from forest and shrubland land cover to grassland land cover type in these areas. Permanent major impacts would also occur to land cover types at transmission line structure and substation footprints where existing land cover would be converted to a developed area (see Table 3.10-20).

Table 3.10-20. Land Cover Class Acreage for Alternative 5

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Total Analysis Area	**2,431**	**2,230**	**22**	**129**	**213**
Land Cover Class					

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Agriculture	1,342	1,263	22	64	106
Forest	245	216	0	7	0
Grassland	454	338	0	22	0
Urban	266	295	0	30	0
Barren	41	68	0	0	107
Shrubland	8	7	0	0	0
Wetlands	66	35	0	2	0
Open Water	10	8	0	0	0

3.10.2.8.2 AGRICULTURAL LANDS

Temporary minor impacts would occur to prime farmland and farmland of statewide importance during construction activities within the ROW (Table 3.10-21). These would include soil mixing, rutting, and soil compaction. However, these areas would be restored to existing conditions except within the transmission line structure footprints.

Permanent major impacts would occur to prime farmland and farmland of statewide importance at transmission line structure and substation footprints where existing farmland would be converted to a developed area (see Table 3.10-21).

Table 3.10-21. Acres of Farmland-by-Farmland Classification for Alternative 5

	Prime Farmland	Farmland of Statewide Importance
Total Analysis Area	**2,431**	**2,230**
Temporary Disturbance Within ROW	916	773
Temporary Disturbance from Access Roads	19	42
Temporary Disturbance from Laydown Yards	0	0
Outside ROW within 300 feet of Analysis Area	880	654
Permanent Disturbance from the Transmission Line	>1	>1
Permanent Disturbance from the Hill Valley Substation Option 1	11	11

3.10.2.8.3 RECREATION AREAS

Table 3.10-22 summarizes the area of overlap of recreational areas and the C-HC Project ROW and analysis area.

Table 3.10-22. Acres of Overlap with Recreational Areas for Alternative 5

	Within ROW	Outside ROW within 300 feet Analysis Area
Black Earth Creek Wildlife Area, Sunnyside Unit	9	9
Military Ridge State Trail	3	0.9
Refuge	44	6
Pecatonica State Trail	0.3	0.3

Impacts to the Black Earth Creek Wildlife Area, Sunnyside Unit would be the same as presented under Alternative 1.

Impacts to the Military Ridge State Trail would be the same as presented under Alternative 4.

Impacts to the Refuge would be the same as presented under Alternative 1.

Impacts to Pecatonica State Trail would be the same as presented under Alternative 3.

3.10.2.8.4 NATURAL AREAS

Table 3.10-23 summarizes the area of overlap of natural areas and the C-HC Project ROW and analysis area.

Table 3.10-23. Acres of Overlap with Natural Areas for Alternative 5

	Within ROW	Outside ROW within 300 feet Analysis Area
REM – Little Platte River Fishery Area	9	0.3
Thompson Memorial Prairie State Natural Area	4	3

Impacts to REM – Little Platte River Fishery Area would be the same as presented under Alternative 3.

Impacts to the Thompson Memorial Prairie State Natural Area would be the same as presented under Alternative 4.

3.10.2.9 ALTERNATIVE 6

3.10.2.9.1 LAND COVER

Temporary minor impacts would occur to agriculture, grassland, and barren land cover classes as a result of the C-HC Project. Areas within the ROW, access roads, and laydown yards would return to existing conditions in these land cover types with only the areas in the transmission line structure and substation footprints being permanently affected (Table 3.10-24).

Permanent major impacts would occur to forest and shrubland land cover types as these areas within the ROW would be cleared prior to construction and low vegetation would be maintained throughout the life of the project, resulting in a permanent change from forest and shrubland land cover to grassland land cover type in these areas. Permanent major impacts would also occur to land cover types at transmission line structure and substation footprints where existing land cover would be converted to a developed area (see Table 3.10-24).

Table 3.10-24. Land Cover Class Acreage for Alternative 6

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Total Analysis Area	**1,936**	**1,773**	**22**	**163**	**213**
Land Cover Class					
Agriculture	955	810	22	84	106
Forest	252	203	0	6	0
Grassland	355	275	0	32	0

	Within ROW	Outside ROW and within Analysis Area	Hill Valley Substation	Access Roads	Laydown Yards
Urban	215	329	0	34	0
Barren	56	101	0	0	107
Shrubland	17	9	0	0	0
Wetlands	72	35	0	2	0
Open Water	14	10	0	0	0

3.10.2.9.2 AGRICULTURAL LANDS

Temporary minor impacts would occur to prime farmland and farmland of statewide importance during construction activities within the ROW (Table 3.10-25). These would include soil mixing, rutting, and soil compaction. However, these areas would be restored to existing conditions except within the transmission line structure footprints.

Permanent major impacts would occur to prime farmland and farmland of statewide importance at transmission line structure and substation footprints where existing farmland would be converted to a developed area (see Table 3.10-25).

Table 3.10-25. Acres of Farmland by Farmland Classification for Alternative 6

	Prime Farmland	Farmland of Statewide Importance
Total Analysis **Area**	**1,936**	**1,773**
Within ROW	626	575
Temporary Disturbance from Access Roads	23	37
Temporary Disturbance from Laydown Yards	0	0
Outside ROW within 300 feet analysis area	578	499
Permanent Disturbance from the Transmission Line	>1	>1
Permanent Disturbance from the Hill Valley Substation Option 1	11	11

3.10.2.9.3 RECREATION AREAS

Table 3.10-26 summarizes the area of overlap of recreational areas and the C-HC Project ROW and analysis area.

Table 3.10-26. Acres of Overlap with Recreational Areas for Alternative 6

	Within ROW	Outside ROW within 300 feet Analysis Area
Black Earth Creek Wildlife Area, Sunnyside Unit	8	6
Military Ridge State Trail	1	1
Refuge	44	6

Impacts to Black Earth Creek Wildlife Area, Sunnyside Unit, would be the same as presented under Alternative 2.

Impacts to Military Ridge State Trail would be the same as presented under Alternative 4.

Impacts to the Refuge would be the same as presented under Alternative 1.

3.10.2.9.4 NATURAL AREAS

Table 3.10-27 summarizes the area of overlap of natural areas and the C-HC Project ROW and analysis area.

Table 3.10-27. Acres of Overlap with Natural Areas for Alternative 6

	Within ROW	Outside ROW within 300 feet Analysis Area
Thompson Memorial Prairie State Natural Area	4	3

Impacts to the Thompson Memorial Prairie State Natural Area would be the same as presented under Alternative 4.

3.10.3 *Summary of Impacts*

3.10.3.1 LAND COVER

All land cover types would be temporarily impacted as a result of the C-HC Project construction activities (Table 3.10-28). Agriculture land cover would have the highest temporary impact with between 1,096 acres impacted under Alternative 1, and 1,534 acres impacted under Alternative 5; however, much of this cover type would be restored to existing conditions once construction has completed. Grasslands would also be restored to existing conditions after construction. Whereas temporary impacts to wetlands and open water bodies would occur during construction, environmental commitments would be implemented to minimize temporary impacts to these land cover types.

Table 3.10-28. Land Cover Temporary Impact Summary

	Total Analysis Area (acres)	Agriculture (acres)	Forest (acres)	Grassland (acres)	Urban (acres)	Barren (acres)	Shrubland (acres)	Wetlands (acres)	Open Water (acres)
Alternative 1	3,591	1,096	535	268	117	64	10	114	15
Alternative 2	3,774	1,146	541	291	148	176	9	124	13
Alternative 3	4,226	1,299	516	329	166	157	10	110	11
Alternative 4	4,329	1,361	243	452	290	152	16	71	11
Alternative 5	4,661	1,534	252	476	266	148	8	68	10
Alternative 6	3,709	1,167	258	387	249	163	17	74	14

All land cover types, except open water, would be permanently impacted as a result of the C-HC Project (Table 3.10-29). Land cover type would change from existing land cover to a developed land cover at transmission line structure sites and the substation location. Additionally, land clearing activities and ROW maintenance would permanently change forest and shrubland land cover types to grassland areas. Alternative 4 would result in the fewest acres (236 acres) converted from forested to grassland land cover in the ROW. Alternative 2 would result in the greatest number of acres (530 acres) converted from forest to grassland land cover in the ROW.

Temporary minor impacts would occur to agriculture, grassland, and barren land cover classes as a result of the C-HC Project. Permanent major impacts would occur to forest and shrubland land cover types as a permanent change from forest and shrubland land cover to grassland land cover type. Permanent major impacts would also occur to land cover types at transmission line structure and substation footprints where existing land cover would be converted to a developed area.

Table 3.10-29. Land Cover Permanent Impact Summary

	Total Analysis Area (acres)	Agriculture (acres)	Forest (acres)	Grassland (acres)	Urban (acres)	Barren (acres)	Shrubland (acres)	Wetlands (acres)	Open Water (acres)
Alternative 1	3,591	22	524	>1	>1	>1	10	>1	0
Alternative 2	3,774	22	530	>1	>1	>1	9	>1	0
Alternative 3	4,226	22	504	>1	>1	>1	10	>1	0
Alternative 4	4,329	22	236	>1	>1	>1	16	>1	0
Alternative 5	4,661	22	245	>1	>1	>1	8	>1	0
Alternative 6	3,709	22	252	>1	>1	>1	17	>1	0

3.10.3.2 AGRICULTURAL LANDS

Temporary impacts from the C-HC Project construction activities would occur in prime farmland and farmland of statewide importance (Table 3.10-30). Impacts on prime farmland and farmland of statewide importance within the ROW would include soil mixing, rutting, and soil compaction. However, the implementation of environmental commitments for soils and reclamation activities within the ROW after construction has completed, will minimize any long-term effects to these areas and their productivity.

Permanent impacts from the transmission line structures would occur in the loss of prime farmland and farmland of statewide importance (see Table 3.10-30).

Table 3.10-30. Farmland Classification Impact Summary

	Total Analysis Area (acres)	Prime Farmland Temporary Impact (acres)	Prime Farmland Permanent Impact (acres)	Farmland of Statewide Importance Temporary Impact (acres)	Farmland of Statewide Importance Permanent Impact (acres)
Alternative 1	3,591	399	11	553	11
Alternative 2	3,774	375	22	630	0
Alternative 3	4,226	636	22	661	0
Alternative 4	4,329	872	22	725	0
Alternative 5	4,661	935	11	815	11
Alternative 6	3,709	649	11	612	11

As a whole, the types of agricultural use taking place within the analysis area are generally compatible with the presence of transmission line ROWs and agricultural activities would largely be allowed to continue in the long term. The Utilities would coordinate with landowners regarding routing the ROW and would incorporate appropriate environmental commitments. The relatively small amount of acreage needed for the transmission line structures and substation would have a long-term, minor impact on agricultural productivity.

3.10.3.3 RECREATION AREAS

Alternatives 1, 3, 4, and 5 would cause minor temporary impacts and no permanent impacts to the Black Earth Creek Wildlife Area, Sunnyside Unit (Table 3.10-31 and Table 3.10-32). These alternatives would follow an existing transmission ROW, so impacts are limited to only construction activities. Alternatives 2 and 6 would cause moderate temporary and minor permanent impacts to the Black Earth Creek Wildlife Area, Sunnyside Unit (see Table 3.10-31 and Table 3.10-32). These alternatives would create a new transmission ROW in this area and would cross the parking lot to this recreation area.

Alternatives 1, 2, and 3 would cause minor temporary impacts and no permanent impacts to the Blackhawk Lake Recreational area (see Table 3.10-31 and Table 3.10-32). These alternatives would follow an existing transmission line ROW, so impacts are limited to only construction activities.

Alternatives 1, 2, and 3 would cause minor temporary and minor permanent impacts to the Governor Dodge State Park (see Table 3.10-31 and Table 3.10-32). These alternatives would create a new transmission line ROW through small wooded tracts just north of the park. This would change the character of the park in this area which would impact recreational users' experiences in these areas.

All alternatives would cause minor temporary and moderate permanent impacts to the Ice Age National Scenic Trail and Cross Plains Complex (see Table 3.10-31 and Table 3.10-32). Whereas the ROW does not impact the trail system, it will parallel it in some areas. The close proximity of a new high-voltage transmission line in these areas would alter the character of the trail system and impact recreational users' experiences in these areas.

Alternatives 4, 5, and 6 would have minor temporary and moderate permanent impacts to the Military Ridge State Trail (see Table 3.10-31 and Table 3.10-32). A four-lane highway lies between the transmission line ROW and the trail system, which would provide a buffer for trail users from construction activities. However, a new high-power transmission line within the vicinity of the trail system would alter the character of the trail and would impact recreational users' experiences in these areas.

Alternatives 2, 3, and 4 would have minor temporary and no permanent impacts to the Refuge (see Table 3.10-31 and Table 3.10-32). These alternatives would follow the existing transmission line ROW through the Refuge, so impacts would be limited to construction activities. Alternatives 1, 5, and 6 would cause both moderate temporary and moderate permanent impacts to the Refuge (see Table 3.10-31 and Table 3.10-32). These alternatives would create a new ROW through the Refuge altering the character of the Refuge from an undeveloped area to a developed area, which would impact recreational users in these areas. Additional beneficial impacts from Alternatives 1, 5, and 6 would occur as the existing ROW for the 161-kV transmission line crossing the Refuge would be reclaimed to pre-existing conditions.

Alternatives 3, 4, and 5 would cause moderate temporary and moderate permanent impacts to the Pecatonica State Trail (see Table 3.10-31 and Table 3.10-32). These alternatives would create a new ROW through agricultural fields, so construction would be limited to transmission line structure locations. However, a new high-power transmission line in this area would change the character of the trail system which would impact recreational users in these areas.

Table 3.10-31. Recreation Areas Temporary Impact Summary

	Black Earth Creek Wildlife Area, Sunnyside Unit	Blackhawk Lake Recreational Area	Governor Dodge State Park	Ice Age Trail	Military Ridge State Trail	The Refuge	Pecatonica State Trail
Alternative 1	Minor	Minor	Minor	Minor	N/A	Moderate	N/A
Alternative 2	Moderate	Minor	Minor	Minor	N/A	Minor	N/A
Alternative 3	Minor	Minor	Minor	Minor	N/A	Minor	Moderate
Alternative 4	Minor	N/A	N/A	Minor	Minor	Minor	Moderate
Alternative 5	Minor	N/A	N/A	Minor	Minor	Moderate	Moderate
Alternative 6	Moderate	N/A	N/A	Minor	Minor	Moderate	N/A

N/A = not applicable because the alternative does not cross, and the analysis area does not overlap the recreational area.

Table 3.10-32. Recreation Areas Permanent Impact Summary

	Black Earth Creek Wildlife Area, Sunnyside Unit	Blackhawk Lake Recreational Area	Governor Dodge State Park	Ice Age Trail	Military Ridge State Trail	The Refuge	Pecatonica State Trail
Alternative 1	None	None	Minor	Moderate	N/A	Moderate	N/A
Alternative 2	Minor	None	Minor	Moderate	N/A	None	N/A
Alternative 3	None	None	Minor	Moderate	N/A	None	Moderate
Alternative 4	None	N/A	N/A	Moderate	Moderate	None	Moderate
Alternative 5	None	N/A	N/A	Moderate	Moderate	Moderate	Moderate
Alternative 6	Minor	N/A	N/A	Moderate	Moderate	Moderate	N/A

N/A = not applicable because the alternative does not cross, and the analysis area does not overlap the recreational area.

3.10.3.4 NATURAL AREAS

Alternatives 1, 2, and 3 would cause major temporary and permanent impacts to the REM – Otters Creek fishery area (Table 3.10-33 and Table 3.10-34). These alternatives would create a new transmission line ROW across this area which would include the clearing of wooded areas. This will change the character of this area which will impact recreational users' experiences.

Alternatives 3, 4, and 5 would cause minor temporary and no permanent impacts to the REM – Little Platte River fishery area (see Table 3.10-33 and Table 3.10-34). These alternatives would use an existing transmission line ROW through this area, so impacts would be limited to construction activities.

Alternatives 4, 5, and 6 would cause moderate temporary and permanent impacts to the Thompson Memorial Prairie State Natural Area (see Table 3.10-33 and Table 3.10-34). These alternatives would create a new transmission line ROW through agricultural fields and would change the character of the area which would impact recreational users experience.

Table 3.10-33. Natural Areas Temporary Impact Summary

	REM – Otters Creek Fishery Area	REM – Little Platte River Fishery Area	Thompson Memorial Prairie State Natural Area
Alternative 1	Major	N/A	N/A
Alternative 2	Major	N/A	N/A
Alternative 3	Major	Minor	N/A
Alternative 4	N/A	Minor	Moderate
Alternative 5	N/A	Minor	Moderate
Alternative 6	N/A	N/A	Moderate

N/A = not applicable because the alternative does not cross, and the analysis area does not overlap the natural area.

Table 3.10-34. Natural Areas Permanent Impact Summary

	REM – Otters Creek Fishery Area	REM – Little Platte River Fishery Area	Thompson Memorial Prairie State Natural Area
Alternative 1	Major	N/A	N/A
Alternative 2	Major	N/A	N/A
Alternative 3	Major	None	N/A
Alternative 4	N/A	None	Moderate
Alternative 5	N/A	None	Moderate
Alternative 6	N/A	N/A	Moderate

N/A = not applicable because the alternative does not cross, and the analysis area does not overlap the natural area.

3.10.3.5 COMPREHENSIVE LAND USE PLANS/DESIGNATIONS

There would be no impact from the C-HC Project to comprehensive land use plans within the analysis area as transmission line ROW development is not prohibited. Under the applicable zoning ordinances and comprehensive plans, transmission lines are either a permitted or a conditional use in all jurisdictions traversed by the proposed ROW.

Long-term minor impacts would occur to private properties as the project would require ROW easements. These would include land use restrictions on private properties.

3.11 Visual Quality and Aesthetics

This section presents the visual characterization of the existing aesthetic conditions in the landscape. The description of the affected environment and the environmental consequences focuses on scenic resources and key observation points (KOPs) within potentially affected visual environment. Key observation points are visually sensitive gathering points, where the public has access to areas that have an open view to the surrounding landscape without being obstructed by terrain or vegetation. This unencumbered view of the surrounding landscape is also referred to as a viewshed.

The analysis area for visual quality and aesthetics ranges from within the ROW to upwards of 2 miles from the ROW, depending on topography, vegetation, and the potential visibility of the C-HC Project. The analysis area for visual resources was determined through the application of visibility mapping and field reconnaissance.

3.11.1 *Affected Environment*

Aesthetics can be defined as a mix of landscape character, the context in which the landscape is being viewed, and the visual quality of the landscape. Natural landforms, vegetation, water features, and human modifications give the landscape within a specific area its visual quality. The visual character of an area is influenced by natural systems as well as by human interactions and use of land. In natural settings, visual characteristics are natural elements, whereas in rural or pastoral/agricultural settings, attributes may include human-made elements such as fences, walls, barns and outbuildings, infrastructure (roads, utility poles, radio/cellular towers, water towers), and occasional residences. In a more developed setting, the visual character may include buildings, groomed lawns and landscaping, pavement, and more extensive utility infrastructure.

3.11.1.1 VISUAL CHARACTERISTICS

The existing landscape character across the analysis area varies from towns and suburban developed areas with private residences to farmsteads and agricultural lands to forested lands and riparian and river environments. The landscape's topography varies from mostly flat to rolling agricultural land and from rolling forested areas to blufflands near the Mississippi River. There are several existing 69-kV and 138-kV transmission lines that occur within the analysis area and one 161-kV line. The Millville to Stoneman 69-kV transmission line and the Turkey River to Stoneman 161-kV line are collocated where they cross the Mississippi River in Cassville, Wisconsin (known as the "Stoneman" crossing). Additional 345-kV transmission lines connect to the Cardinal and Hickory Creek substations from other directions (see Figure 1.4-1 in Chapter 1).

The western portion of the analysis area intersects the Driftless Area, which is a region in Minnesota, Wisconsin, northwestern Illinois, and northeastern Iowa of the American Midwest that was never glaciated. Colloquially, the term is expanded to include the broader incised Paleozoic Plateau, which contains deeply carved river valleys and extends into southeastern Minnesota and northeastern Iowa. The region includes elevations ranging from 603 to 1,719 feet at Blue Mound State Park (described below) and covers an area of 24,000 square miles. The rugged terrain is due both to the lack of glacial deposits, or drift, and to the incision of the upper Mississippi River and its tributaries into bedrock (Driftless Wisconsin 2018a). Approximately 85% of the Driftless Area lies within Wisconsin. Largely rural in character, land cover is forest, farmland, and grassland/pasture; modest wetlands are found in river valleys, and along the Mississippi. Row crop farming is less encountered than elsewhere in the state. Away from the Mississippi, the terrain is gently rolling, supporting dairy farms. Wildlife is abundant in the Driftless area providing opportunities for hunting, wildlife viewing, and bird watching (Anderson and Anderson 2007).

3.11.1.2 SCENIC RESOURCES

Within the analysis area, there is one National Scenic Trail, two state parks, and one National Wildlife Refuge offering designated scenic areas within their boundaries. In addition, the Great River Road National Scenic Byway runs through the analysis area. These are depicted in Figure 3.11-1 and described below.

3.11.1.2.1 ICE AGE TRAIL

The Ice Age Trail is a National Scenic Trail located entirely within Wisconsin. The Ice Age Trail crosses the eastern edge of the analysis area, west of the Cardinal Substation in Dane County. The trail is also one of 42 designated Wisconsin state trails and the only one specifically designated as a "State Scenic Trail." From Interstate State Park on the Minnesota border to Potawatomi State Park on Lake Michigan, the Ice Age Trail winds for more than 1,000 miles, following the edge of the last continental glacier in Wisconsin. The trail provides opportunities for people to immerse themselves in a large natural landscape, and experience expansive views that provide a visual display between unglaciated driftless areas and lands shaped by continental glaciation. The Ice Age Trail goes through several state and Federal lands in Wisconsin, traveling many miles through county and private lands. In addition to the state parks and forests, the Ice Age Trail travels through many state wildlife and fishery areas and some state natural areas (WDNR 2018h).

In 2001, Congress appropriated funds for the acquisition of specific lands in the Cross Plains unit of the Ice Age Reserve for an Ice Age National Scenic Trail Interpretive Site, called the Ice Age Complex. The Ice Age Complex at Cross Plains (Complex) is a 1,700-acre unit of the NPS located west of Madison, southeast of Cross Plains, and south of Highway 14. The Complex contains lands owned and managed by the NPS, the WDNR, Dane County Parks, the USFWS, the Ice Age Trail Alliance, and private citizens. The Ice Age Complex is what is referred to as an Affiliated Area by the NPS. The NPS developed a General Management Plan for the lands within the boundaries of the Complex (NPS 2013). The intent of the Complex is to provide visitors with interpretation of its evolution from the last glacial retreat, with opportunities to enjoy low-impact outdoor recreation. There is currently no visitor infrastructure at the Complex other than parking along an existing road, an old farmhouse, and a barn. Current development plans include the installation of a new sustainable visitor center, new protected Ice Age National Scenic Trail segments, additional interpretive and recreational sites, administrative and maintenance facilities, and expansion to complete the park out to State Highway 14. In 2018, the NPS is slated to work with WDNR, Dane County Parks, and the USFWS to develop a Use Management Plan, which will identify locations for visitor infrastructure (NPS 2017a). Once completed, the NPS anticipates up to 250,000 annual visitors per year at the Ice Age Complex.

3.11.1.2.2 GOVERNOR DODGE STATE PARK

Located outside Dodgeville, Wisconsin in Iowa County and in Wisconsin’s Driftless Area, Governor Dodge State Park is one of the state’s largest parks, with 5,350 acres of steep hills, bluffs, and deep valleys plus two lakes and a waterfall. The park is home to numerous species of wildlife and over 150 species of birds. Additionally, the tremendous variations in topography, exposures to sunlight, and soil types provide a diverse array of habitats that support hundreds of plant species. In fiscal year 2016, the total attendance of Governor Dodge State Park was 496,847 (WDNR 2018g).

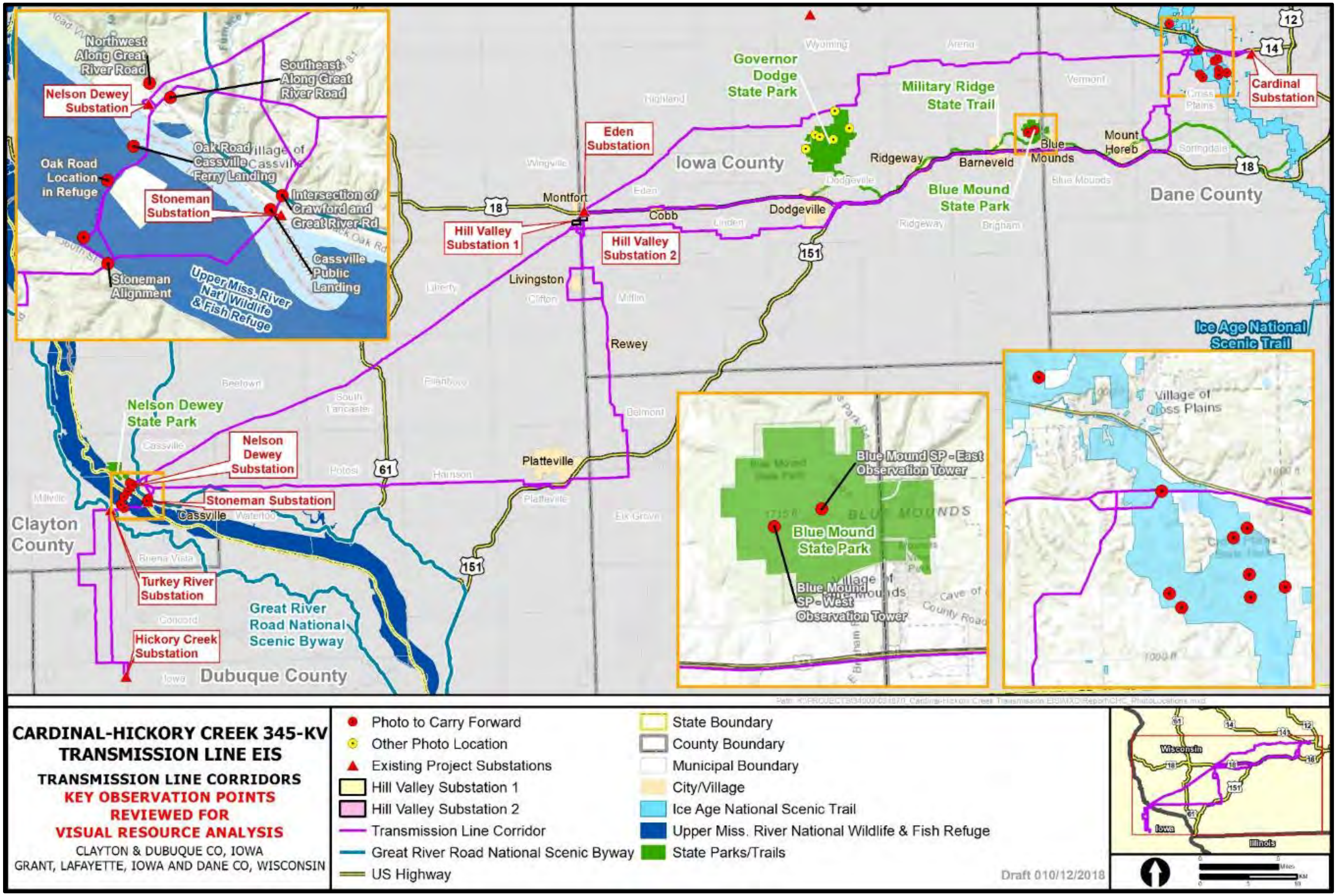

Figure 3.11-1. Key observation points.

3.11.1.2.3 BLUE MOUND STATE PARK

Located near the Village of Blue Mounds in Dane and Iowa Counties, Blue Mound State Park sits atop the largest hill in the south half of Wisconsin and features observation towers affording views of the Wisconsin River Valley and Baraboo Range to the north, the buttes, mounds, and forests of the Driftless Area to the south and west, and the glacial plains and City of Madison to the east. It is home to numerous species of wildlife, over 150 species of birds, and an abundance of flowering plant life. In fiscal year 2016, the total attendance at Governor Dodge State Park was 162,138 (WDNR 2018l).

3.11.1.2.4 UPPER MISSISSIPPI RIVER NATIONAL WILDLIFE AND FISH REFUGE

Established in 1924, the Refuge is approximately 260 river miles long, stretching from the confluence of the Chippewa River in Wisconsin to Rock Island, Illinois. The Refuge has 240,000 acres of Mississippi floodplain throughout four states along the Mississippi River: Minnesota, Wisconsin, Iowa, and Illinois. It is an important habitat for migratory birds, fish, and other wildlife, as well as many species of plants (USFWS 2013). The Refuge is also an important area for tourists. The area receives nearly 3.7 million annual visits (USFWS 2006a). These visitors enjoy the scenic river overlooks from 500-foot-high bluffs, as well as exploring the river, its backwaters, and its islands. Tourists can also enjoy views from the National Scenic Byway (described below) on either side of the Refuge. Additional information about the Refuge is provided in Section 3.14.

The viewshed within the Refuge from the position of a human observer standing in the Refuge, looking west to Wisconsin, can be characterized as having native vegetation in the foreground and middle ground, which some human disturbances, such as Oak Road and the existing transmission line in the middle ground. The background of the Refuge viewshed contains the developed area of Cassville and the demolished Nelson Dewey generation plant site. Due to the sensitivity of the Refuge's viewshed, RUS and USFWS completed extensive visual resource analysis from multiple observation points within and outside the Refuge.

3.11.1.2.5 GREAT RIVER ROAD NATIONAL SCENIC BYWAY

The Great River Road National Scenic Byway has been recognized as a scenic highway for many years, and more recently has been designated as a National Scenic Byway. The National Scenic Byway program is part of the FHWA. To be designated as a National Scenic Byway, a highway must have special scenic, historic, recreational, cultural, archaeological, and/or natural qualities that have been recognized as such through legislation or some other official declaration (FHWA 2018). The Great River Road, managed by the Mississippi River Parkway Commission, follows the Mississippi River for 3,000 miles through 10 states, from northern Minnesota to the Gulf of Mexico. The Great River Road consists of separate units that have been designated and are administered by the states along the river. In Wisconsin, the state purchased scenic easements along the Great River Road in the 1950s to help preserve its value (Wisconsin Great River Road 2018).

The Great River Road attracts a diversity of audiences that have different motivations for driving the road, but tourists primarily use the road for shopping and sightseeing. According to the Wisconsin Department of Tourism, the top attributes of the Great River Road are overall scenic views and access to scenic overlooks (Schmeckle Reserve Interpreters 2005). Within the analysis area, the Great River Road runs along both sides of the Mississippi River, in Wisconsin and Iowa, near the town of Cassville, Wisconsin. This portion of the Scenic Byway overlaps the Great River Road and Mississippi River Bicycle Trail, which provides users with scenic viewing opportunities. In addition to the Mississippi

River itself, the Blufflands, the nearby wildlife refuges, wildlife management areas, state parks, historic sites, and natural communities all contribute to the value of the Great River Road.

3.11.2 *Environmental Consequences*

A “visual impact” describes the change in visual resources brought about by a project and the public's sensitivity to that change. This section describes impacts to visual quality and aesthetics from the construction, operation, and maintenance of the C-HC Project. The visual resources impact analysis is largely documented from the KOPs, or important viewpoints identified as being important to the landscape and affected public.

Potential visual impacts to sites listed in the NRHP are discussed in Section 3.9.

3.11.2.1 DATA SOURCES, METHODS, AND ANALYSIS ASSUMPTIONS

The following impact indicators were considered when analyzing impacts to visual resources from the C-HC Project:

- Number of residences within 300 feet of the C-HC Project (i.e., the analysis area).
- Number of recreational users likely to see the transmission line and level of changes in the landscape from designated overlooks at state parks, Ice Age National Scenic Trail.
- Number of people likely to see the transmission line from the Great River Road.
- Qualitative discussion about the changes in the landscape from the C-HC Project.

Local residents include those who live, work, and travel for their daily business within the analysis area. They generally view the landscape from their yards, homes, local roads, and places of employment. Residents are concentrated in and around the Towns of Cross Plains, Mount Horeb, Dodgeville, and Platteville, but occur throughout the analysis area. Except when involved in local travel, residents are likely to be stationary, and have frequent or prolonged views of the landscape. Local residents may view the landscape from ground level or elevated viewpoints (typically upper floors/stories of homes). Residents’ sensitivity to visual quality is variable, and may be tempered by the aesthetic character/setting of their neighborhood or work place. Those living in more densely settled areas with views focused on their neighborhood street or their downtown centers may be less sensitive to landscape changes than those with a view of undeveloped land. It is generally assumed, however, that all residents are familiar with the surrounding landscape and may be sensitive to changes in their views. To analyze potential impacts to the visual quality and aesthetics experienced at private residences in the analysis area, all residences within 150 feet of the project centerline were identified for each subsegment. The results of that analysis are provided below under the visual characteristics impacts analysis for each alternative.

Recreational users consist of residents and visitors who come to the area for the purpose of experiencing its scenic and recreational resources. They may view the landscape on their way to a destination (i.e., on a roadway) or from the destination itself. Recreational users in the area are generally involved in outdoor recreational activities at parks, trails, water bodies, and forests. Typical activities include bicycling, recreational boating, fishing, and more passive recreational activities (e.g., wildlife viewing). Recreational users are generally considered to have relatively high sensitivity to aesthetic quality and landscape character. They will often have continuous views of landscape features over relatively long periods of time, and scenic quality generally enhances the quality of any outdoor recreational activity. Passive recreational activities generally do not require as much concentration as more active recreational activities, and tend to be more focused on the enjoyment of scenery. Those engaged in passive activities therefore may be particularly sensitive to visual change. Recreational users would be primarily concentrated in public areas such as parks, trails, and scenic roadways (i.e., scenic resources).

To evaluate potential C-HC Project visibility from sensitive viewsheds, SWCA conducted a viewshed analysis for the proposed C-HC Project. Potentially sensitive viewsheds were identified based on a review of public scoping comments and a review of public lands within the analysis area. Topographic viewshed maps were prepared for these areas using USGS digital elevation model (DEM) data (USGS National Elevation Dataset ⅓ arc-second), superimposed with transmission line structures to illustrate potential visibility of the C-HC Project. The resulting viewshed maps defined the maximum area from which the tallest elements of the C-HC Project (i.e., the tops of the transmission line structures) could potentially be seen from ground-level vantage points (existing grade plus 1.7 meters to account for viewer height). The topographic viewshed analysis was run using the maximum height of the transmission line structures (at 150 feet tall and 850 feet apart). The analysis was also run using bare earth, meaning it does not take into account the screening effect of vegetation or built structures, and it provides a very conservative (i.e., "worst case") assessment of potential visibility. The viewshed analysis was run a second time estimating tree height at 35 feet above the ground surface to replicate forested conditions. It should also be noted that its accuracy is also directly related to the accuracy of the USGS DEM data used in the analysis.

Based on the results of the viewshed analysis, key observations points were identified to evaluate potential impacts to the visual quality and aesthetics experienced at scenic resources. RUS and SWCA requested that the Utilities provide photographs from KOPs along the proposed transmission line route(s). The most critical KOP views that represent areas of public sensitivity or heightened scenic quality were selected for simulation to illustrate the introduction of the C-HC Project features into the existing environment and to guide impact analysis. There are 19 KOPs total (see Figure 3.11-1.), most of which are in the vicinity of Cassville/Refuge. Additionally, RUS and SWCA requested KOPs for Governor Dodge State Park and Blue Mound State Park. These locations represented areas where the proposed transmission line may be visible. SWCA assessed the photographs, and worked with RUS, Cooperating Agencies, and the NPS to identify locations to be carried forward in the detailed analysis of impacts, which included visual simulations for select locations.

Visual simulations were produced from high-resolution, digital photographs taken from each selected location. The GIS location of the camera, camera height above the ground, compass direction of the view as seen by the camera, and the approximate vertical angle of the camera view were documented at the time each photograph was taken. Simulations were developed with the photographs using GIS and modeling software to show how the C-HC Project might look like from sensitive and highly valued locations (KOPs) such as trails and overlooks, as well as places where the C-HC Project may be readily visible, such as road crossings. Engineered representations of the transmission line components (structures, conductors, insulators) were inserted to scale into the photographs to show a representation of how the C-HC Project would look on the landscape. The visual simulations were designed to reflect the exact view, coordinates, scale, shading, and coloration of the C-HC Project.

Photographs taken from multiple KOPs within Governor Dodge State Park revealed that the proposed transmission line would not be visible due to tall and dense vegetation and lack of a vantage point from within the park. The remaining KOPs are depicted (in red) in Figure 3.11-1. Visual impacts assessments and visual simulations from these KOPs are discussed below under each applicable alternative. Visual simulations were also conducted by the Utilities to assess impacts from KOPs along the Ice Age National Scenic Trail and in the vicinity of the Cross Plains Complex (see Figure 3.11-1). These simulations are discussed below in Section 3.11

Impact thresholds and determinations are provided below, based on their intensity and duration (Table 3.11-1). Temporary impacts are those that are expected to occur during construction and specific to construction activities. Permanent impacts are those impacts that are expected to result from maintenance and operation of the project once construction is complete. Adverse impacts disclosed in the following sections would be minimized with implementation of the Visual Quality and Aesthetics environmental commitments listed in Section 3.1, Table 3.1-4.

Table 3.11-1. Impact Thresholds and Descriptions for Visual Quality and Aesthetics

	Minor Impact	Moderate Impact	Major Impact
Visual Quality and Aesthetics	Proposed changes could attract attention but would not dominate the view or detract from current user activities.	Proposed changes would attract attention and contribute to the landscape, but would not dominate the landscape. User activities would remain unaffected.	Changes to the characteristic landscape would be considered significant when those changes dominate the landscape and detract from current user activities.

3.11.2.2 NO ACTION

No additional adverse impacts to visual resources would occur under the No Action Alternative. Beneficial impacts to visual resources (described below) would also not occur under this alternative.

3.11.2.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

Potential impacts to visual quality and aesthetics in the analysis area would result from construction of new transmission line structures and conductors, and the establishment of new or expanded ROW through forested areas. The height of transmission line structures would range from 90 to 175 feet for monopole structures and would be spaced every 900 to 1,100 feet. Within the Refuge, low-profile (75-foot) H-frame structures with a typical span length of 500 feet would be constructed within the main part of the Refuge with taller (approximately 196 feet), tubular steel, H-frame support structures at the Mississippi River crossings to allow the transmission line to span the channel and still provide adequate clearance for river-going vessels. The new structures would create additional lines and forms within the viewshed. The extent to which these additional lines and forms affect visual quality depends upon whether the new transmission line follows an existing linear corridor, such as transmission lines, roadways, and railroads; the degree to which it is shielded from view by terrain and vegetation; and the types of other visual elements (such as communications towers, industrial areas, farmsteads, and forests) that already exist in the landscape.

3.11.2.3.1 VISUAL CHARACTERISTICS

When located near a community, transmission lines can lend an industrial feel to an otherwise tranquil residential neighborhood. The greatest individual visual impact would be to people living very close to the C-HC Project; therefore, there is a direct relationship between individual visual impact and the number of residences in proximity to the C-HC Project. The number of residences within the analysis area are presented below, by action alternative.

Temporary impacts to visual characteristics would occur from construction equipment and laydown yards, but these would be short-term and would only persist during the construction period. There would be long-term visual impacts from the construction of the proposed Hill Valley Substation near Montfort, Wisconsin; however, there are no private residences within 150 feet (300-foot analysis area) of the proposed Hill Valley Substation. All action alternatives would result in long-term adverse impacts to visual characteristics within the Driftless Area where the proposed transmission line is visible from roads, trails, and scenic viewpoints.

3.11.2.3.2 SCENIC RESOURCES

Visual impacts to the scenic resources described below would be the same for all action alternatives.

Ice Age National Scenic Trail

The Ice Age NST would be crossed by the C-HC Project under all action alternatives due to the proximity of the trail to the eastern termini of the C-HC Project (Figure 3.11-2). Visual resource analysis for potential impacts to the Ice Age NST and the associated Cross Plains Complex was completed by the Utilities in coordination with the NPS. Visual simulations were conducted from 9 viewpoints in areas where the proposed C-HC Project may be visible from the Ice Age Trail and associated overlooks within the Cross Plains Complex (Figure 3.11-3). Upon further review with NPS and RUS, it was determined that the C-HC Project would potentially be visible from photo viewpoints 1, 2, 3, 4, 5, 6, and 8. Therefore, visual simulations for viewpoints 7 and 9 are not presented in this DEIS. The visual impacts shown in these simulations apply to all alternatives. Note that for all visual simulations, the C-HC Project may be seen differently during leaf-off conditions. The results of the visual simulations are summarized below.

In the visual simulation from viewpoint 1 (Figure 3.11-4), the proposed C-HC Project would be partially obscured by topography and vegetation, but it would be visible towards the left and right of the viewshed. There is an existing transmission line approximately 0.7 miles from the photo point, and the proposed C-HC Project would be constructed approximately 1.7 to 2+ miles from the photo point. Based on viewpoint 1, the C-HC Project would have a long-term minor impact to visual quality and aesthetics at this location along the Ice Age NST.

In the simulation from viewpoint 2 (Figure 3.11-5), there is an existing distribution line that comes in from the south and is underbuilt along the existing east-west transmission line for a few spans, and then turns to the south on stand-alone poles. Where the underbuilt portion of the distribution line parallels the proposed C-HC Project, the smaller voltage transmission line would be relocated underground, and where it is outside the proposed ROW running to the south, it would remain above ground. The distribution pole would serve as a riser structure. Future segments of the Ice Age Trail are planned for this location; therefore, there would be minor impacts to future segments of the Ice Age Trail from the C-HC Project at this location. Impacts would be minor because the visual character represented in the existing viewshed would not be substantially altered by the C-HC Project given that there is an existing transmission line in this viewshed.

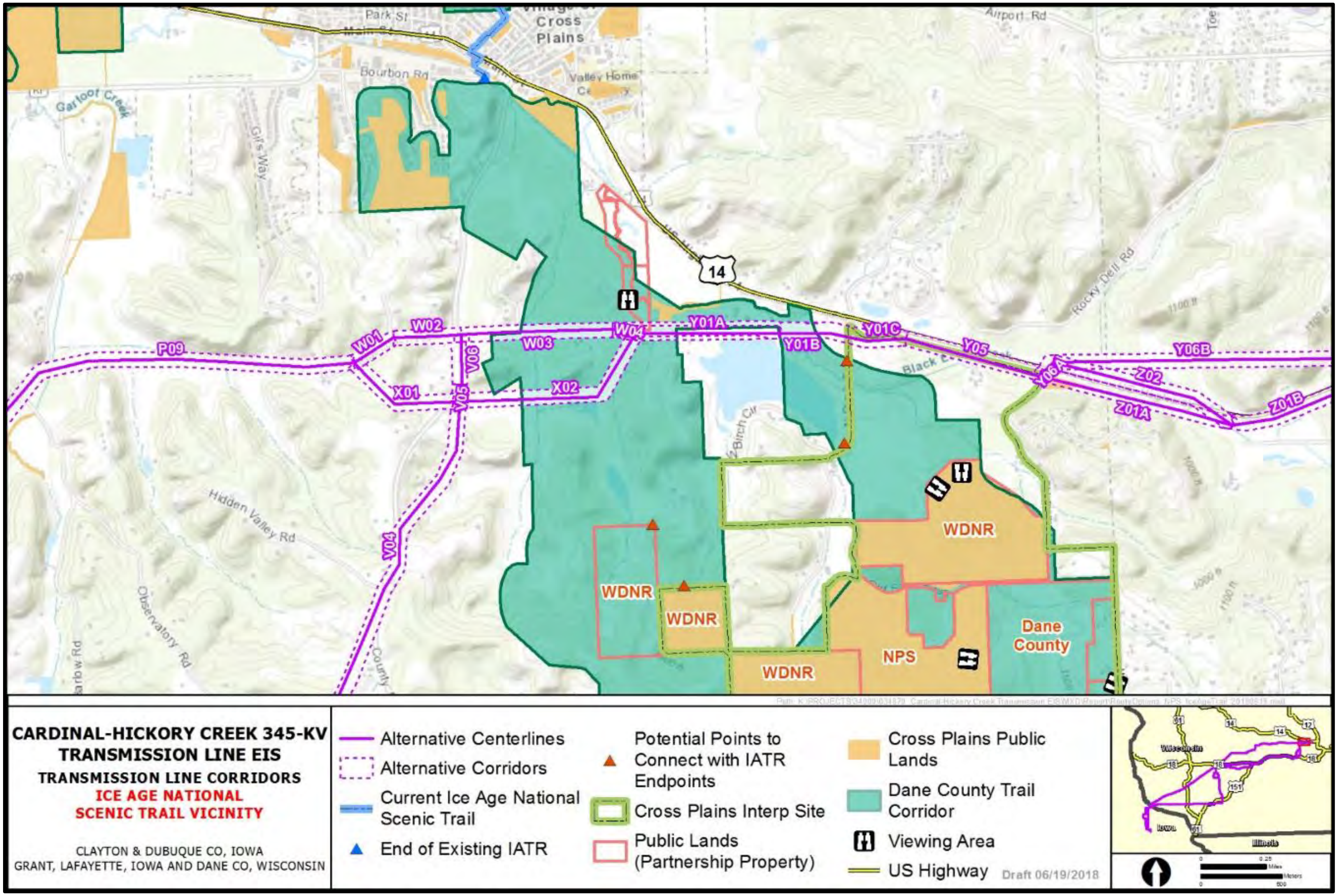

Figure 3.11-2. Proposed C-HC Project transmission line segments in the vicinity of the Ice Age NST.

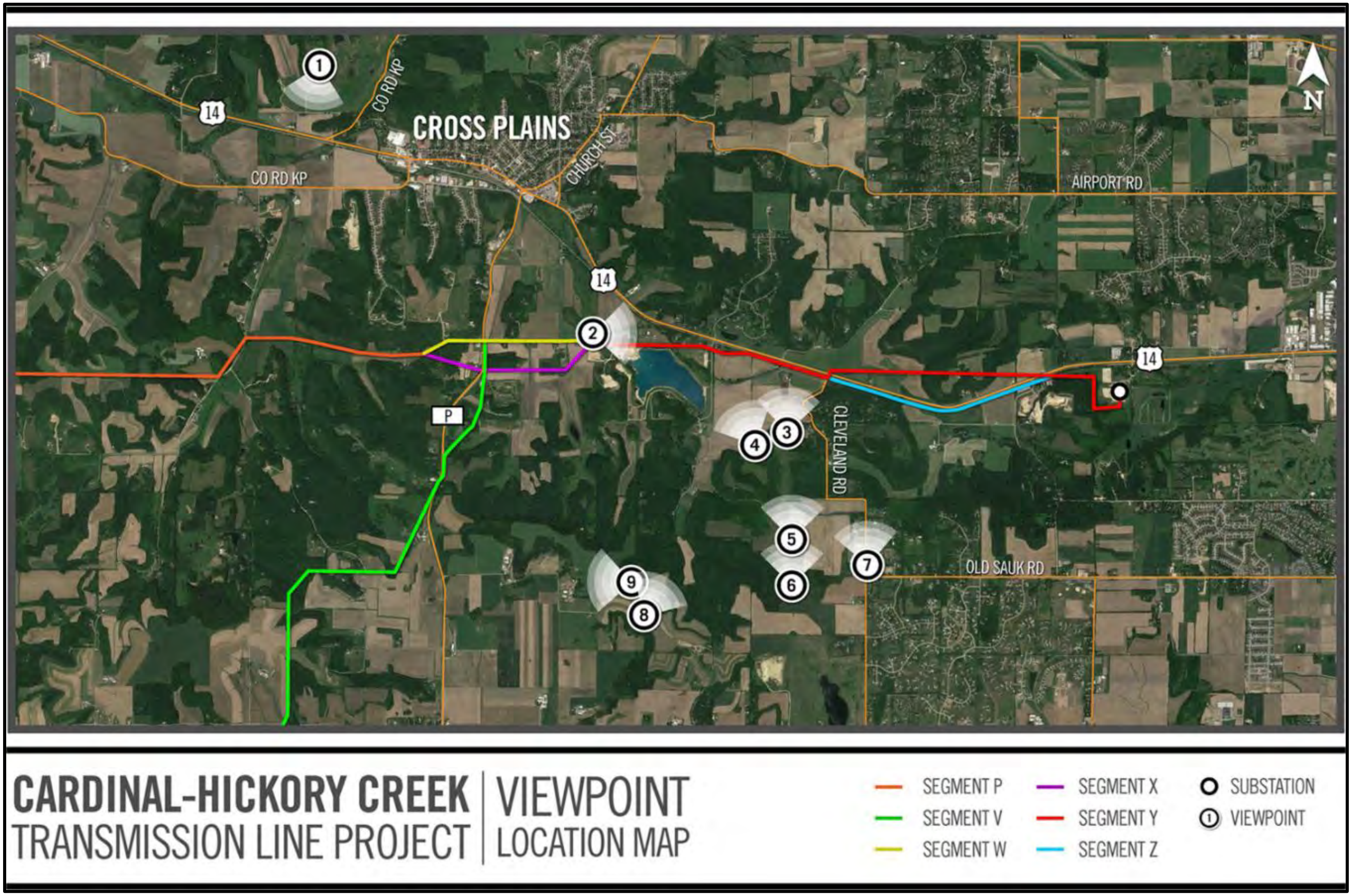

Figure 3.11-3. Overview of visual simulation viewpoints in the vicinity of the Ice Age NST.

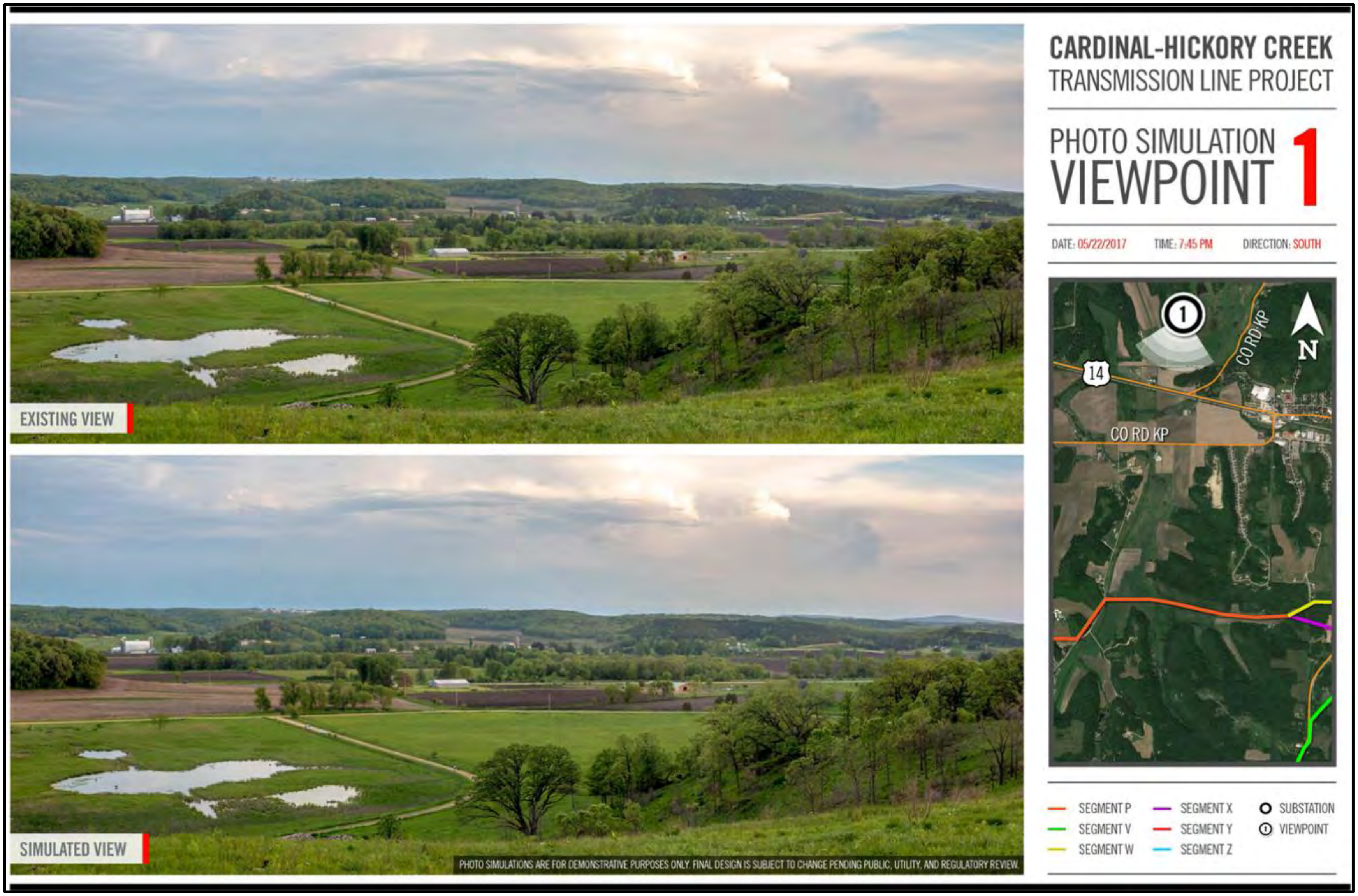

Figure 3.11-4. Visual simulation from viewpoint 1 in the vicinity of the Ice Age NST.

Figure 3.11-5. Visual simulation from viewpoint 2 in the vicinity of the Ice Age NST.

Viewpoint 3 (Figure 3.11-6) represents a proposed Ice Age NST interpretive location for the Black Earth Trench. The C-HC Project would be visible from this location as the proposed transmission line would occur in the middle-ground following Highway 14. Based on discussions between NPS and RUS, the NPS considers this a major long-term adverse impact to viewers at the interpretive overlook from the C-HC Project.

Viewpoint 4 (Figure 3.11-7) represents an important viewshed that is likely the most visually impacted viewpoint from WDNR land (see Figure 3.11-2). Based on discussions between NPS and RUS, the NPS considers any new aboveground utility develop along Stagecoach Road a major adverse impact to scenic resources because this is such an important viewshed for the Ice Age NST. Therefore, the C-HC Project would have a long-term major adverse impact to scenic resources at this location.

Moderate adverse visual impacts would occur from either transmission line segment (Y or Z) at the location represented in the simulation from viewpoint 5 (Figure 3.11-8 and Figure 3.11-9). The C-HC Project would be visible in the middle-ground along Highway 14.

In the visual simulation from viewpoint 6 (Figure 3.11-10 and Figure 3.11-11), the proposed C-HC Project would be partially obscured by topography and vegetation, but it would be visible towards the left of the viewshed. At this location, a view of a future segment Ice Age NST is in the foreground; therefore, the C-HC Project would result in minor adverse impacts to viewers from the future segments of the NST at this location.

In the visual simulation for viewpoint 8 (Figure 3.11-12 and Figure 3.11-13), the C-HC Project would be partially obscured by topography and vegetation, but at least one transmission line structure would be visible toward the middle of the viewshed. Figure 3.11-13 shows a zoomed-in view of the structure. As shown in Figure 3.11-12, the structure would be difficult to see with the human eye from this Ice Age NST viewpoint. Therefore, C-HC Project would result in minor adverse impacts to viewers from the future segments of the NST at this location.

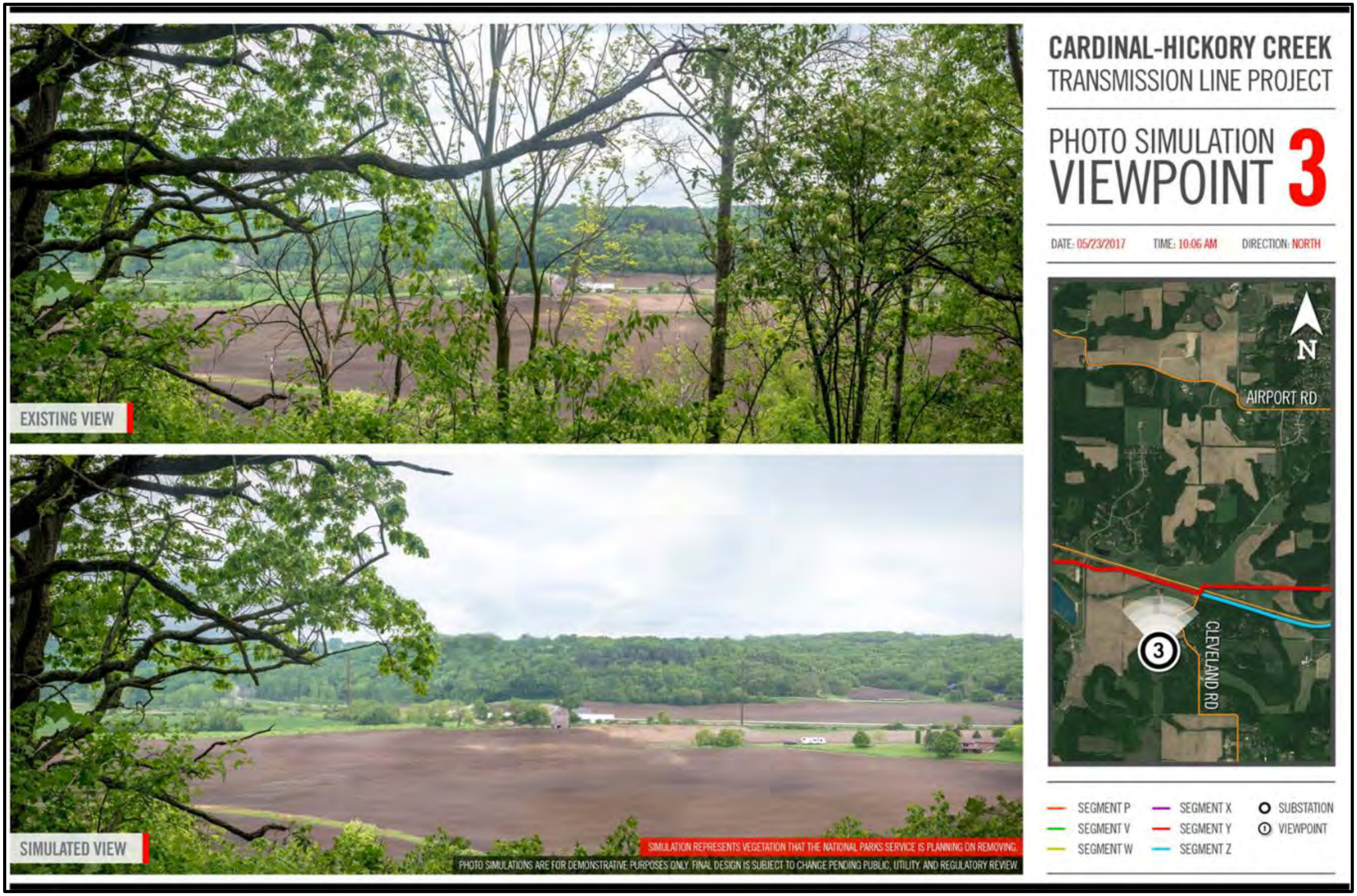

Figure 3.11-6. Visual simulation from photo viewpoint 3 in the vicinity of the Ice Age NST.

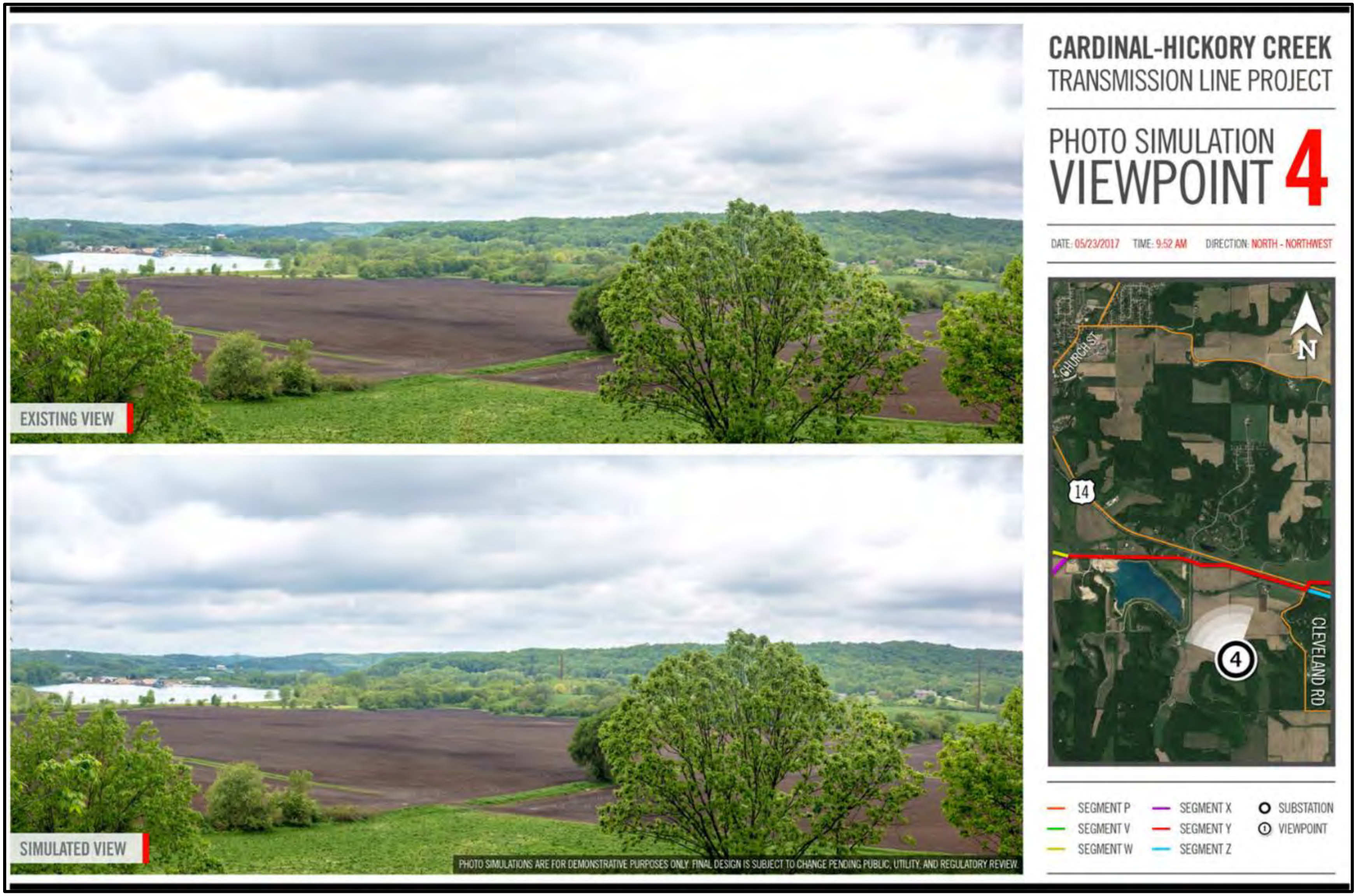

Figure 3.11-7. Visual simulation from photo viewpoint 4 in the vicinity of the Ice Age NST.

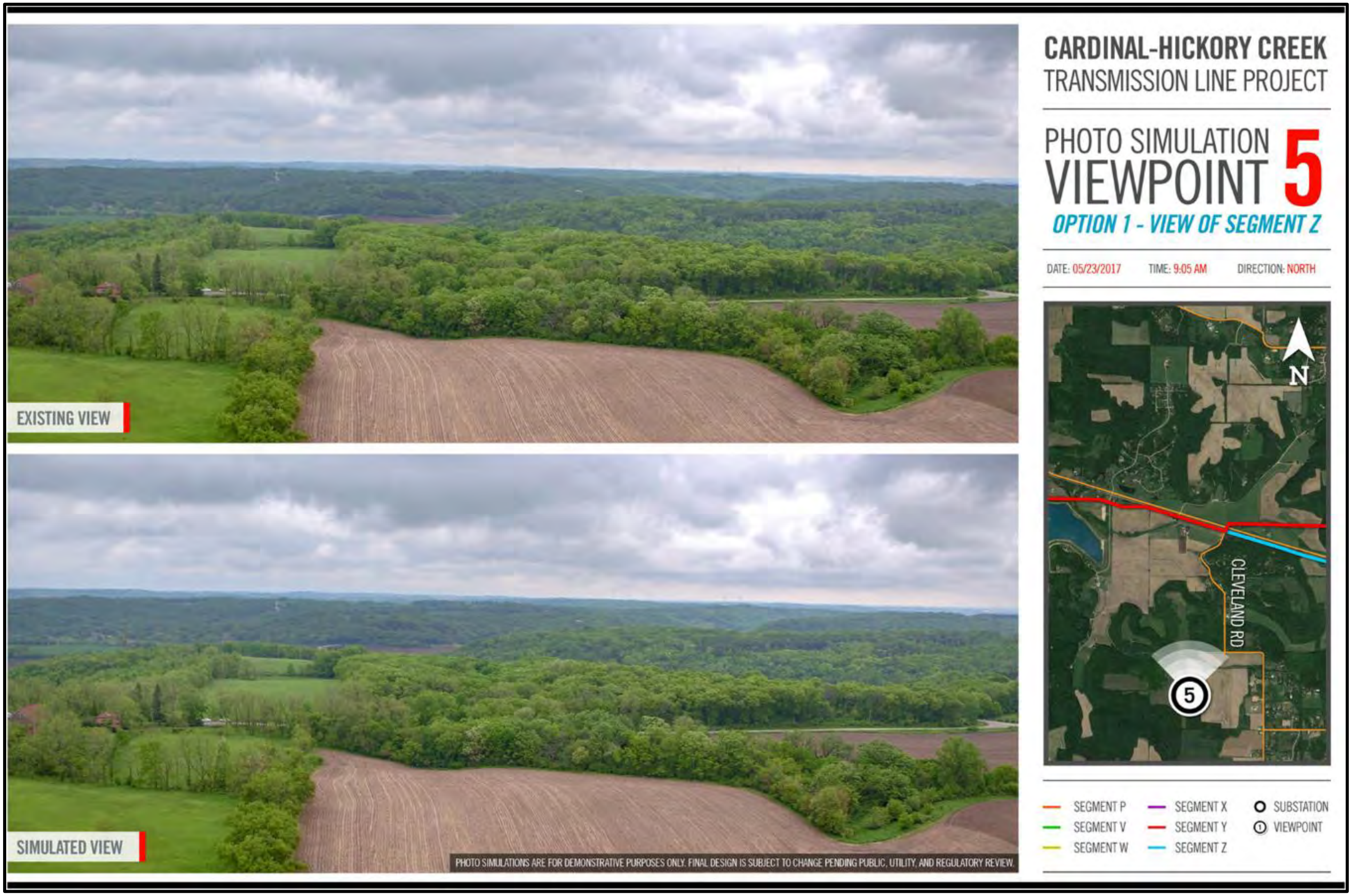

Figure 3.11-8. Visual simulation from photo viewpoint 5, Option 1 – view of Segment Z, in the vicinity of the Ice Age NST.

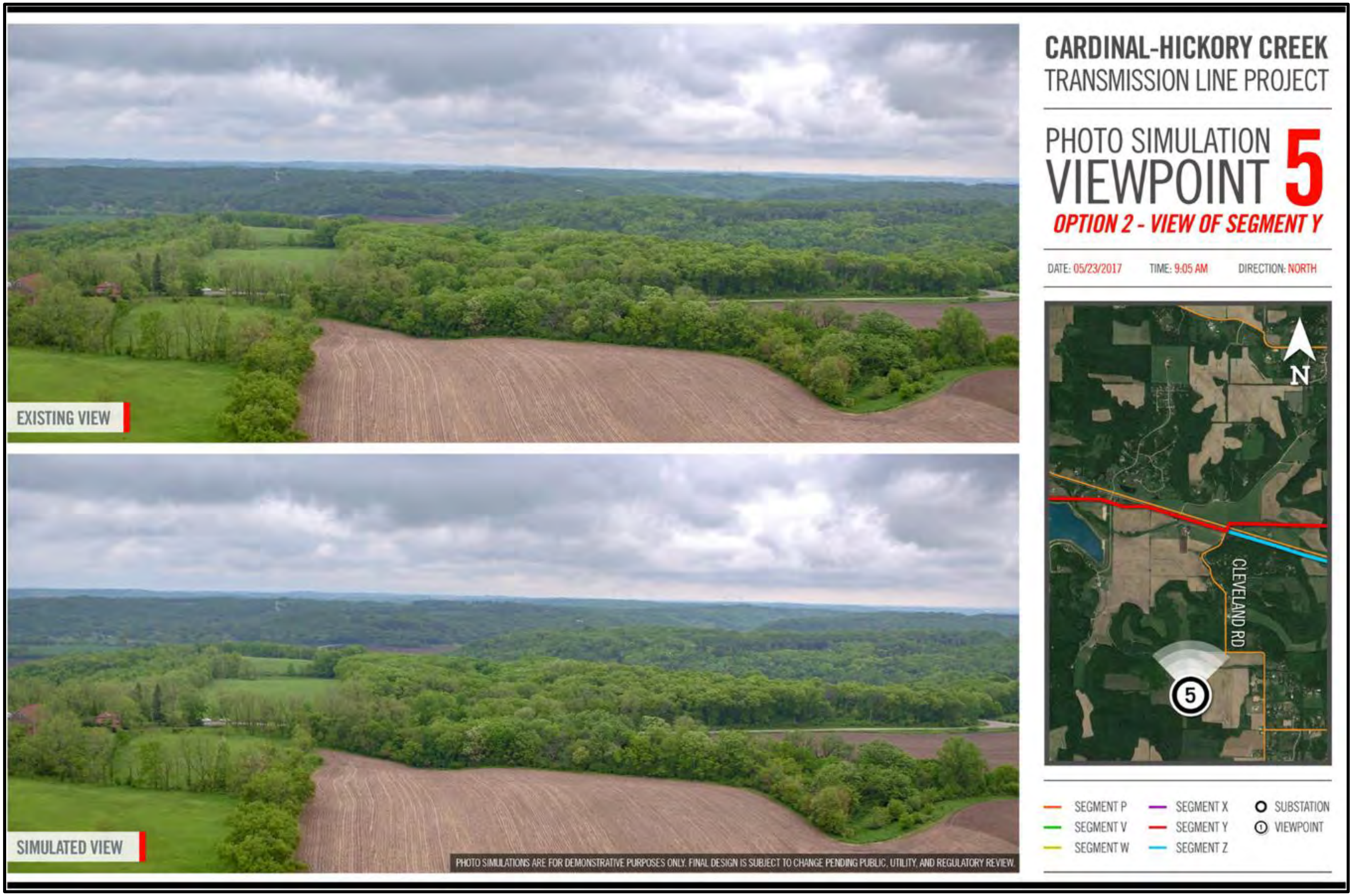

Figure 3.11-9. Visual simulation from photo viewpoint 5, Option 2 – view of Segment Y, in the vicinity of the Ice Age NST.

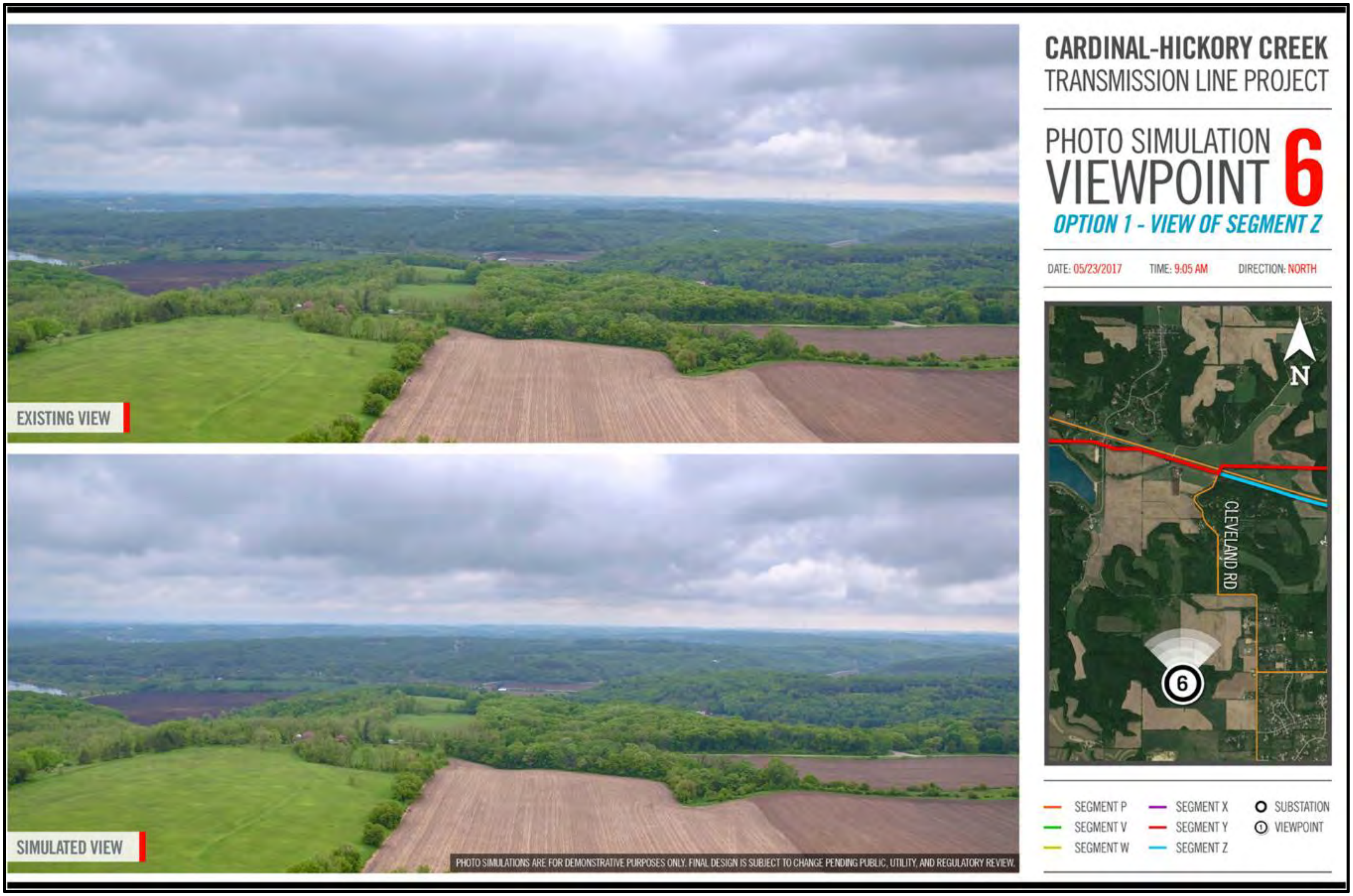

Figure 3.11-10. Visual simulation from photo viewpoint 6, Option 1 – view of Segment Z, in the vicinity of the Ice Age NST.

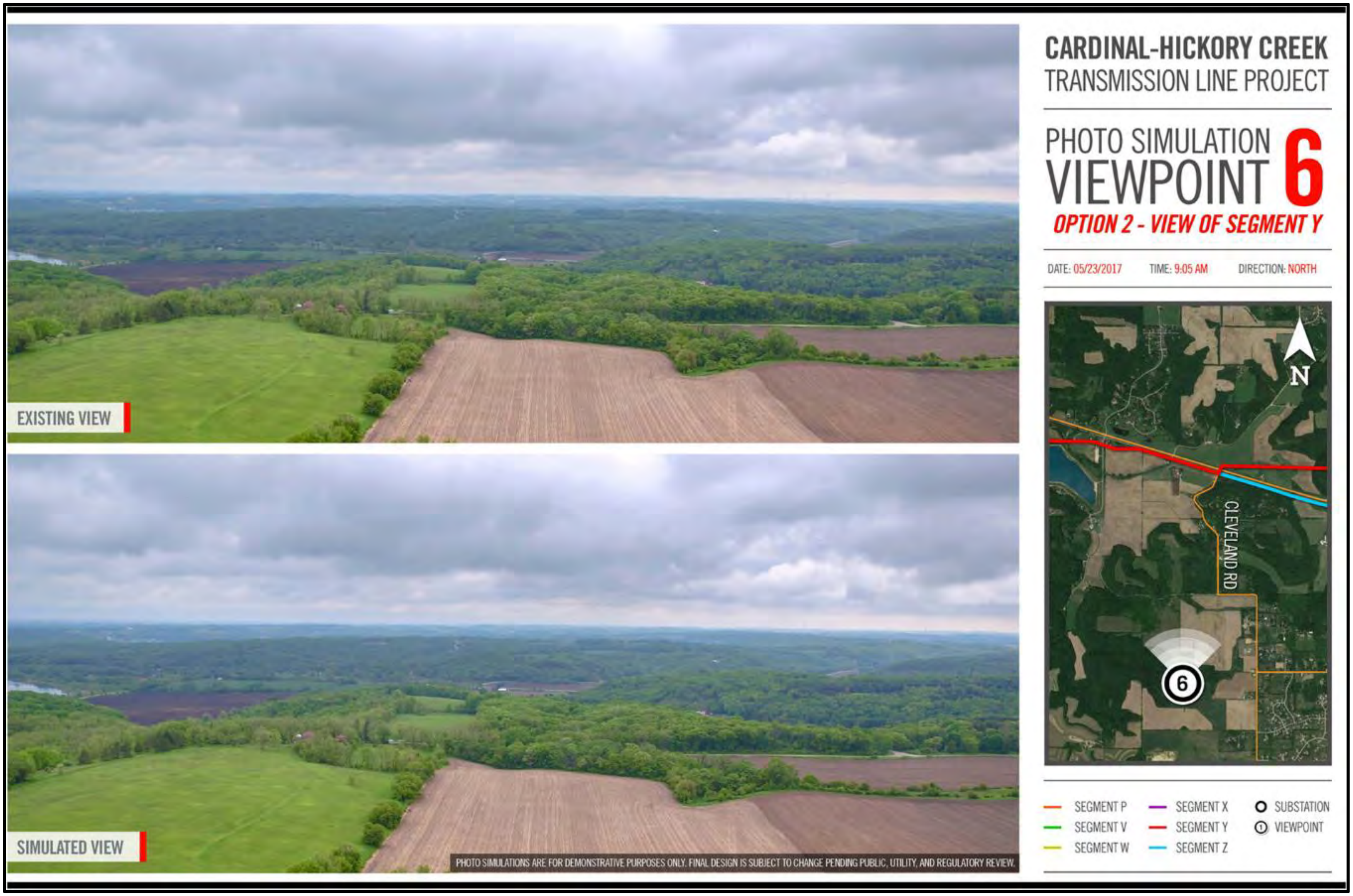

Figure 3.11-11. Visual simulation from photo viewpoint 6, Option 2 – view of Segment Y, in the vicinity of the Ice Age NST.

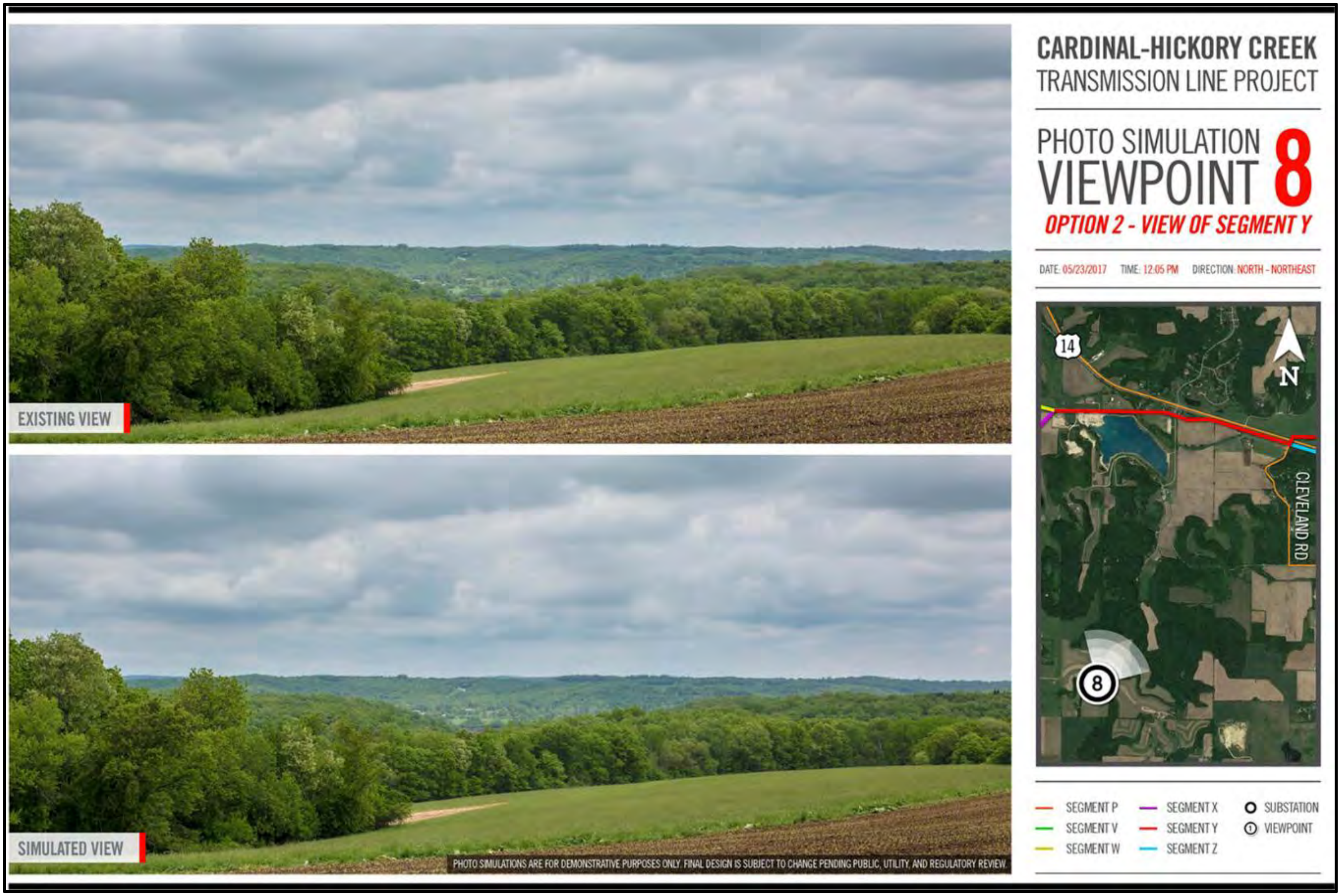

Figure 3.11-12. Visual simulation from photo viewpoint 8, Option 1 – view of Segment Y (human eye view), in the vicinity of the Ice Age NST.

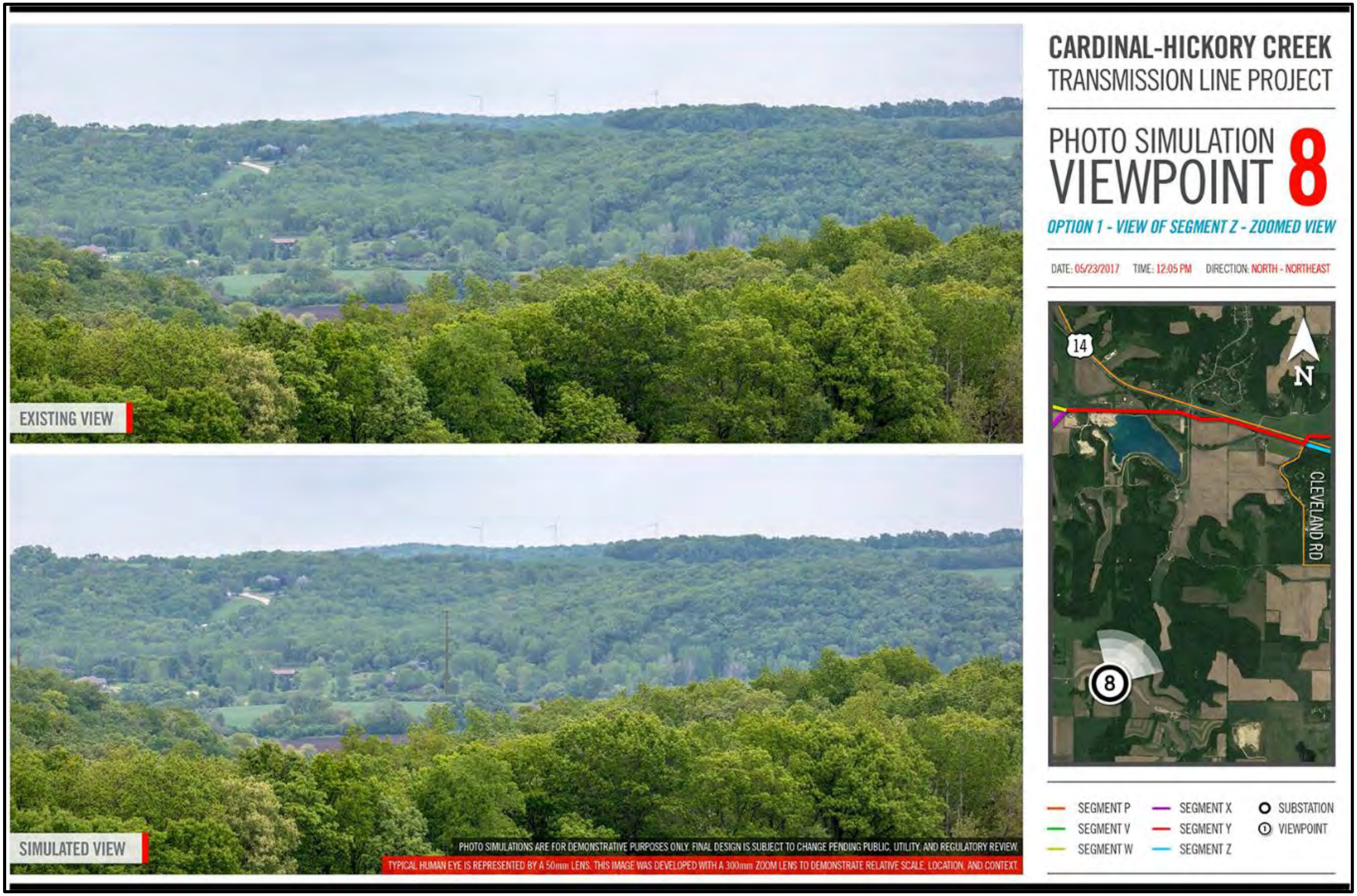

Figure 3.11-13. Visual simulation from photo viewpoint 8, Option 2 – view of Segment Z (zoomed-in), in the vicinity of the Ice Age NST.

3.11.2.4 ALTERNATIVE 1

3.11.2.4.1 VISUAL CHARACTERISTICS

The total length of transmission line in Alternative 1 is approximately 99.1 miles, making it the shortest of the six action alternatives. Within the proposed ROW for Alternative 1, there are two private residences; one is southeast of Cross Plains, Wisconsin, and the other is southeast of Millville, Iowa. Because these two residences are within the ROW in close proximity to the C-HC Project, the individual visual impact to these individual residences would be major and long term at these locations, depending on existing visual obstructions between the residences and the C-HC Project. Within the 300-foot analysis area, but outside the ROW, there are an additional 19 private residences, which would result in moderate visual impacts to these residences. These visual resource impacts would be minor at the overall project level. This alternative would impact the least number of private residences along the proposed transmission line route.

3.11.2.4.2 SCENIC RESOURCES

Upper Mississippi River National Wildlife and Fish Refuge

Visual simulations were conducted from multiple locations within the Refuge (Figure 3.11-14). All action alternatives would cross the Refuge. There are three different options for crossing the Refuge carried forward for detailed analysis as described in Section 2.3.2.7. Segments B-IA1 and B-IA2 are associated with the Nelson Dewey Mississippi River crossing. Impacts from Alternative 1 are represented in viewpoints 1, 2, 3, 4, and 5, which are described below.

Viewpoint 1 is southwest of the Mississippi River within the Refuge. Two photographs were taken from this location to simulate conditions from alternate proposed routes for the C-HC Project. The Nelson Dewey Alignment and Stoneman Revegetation photograph represents simulated conditions under Alternative 1 (Figure 3.11-15). Under Alternative 1, the existing transmission line that crosses the Mississippi River at the Stoneman Substation would be removed and collocated in the C-HC Project ROW that would cross the Mississippi River at the Nelson Dewey Substation. Low-profile H-frame structures would be constructed within the Refuge under Alternative 1 (as with all action alternatives). The unused portion of the ROW would be revegetated, which would result in minor impacts to visual resources under Alternative 1.

Viewpoint 2 is on Oak Road, which is the access road used to reach the Cassville Car Ferry from Iowa as well as to reach the Turkey River Landing river access point. This location was selected to simulate visual impacts from both route options (B-IA1 and B-IA2) associated with the Nelson Dewey Mississippi River Crossing. Two simulations were conducted from this location to demonstrate the differences in visual impacts between route options. Figure 3.11-16 represents the potential visual impacts from route option B-IA1 and Figure 3.11-17 represent the potential visual impacts from route option B-IA2. B-IA1 is the shorter of the two route options, and the C-HC Project would be farther from Oak Road than route option B-IA2. However, both options would result in a major long-term adverse visual impact to viewers along Oak Road in the Refuge.

Viewpoint 3 is also on Oak Road, and is adjacent to a private inholding, which is currently serves as an agricultural field (Figure 3.11-18). Under Alternative 1, the C-HC Project would be adjacent to Oak Road and would be visible from viewpoint 3, resulting in a major long-term adverse visual impact to viewers along Oak Road in the Refuge.

The visual simulation from viewpoint 4 is from the perspective of an observer on Oak Road near the ferry landing (Figure 3.11-19) and viewpoint 5 (Figure 3.11-20) is at the edge of the Mississippi River at the ferry landing. Both visual simulations represent the C-HC Project crossing the Mississippi River at the Nelson Dewey Substation site. There are existing transmission line corridors visible on the north side of the river as well as the existing Nelson Dewey Substation and the recently demolished Nelson Dewey generation plant site. The C-HC Project would result in additional visual impacts to visitors, fishermen, and wildlife photographers as well as car ferry users in this area, particularly on the south side of the river. Due to the amount of development already occurring within this viewshed, the visual resource impacts to the Refuge from the C-HC Project would be long term and moderate at this location.

Under Alternative 1, the Utilities would remove the existing transmission lines that cross the Mississippi River at the Stoneman Substation because the ROW would be shifted north on the river to the Mississippi River crossing at the Nelson Dewey Substation. The existing ROW would be abandoned, and the Utilities would restore the vegetation within the ROW with native vegetation. The visual simulation from photo viewpoint 6 (Figure 3.11-21), at the Cassville Public Landing, represents the ROW revegetation that would occur following the removal of the existing transmission line that crosses the Mississippi River near the Stoneman Substation. The revegetation of the existing ROW would be a beneficial long-term visual impact to the Refuge as well as the observers looking into the Refuge from Cassville, Wisconsin.

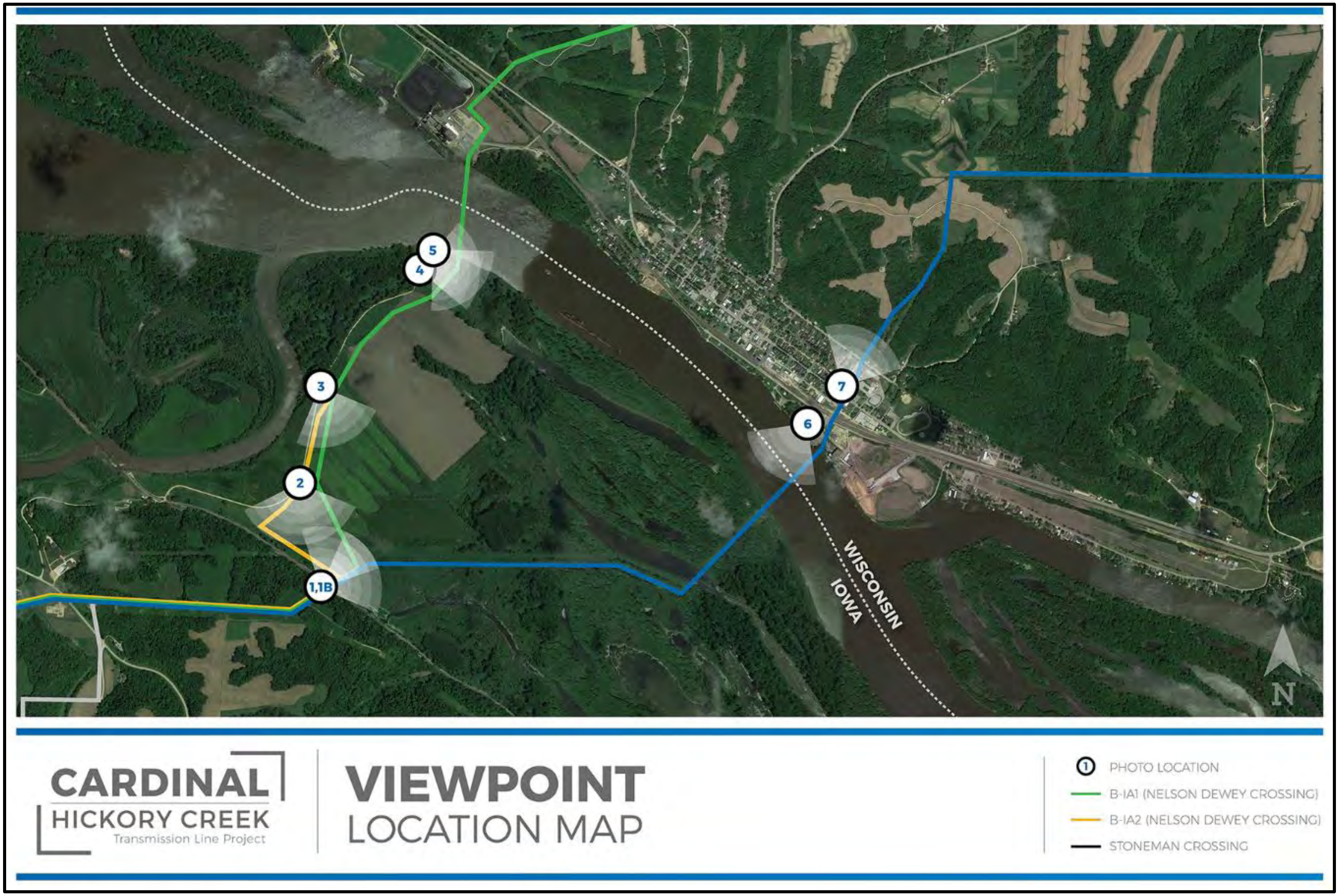

Figure 3.11-14. Overview of visual simulation viewpoints in the vicinity of the Refuge.

Figure 3.11-15. Visual simulation from viewpoint 1 under Alternative 1.

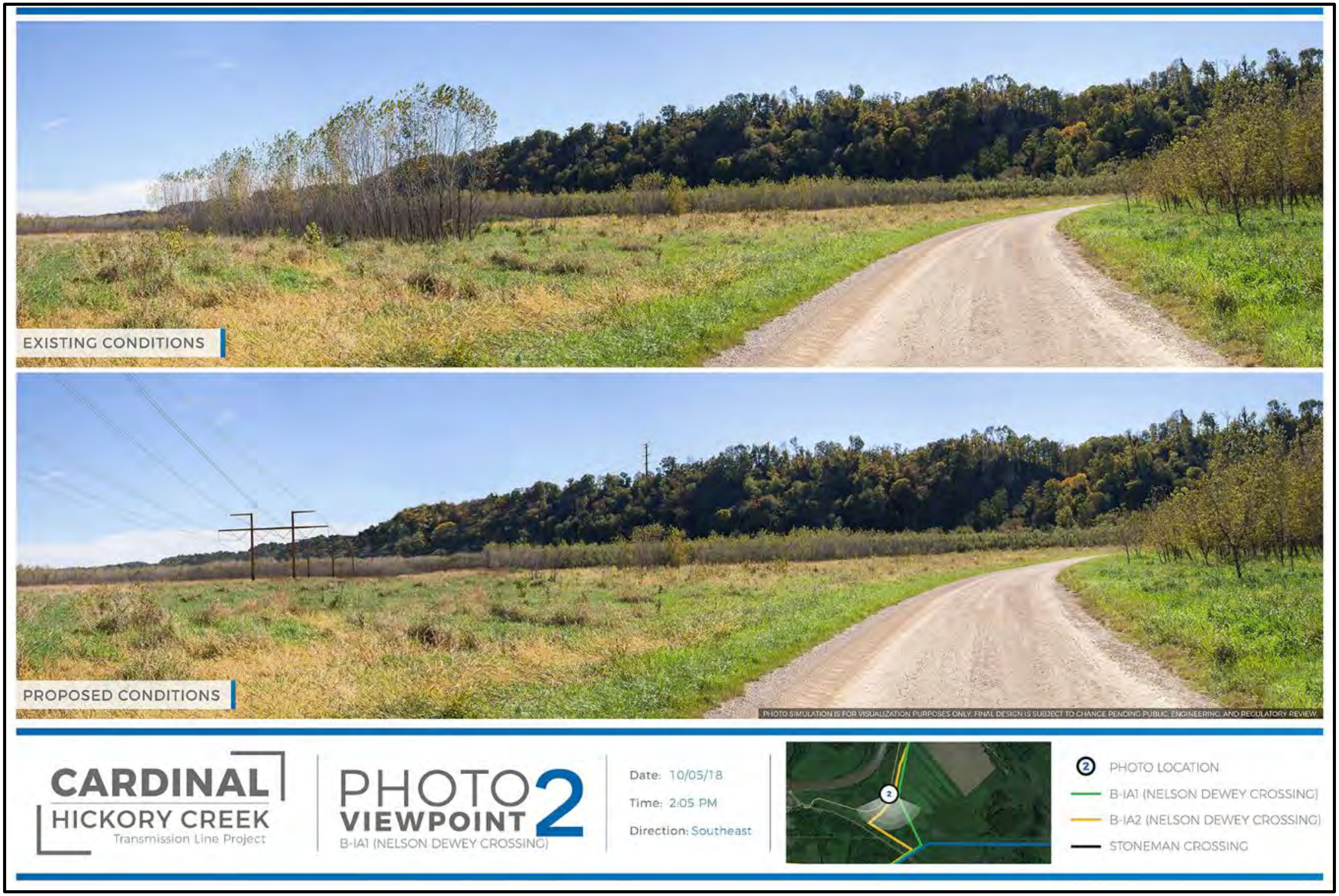

Figure 3.11-16. Visual simulation from viewpoint 2 within the Refuge, on Oak Road (Segment B-IA1).

Figure 3.11-17. Visual simulation from viewpoint 2 within the Refuge, on Oak Road (Segment B-IA2).

Figure 3.11-18. Visual simulation from viewpoint 3 within the Refuge, on Oak Road (Segments B-IA1 and B-IA2).

Figure 3.11-19. Visual simulation from viewpoint 4 showing Alternative 1 in the Refuge to the Mississippi River crossing at the Nelson Dewey Substation (Segments B-IA1 and B-IA2).

Figure 3.11-20. Visual simulation from viewpoint 5 showing the Mississippi River crossing under Alternative 1 (Segments B-IA1 and B-IA2).

Figure 3.11-21. Visual simulation from viewpoint 6 showing the revegetation of the existing transmission line crossing of the Mississippi River at the Stoneman Substation.

Great River Road National Scenic Byway

Three KOPs were identified along the Wisconsin portion of the Great River Road (Figure 3.11-22), two of which would be impacted by Alternative 1. At these two locations, it was determined that a simulation would not be required to analyze impacts to visual resources due to the dense and tall vegetation along the Great River Road that would likely obstruct viewers from seeing most of the C-HC Project for a long duration of time. However, it is possible that viewers could observe lines crossing the road at these locations for a short duration, while driving or cycling on the road, resulting in a minor impact at these locations. Figure 3.11-22 and Figure 3.11-23 represent the existing view from the northwest and southeast locations along the Great River Road, respectively.

Figure 3.11-22. Northwest KOP location on the Great River Road in Wisconsin.

Figure 3.11-23. Southeast KOP location on the Great River Road in Wisconsin.

3.11.2.5 ALTERNATIVE 2

3.11.2.5.1 VISUAL CHARACTERISTICS

The total length of Alternative 2 is approximately 104.3 miles. Within the proposed ROW for Alternative 2, there are two private residences: one is southeast of Cross Plains and the other is north of Dodgeville. Because these two residences are within the ROW in close proximity to the C-HC Project, the visual impact to these individual residences would be major and long term at these locations depending on existing visual obstructions between the residences and the C-HC Project. Within the 300-foot analysis area, but outside the ROW, there are an additional 26 private residences, which would result in moderate visual impacts to these residences. These visual resource impacts would be minor at the overall project level.

3.11.2.5.2 SCENIC RESOURCES

Upper Mississippi River National Wildlife and Fish Refuge

Visual simulations were conducted from multiple locations within the Refuge (see Figure 3.11-14). Impacts from Alternative 2 are represented in viewpoints 1B and 6.

Viewpoint 1B is southwest of the Mississippi River within the Refuge (Figure 3.11-24). The Stoneman Alignment represents simulated conditions under Alternative 2 (Figure 3.11-25). At this viewpoint, the C-HC Project would be built within the ROW for the existing transmission lines using low-profile H-frame structures. Alternative 2 would result in long-term minor impacts to visual resources within the Refuge.

The visual simulation from viewpoint 6 (see Figure 3.11-25), at the Cassville Public Landing, represents the Stoneman crossing of the Mississippi River. Two simulations were conducted from this KOP to simulate conditions from alternate proposed routes for the C-HC Project. Under Alternative 2, the existing transmission line that crosses the river at this location would be removed and replaced with an H-frame structure resulting in a minor impact to viewers and recreational users at this location from the C-HC Project.

Great River Road National Scenic Byway

The visual simulation from photo viewpoint 7 (Figure 3.11-26) is in the town of Cassville on the Great River Road. At this viewpoint, the C-HC Project would have angular redirections, and new transmission line structures would be within Cassville and on the bluffs overlooking the community. There are existing multiple distribution lines and one transmission line visible from this viewpoint. The addition of the structures associated with the C-HC Project would dominate the view at this location; therefore, the C-HC Project would have a major long-term impact within Cassville and along the Great River Road at this location under Alternative 2.

Figure 3.11-24. Visual simulation from viewpoint 1 showing Alternative 2 in the Refuge to the Mississippi River Crossing at the Stoneman Substation.

Figure 3.11-25. Visual simulation from viewpoint 6 showing the Stoneman crossing of the Mississippi River (Segment C-IA).

Figure 3.11-26. Visual simulation from viewpoint 7 showing the C-HC Project in the town of Cassville.

3.11.2.6 ALTERNATIVE 3

3.11.2.6.1 VISUAL CHARATERISTICS

The total length of Alternative 3 is approximately 116.8 miles. Within the proposed ROW for Alternative 3, there are three private residences: one is southeast of Cross Plains, Wisconsin, one is north of Dodgeville, Wisconsin, and one is in the town of Cassville, Wisconsin. Because these three residences are within the ROW in close proximity to the C-HC Project, the visual impact to these individual residences would be major and long term at these locations depending on existing visual obstructions between the residences and the C-HC Project. Within the 300-foot analysis area, but outside the ROW, there are an additional 34 private residences, which would result in moderate visual impacts to these residences. These visual resource impacts would be minor at the overall project level.

3.11.2.6.2 SCENIC RESOURCES

Under Alternative 3, visual impacts to scenic resources within the Refuge and along the Great River Road would be the same as those described for Alternative 2.

3.11.2.7 ALTERNATIVE 4

3.11.2.7.1 VISUAL CHARACTERISTICS

The total length of Alternative 4 is approximately 119.2 miles. Within the proposed ROW for Alternative 4, there are nine private residences; one is southeast of Cross Plains, Wisconsin, one is in Barneveld, Wisconsin, one is southwest of Ridgeway, Wisconsin, two are northwest of Dodgeville, Wisconsin, two are east of Montfort, Wisconsin along Highway 18, one is in Cassville, Wisconsin, and one is southeast of Millville, Iowa. Because these nine residences are within the ROW in close proximity to the C-HC Project, the visual impact to these individual residences would be major and long term at these locations depending on existing visual obstructions between the residences and the C-HC Project. Within the 300-foot analysis area, but outside the ROW, there are an additional 52 private residences, which would result in moderate visual impacts to these residences. These visual impacts would be minor at the overall project level. This alternative would impact the greatest number of private residences along the proposed transmission line route.

3.11.2.7.2 SCENIC RESOURCES

Under Alternative 4, visual impacts to scenic resources within the Refuge and along the Great River Road would be the same as those described for Alternative 2.

Blue Mound State Park

Under this alternative, the proposed C-HC Project would be approximately 1 mile from the park and constructed within the existing ROW of Highway 18/151. Simulations from two KOPs at the west and east observation towers within Blue Mound State Park revealed that the proposed C-HC Project would most likely not be visible from either location (Figure 3.11-27 and Figure 3.11-28, respectively); therefore, there would be no impact to scenic resources within Blue Mound State Park.

Figure 3.11-27. Visual simulation from the west observation tower in Blue Mound State Park in Wisconsin.

Figure 3.11-28. Visual simulation from the east observation tower in Blue Mound State Park in Wisconsin.

3.11.2.8 ALTERNATIVE 5

3.11.2.8.1 VISUAL CHARACTERISTICS

The total length of Alternative 5 is approximately 128.2 miles, making it the longest of the six action alternatives. Within the proposed ROW for Alternative 5, there are two private residences: one is southeast of Cross Plains, Wisconsin, and one is in Barneveld, Wisconsin. Because these two residences are within the ROW in close proximity to the C-HC Project, the visual impact to these individual residences would be major and long term at these locations depending on existing visual obstructions between the residences and the C-HC Project. Within the 300-foot analysis area, but outside the ROW, there are an additional 53 private residences, which would result in moderate visual impacts to these residences. These visual resource impacts would be minor at the overall project level.

3.11.2.8.2 SCENIC RESOURCES

Under Alternative 5, visual impacts to scenic resources within the Refuge and along the Great River Road would be the same as those described for Alternative 1.

Visual impacts to Blue Mound State Park would be the same as those described for Alternative 4.

3.11.2.9 ALTERNATIVE 6

3.11.2.9.1 VISUAL CHARACTERISTICS

The total length of Alternative 6 is approximately 101.9 miles. Within the proposed ROW for Alternative 6, there are eight private residences: one is southeast of Cross Plains, Wisconsin; one is in Barneveld, Wisconsin; one is southwest of Ridgeway, Wisconsin, along Highway 18; two are west of Dodgeville, Wisconsin; two are east of Montfort, Wisconsin; and one is southeast of Millville, Iowa. Because these eight residences are within the ROW in close proximity to the C-HC Project, the visual impact to these individual residences would be major and long term at these locations depending on existing visual obstructions between the residences and the C-HC Project. Within the 300-foot analysis area, but outside the ROW, there are an additional 39 private residences, which would result in moderate visual impacts to these residences. These visual resource impacts would be minor at the overall project level.

3.11.2.9.2 SCENIC RESOURCES

Under Alternative 6, visual impacts to scenic resources within the Refuge and along the Great River Road would be the same as those described for Alternative 1.

Visual impacts to Blue Mound State Park would be the same as those described for Alternative 4.

3.11.3 *Summary of Impacts*

The greatest individual visual impact would be to people living very close to the C-HC Project; therefore, there is a direct relationship between individual visual impact and the number of residences in proximity to the C-HC Project. Table 3.11-2 is a comparison of the number of private residences impacted for each action alternative. Alternative 4 would impact the greatest number of private residences within the ROW (i.e., major impacts), and would also impact the greatest number of residences overall. Alternatives 1, 2, and 5 would have the least amount of major impacts to residences within the ROW, and Alternative 1 would impact the least number of residences overall.

Table 3.11-2. Number of Private Residences with Potential Visual Impacts for All Alternatives

	Private Residences Within ROW	Private Residences Outside ROW, Within Analysis Area
Alternative 1	2	19
Alternative 2	2	26
Alternative 3	3	34
Alternative 4	9	52
Alternative 5	2	53
Alternative 6	8	39

3.11.3.1 ICE AGE NATIONAL SCENIC TRAIL

Under all alternatives, visual impacts to users of the Ice Age NST would occur. The severity of these impacts from various KOPs was determined by conducting visual simulations. From most of the KOPs, minor visual impacts would occur in areas where the proposed C-HC Project would be partially visible from existing or future segments of the Ice Age NST. Moderate impacts would occur where the C-HC Project would be in closer proximity and/or entirely visible from overlooks. At two KOPs, which represent important viewsheds for the Ice Age NST, major visual impacts would occur (see Figure 3.11-6 and Figure 3.11-7).

3.11.3.2 UPPER MISSISSIPPI RIVER NATIONAL WILDLIFE AND FISH REFUGE

Under Alternatives 1, 5, and 6, minor impacts to scenic resources within the Refuge would occur from the C-HC Project at the Stoneman alignment/revegetation KOP. Major adverse impacts would occur from the C-HC Project at the KOP along Oak Road. Moderate impacts to viewers would occur at the Nelson Dewey River crossing KOP at the Oak Road Ferry Landing, and beneficial impacts to viewers would occur from the Stoneman River crossing at the Cassville public landing KOP due to the removal of the existing transmission line and revegetation of the ROW.

Under Alternatives 2, 3, and 4, minor impacts to scenic resources within the Refuge would occur from the C-HC Project.

3.11.3.3 GREAT RIVER ROAD NATIONAL SCENIC BYWAY

Alternatives 1, 5, and 6, would result in minor impacts to users of the Great River Road from the C-HC Project at two KOPs in Wisconsin.

Alternatives 2, 3, and 4, would result in major impacts to users of the Great River Road from the KOP in Cassville, Wisconsin.

3.11.3.4 BLUE MOUND STATE PARK

Alternatives 4, 5, and 6 would be in the vicinity of Blue Mound State Park; however, photographs from two KOPs revealed that the C-HC Project would not be visible from either location.

3.12 Socioeconomics and Environmental Justice

This section describes the social and economic (commonly referred to as socioeconomic) conditions of the analysis area. Socioeconomic characteristics used to describe the affected environment include population and demographics, housing, employment sectors, tourism, and property values. This section also identifies any environmental justice communities in the analysis area. Environmental justice includes the fair treatment and meaningful involvement of all people—regardless of race, ethnicity, or income level—in Federal environmental decision-making.

3.12.1 *Affected Environment*

The socioeconomics analysis area stretches across four counties in Wisconsin (Dane, Iowa, Lafayette, and Grant Counties) and two counties in Iowa (Clayton and Dubuque Counties). This analysis area was chosen because it contains the project area and because socioeconomic statistics are typically measured according to political boundaries, such as counties and towns. Socioeconomic information for the analysis area and the states are provided in this section.

3.12.1.1 DEMOGRAPHICS

The counties in the analysis area are predominantly rural with small populations in towns and communities across the study area. Dane County, Wisconsin, has the largest 2016 population of all the counties in the analysis area (approximately 516,818), followed by Dubuque County, Iowa (approximately 93,359), and Grant County, Wisconsin (approximately 51,723).

The population of all of the analysis area counties combined increased approximately 4.6% between 2010 and 2016, while the populations of Wisconsin and Iowa increased approximately 1.2% and 2.0%, respectively, during that time. The counties in the analysis area that have experienced the greatest growth between 2010 and 2016 include Dane County, Wisconsin (approximately 5.9%) and Dubuque County, Iowa (approximately 2.9%), while Clayton County, Iowa, and Lafayette County, Wisconsin, have both experienced decreases in population between 2010 and 2016 (2.2% and 0.3% decreases, respectively). The populations of these counties are shown in Table 3.12-1.

Table 3.12-1. Population of Study Area Counties (2000, 2010, 2016)

County/State	2000 Population	2010 Population	2016 Population	% Change 2000–2010	% Change 2010–2016
Dane County	426,526	488,073	516,818	14.4%	5.9%
Iowa County	22,780	23,687	23,751	4.0%	0.3%
Lafayette County	16,137	16,836	16,793	4.3%	−0.3%
Grant County	49,597	51,208	51,723	3.2%	1.0%
State of Wisconsin	5,363,675	5,686,986	5,754,798	6.0%	1.2%
Clayton County	18,678	18,129	17,735	−2.9%	−2.2%
Dubuque County	89,143	93,653	96,359	5.1%	2.9%
State of Iowa	2,926,324	3,046,355	3,106,589	4.1%	2.0%
Total Analysis Area	**622,861**	**691,586**	**723,179**	**11.0%**	**4.6%**

Source: U.S. Census Bureau (2000, 2010, 2016a)

There are several communities within the analysis area. The populations of communities within and near the analysis area are shown in Table 3.12-2. The largest town is Platteville, Wisconsin, followed by

Mount Horeb, Wisconsin; Dodgeville, Wisconsin; Lancaster, Wisconsin; Cross Plains, Wisconsin; and Fennimore, Wisconsin. The remaining towns all have populations of less than 1,600 people.

Table 3.12-2. Populations of Towns within Study Area (2014)

Town	County	2014 Population
Black Earth, WI	Dane	1,410
Blue Mounds, WI	Dane	870
Cross Plains, WI	Dane	3,755
Mazomanie, WI	Dane	1,585
Mount Horeb, WI	Dane	7,286
Arena, WI	Iowa	807
Barneveld, WI	Iowa	1,223
Cobb, WI	Iowa	506
Dodgeville, WI	Iowa	4,693
Highland, WI	Iowa	914
Linden, WI	Iowa	541
Rewey, WI	Iowa	300
Ridgeway, WI	Iowa	584
Livingston, WI	Grant and Iowa	645
Montfort, WI	Grant and Iowa	710
Bloomington, WI	Grant	836
Cassville, WI	Grant	804
Fennimore, WI	Grant	2,416
Lancaster, WI	Grant	3,830
Platteville, WI	Grant	11,480
Millville, IA	Clayton	21
Luxemburg, IA	Dubuque	192
Holy Cross, IA	Dubuque	369

Source: U.S. Census Bureau (2014)

It is expected that the population in the analysis area will continue to increase following existing population trends. Estimates indicate that the population of the state of Wisconsin and the state of Iowa increased by approximately 166,608 and 39,122 between 2016 and 2017 (U.S. Census Bureau 2018). The population in the analysis area counties increased by approximately 20,370 people between 2016 and 2017 (U.S. Census Bureau 2018).

3.12.1.2 HOUSING

The total number of housing units within the analysis area counties, the state of Wisconsin as a whole, and the state of Iowa as a whole are displayed in Table 3.12-3, along with various characteristics of the housing in the study area. The percent of housing that is owner-occupied is higher in the analysis area counties (70.6%–76.0%), compared with 67.0% for Wisconsin and 71.1% for Iowa, except for Dane County, Wisconsin (with 58.3%). Clayton County, Iowa, and Lafayette County, Wisconsin, have the highest rates of owner-occupied housing. Vacancy rates are relatively low throughout the study area

(0.6%–1.7% for homeowner units) and the states as a whole (1.7% for Wisconsin and 1.5% for Iowa), with the lowest rates occurring in Dubuque County, Iowa, and Lafayette County, Wisconsin.

Single-family housing accounts for the majority of housing in Wisconsin (70.9%) and Iowa (77.4%) as well as the analysis area counties, with Lafayette County, Wisconsin, having the highest percentage of single-family housing (83.9%). There is a higher percentage of multifamily housing in the states compared to the analysis area counties, except for Dane County, Wisconsin, and Dubuque County, Iowa.

Conversely, mobile homes constitute a smaller percentage of housing units in the states, compared with the analysis area counties, except for Dane County, Wisconsin.

Table 3.12-3. Housing Characteristics in the Analysis Area (2016)

	Dane County	Iowa County	Lafayette County	Grant County	State of Wisconsin	Clayton County	Dubuque County	State of Iowa	Analysis Area
Number of Housing Units	222,808	10,760	7,238	21,783	2,649,597	9,019	40,424	1,362,619	312,032
Percent Owner-Occupied	58.3%	75.6%	75.9%	70.6%	67.0%	76.0%	72.3%	71.1%	71.5%
Vacancy Rate (homeowner/rental)	1.3/2.2	1.7/5.6	1.1/3.0	1.2/8.1	1.7/4.9	1.6/7.8	0.6/6.4	1.5/6.1	1.3/5.5
Percent Single Family	59.3%	82.0%	83.9%	77.2%	70.9%	80.9%	73.9%	77.4%	76.2%
Percent Mobile Homes	0.7%	5.0%	5.5%	6.0%	3.6%	7.8%	3.8%	3.7%	4.8%
Median Value	$236,000	$166,900	$124,100	$135,400	$167,000	$111,500	$153,000	$132,800	$154,483
Median Rent	$942	$703	$649	$656	$789	$584	$720	$715	$709

Source: U.S. Census Bureau (2016a)

Housing values are lower on average in the analysis area counties ($111,500–$166,900), compared with $167,000 in Wisconsin and $132,800 in Iowa, except for $236,000 in Dane County, Wisconsin and $153,00 in Dubuque County, Iowa, with median values lowest in Clayton County, Iowa and Lafayette County, Wisconsin, and highest in Dane County, Wisconsin, and Iowa County, Wisconsin. Rents are also lower in the study area than in the states as a whole, except for Dane County, Wisconsin, and Dubuque County, Iowa, with the lowest median rent in Clayton County, Iowa, and the highest in Dane County, Wisconsin.

3.12.1.3 EMPLOYMENT

The labor forces in the states of Wisconsin and Iowa increased between 2000 and 2010, as well as between 2010 and 2017. Most of the analysis area counties' labor forces also increased over these time periods. However, the labor force of Grant County, Wisconsin, experienced a slight decrease between 2010 and 2017, and the labor force of Clayton County, Iowa, decreased between 2000 and 2010 and then increased between 2010 and 2017. The labor forces in the analysis area counties between 2000 and 2017 are included in Table 3.12-4.

Unemployment rates in Wisconsin and Iowa and within the analysis area counties were relatively low in 2000, increased between 2000 and 2010, and were back to near 2000 levels for the states and most analysis area counties by 2016 and 2017. The states' annual unemployment rates were below 4.0% in 2000, as was the case for all analysis area counties in 2000. The states' and analysis area counties' annual unemployment rates were all above 5% in 2010. In 2017, the states' and analysis area counties' annual unemployment rates were all at or below 4.0%. Labor force and unemployment rates for the states and analysis area counties are summarized in Table 3.12-4.

Table 3.12-4. Analysis Area Labor Force and Unemployment Rates (2000–2017) (Labor Force / Annual Unemployment Rate)

County or State	2000	2002	2004	2006	2008	2010	2012	2014	2016	2017
Dane County	264,274 / 2.4%	277,232 / 3.4%	283,220 / 3.2%	288,708 / 3.3%	295,779 / 3.4%	293,228 / 5.9%	297,439 / 4.9%	305,805 / 3.7%	318,936 / 2.8%	322,336 / 2.4%
Iowa County	13,590 / 2.9%	14,044 / 4.2%	14,145 / 4.0%	14,358 / 4.3%	14,069 / 4.7%	13,772 / 8.2%	13,549 / 6.7%	13,556 / 5.1%	13,748 / 3.5%	13,969 / 2.9%
Lafayette County	9,145 / 3.1%	9,333 / 5.2%	9,025 / 4.4%	9,163 / 4.1%	9,098 / 4.2%	9,489 / 7.2%	9,399 / 5.6%	9,403 / 4.2%	9,755 / 3.7%	10,213 / 2.5%
Grant County	27,351 / 3.4%	28,151 / 4.9%	27,420 / 4.6%	27,172 / 4.5%	28,114 / 4.8%	28,735 / 7.5%	27,698 / 6.0%	27,747 / 4.8%	28,307 / 3.9%	28,404 / 3.2%
State of Wisconsin	2,973,221 / 3.5%	3,024,319 / 5.4%	3,034,581 / 5.0%	3,058,935 / 4.7%	3,091,796 / 4.9%	3,081,512 / 8.7%	3,073,981 / 7.0%	3,082,564 / 5.4%	3,130,520 / 4.0%	3,151,909 / 3.3%
Clayton County	10,207 / 3.4%	9,943 / 5.7%	9,472 / 6.8%	9,689 / 5.0%	9,972 / 5.5%	9,996 / 8.6%	10,166 / 5.7%	10,204 / 5.0%	10,314 / 4.2%	10,169 / 4.0%
Dubuque County	48,376 / 3.2%	48,870 / 4.0%	49,023 / 4.4%	51,906 / 3.7%	52,196 / 4.4%	54,224 / 5.8%	54,623 / 4.5%	55,648 / 4.1%	55,757 / 3.7%	54,459 / 3.0%
State of Iowa	1,590,453 / 2.6%	1,637,909 / 4.0%	1,601,788 / 4.5%	1,657,584 / 3.7%	1,679,293 / 4.2%	1,678,281 / 6.0%	1,653,141 / 5.0%	1,700,756 / 4.2%	1,696,113 / 3.6%	1,678,549 / 3.1%
Total Study Area	372,943 / 3.1%	387,573 / 4.6%	392,305 / 4.6%	400,996 / 4.2%	409,228 / 4.5%	409,444 / 7.2%	412,874 / 5.6%	422,363 / 4.5%	436,817 / 3.6%	439,550 / 3.0%

Source: U.S. Bureau of Labor Statistics (2018a, 2018b)

Recent monthly unemployment rates in the state and analysis area counties have continued to be below 4.0% except for Clayton County, Iowa, which fluctuated between 6.1% and 2.3% from March 2017 to March 2018 (Table 3.12-5). As expected, unemployment rates tend to rise somewhat during the winter months of January through March, when agricultural and construction activities decrease.

Table 3.12-5. Recent Monthly Unemployment Rates in the Analysis Area

Month	Dane County (%)	Iowa County (%)	Lafayette County (%)	Grant County (%)	State of Wisconsin (%)	Clayton County (%)	Dubuque County (%)	State of Iowa (%)
Mar 2018	2.2	3.2	2.4	3.2	3.2	4.7	3.1	3.0
Feb 2018	2.3	3.6	2.9	3.6	3.3	5.5	3.6	3.5
Jan 2018	2.2	3.1	2.5	3.3	3.1	6.1	3.8	3.6
Dec 2017	1.9	2.3	1.8	2.4	2.7	4.1	3.0	2.9
Nov 2017	2.1	2.4	2.0	2.4	2.8	2.7	2.3	2.5
Oct 2017	2.1	2.2	2.0	2.4	2.7	2.3	2.0	2.3
Sep 2017	2.3	2.3	2.2	2.6	2.9	2.8	2.5	2.8
Aug 2017	2.4	2.6	2.3	3.1	3.3	3.2	3.0	3.1
July 2017	2.5	2.5	2.6	3.4	3.4	2.9	2.8	3.0

Month	Dane County (%)	Iowa County (%)	Lafayette County (%)	Grant County (%)	State of Wisconsin (%)	Clayton County (%)	Dubuque County (%)	State of Iowa (%)
June 2017	2.8	3.0	2.7	3.6	3.6	3.2	2.9	3.2
May 2017	2.4	2.6	2.3	2.9	3.1	3.0	2.6	2.9
Apr 2017	2.2	2.8	2.3	2.7	3.1	3.8	2.8	3.0
Mar 2017	2.5	3.7	3.0	3.9	3.7	5.9	3.7	3.6

Source: U.S. Bureau of Labor Statistics (2018a)

For the state of Wisconsin, the top three sectors in terms of employment in 2016 were manufacturing; government and government enterprises; and health care and social assistance. The top three sectors for the state of Iowa in 2016 were government and government enterprises; state and local government; and retail trade. These sectors are among the top sectors in many of the analysis area counties as well. However, farm employment is among the top sectors in more rural counties such as Lafayette County, Wisconsin, Iowa County, Wisconsin, and Clayton County, Iowa. The utilities sector accounts for 0.3% of the employment in both Wisconsin and Iowa. Annual earnings[3] for the construction industry in the analysis area counties as a whole totaled approximately $1.9 billion in 2016 (BEA 2017). Table 3.12-6 summarizes the employment by industry for the states and analysis area counties.

Table 3.12-6. Analysis Area Employment by Industry (2016)

Industry	Dane County	Iowa County	Lafayette County	Grant County	State of Wisconsin	Clayton County	Dubuque County	State of Iowa	Analysis Area
Farm employment	3,375	1,817	1,577	2,961	85,997	1,610	1,567	90,141	12,907
Forestry, fishing, and related activities	1,267	N/A	N/A	N/A	16,882	N/A	N/A	14,977	1,267
Mining, quarrying, and oil and gas extraction	532	N/A	N/A	N/A	6,934	N/A	N/A	5,000	532
Utilities	1,232	N/A	N/A	72	10,190	N/A	165	6,928	1,469
Construction	19,119	1,006	543	1,510	171,982	1,105	3,592	119,671	26,875
Manufacturing	25,177	1,232	801	2,364	481,518	1,045	9,248	220,989	39,867
Wholesale trade	14,895	641	566	796	142,252	351	3,299	75,763	20,548
Retail trade	38,759	3,986	601	3,143	385,365	1,088	8,420	227,978	55,997
Transportation and warehousing	9,095	N/A	N/A	799	126,582	N/A	2,710	78,785	12,604
Information	17,796	81	N/A	236	56,725	85	1,004	26,846	19,202
Finance and insurance	25,606	420	321	1,165	178,530	418	4,999	130,300	32,929
Real estate and rental and leasing	17,993	552	N/A	1,535	130,664	280	2,453	71,647	22,813
Professional, scientific, and technical services	34,043	419	N/A	913	172,857	273	3,372	82,168	39,020
Management of companies and enterprises	10,245	34	N/A	217	71,332	N/A	818	20,416	11,314

[3] Earnings is the sum of three components of personal income: wages and salaries, supplements to wages and salaries, and proprietor's income.

Industry	Dane County	Iowa County	Lafayette County	Grant County	State of Wisconsin	Clayton County	Dubuque County	State of Iowa	Analysis Area
Administrative and support and waste management and remediation services	21,551	233	206	1,176	178,544	N/A	2,645	87,366	25,811
Educational services	8,230	N/A	25	361	72,295	N/A	3,840	50,497	12,456
Health care and social assistance	40,121	N/A	323	2,647	426,954	N/A	9,152	219,689	52,243
Arts, entertainment, and recreation	9,797	494	83	312	71,849	317	2,004	35,648	13,007
Accommodation and food services	29,604	671	294	1,634	258,043	494	4,757	131,589	37,454
Other services (except government and government enterprises)	20,966	584	N/A	1,560	193,943	623	3,884	110,062	27,617
Government and government enterprises	82,702	1,474	1,116	5,835	437,348	1,389	5,121	269,771	97,637
Federal civilian	5,216	78	47	150	29,157	78	269	17,789	5,838
Military	1,470	62	44	125	15,820	65	366	11,639	2,132
State and local government	76,016	1,334	1,025	5,560	392,371	1,246	4,486	240,343	89,667
Total Employment	**432,105**	**15,732**	**8,004**	**29,683**	**3,676,786**	**11,144**	**73,451**	**2,076,231**	**570,119**

Source: U.S. Bureau of Economic Analysis (2018)

Note: Some employment information is not available (N/A) due to the proprietary nature of the data.

3.12.1.3.1 AGRICULTURE

Based on the 2012 Census of Agriculture, 34.8% (14,568,926 acres) of the total land area in Wisconsin and 85.0% (30,622,731 acres) of the total land area of Iowa is farmland, with an average farm size of 209 acres and 345 acres, respectively (USDA Census of Agriculture 2014). The acres of agricultural lands in the analysis area are discussed in detail in Section 3.10.1.2 (Agricultural Lands). Wisconsin and Iowa ranked ninth and second, respectively, in the United States in total value of agricultural products sold in 2012 ($11.7 billion and $30.8 billion). Crop sales accounted for approximately 39.3% and livestock sales accounted for the remaining 60.7% of total value of agricultural products sold in Wisconsin (USDA Census of Agriculture 2014). In Iowa, crop sales accounted for approximately 56.5% of total value of agricultural products sold and livestock accounted for the remaining 43.5% (USDA Census of Agriculture 2014).

Compared with the state as a whole, the analysis area counties in Wisconsin have a much higher percentage of land in farms, and the analysis area counties in Iowa have a slightly lower percentage of land in farms. Lafayette County, Wisconsin, has the largest percentage of farmland in the analysis area and Dane County, Wisconsin, has the lowest percentage of farmland in the analysis area. Average farm sizes in the analysis area counties were larger than the state averages in all counties except Dane County, Clayton County, and Dubuque County. In terms of the total value of agricultural products sold, Dane County had the highest value and Iowa County had the lowest value. In all the analysis area counties, livestock sales comprise a majority of the total value of agricultural products sold. Iowa County had the highest percentage of livestock sales, while Dane County had the highest percentage of crop sales.

3.12.1.4 TOURISM

Tourism in the analysis area counties identified by members of the public during the public scoping period includes activities such as birdwatching and visitation to Military Ridge State Trail. Popular birdwatching areas in the analysis area includes the Mississippi River, as the Great River Birding Trail parallels the river all the way from the Gulf of Mexico north to its headwaters in Minnesota (Audubon Society 2016). The Refuge is also a popular destination for birdwatching. The Village of Cassville, Wisconsin hosts the Cassville Eagle Days annual event and advertises its birding opportunities resulting from the Village's proximity to the Refuge (Cassville Tourism 2016). Other popular birdwatching areas in the analysis area include Governor Dodge State Park (approximately 3 miles north of Dodgeville, Wisconsin), Festge County Park (approximately 1 mile west of Cross Plains, Wisconsin), and Military Ridge State Trail (Wisconsin Department of Tourism 2018a). Besides birdwatching, Military Ridge State Trail is also a popular destination for cross-country skiing, snowshoeing, hiking, and cycling (Wisconsin Department of Tourism 2018b). Other popular tourist destinations in the analysis area include the Driftless Area, Black Earth Creek, Ice Age National Scenic Trail, and Blue Mound State Park, which provide opportunities for hiking, canoeing, kayaking, cycling, fishing, and other outdoors activities. The Driftless Area attracts tourists because of its unique topography, opportunities for outdoor activities, historic sites, arts and culture, and other entertainment (Driftless Wisconsin 2018b). The Ice Age National Scenic Trail stretches approximately 1,200 miles across Wisconsin and traces the edge of a huge glacier that covered much of North America approximately 15,000 years ago (NPS 2017b). Table 3.12-7 and Table 3.12-8 provide a summary of the economic impact of tourism in the analysis area counties.

Table 3.12-7. Tourism Economic Statistics for Analysis Area Counties in Iowa (2015–2016)

County	Expenditures (Millions)	Payroll (Millions)	Employment	State Tax Receipts (Millions)	Local Tax Receipts
Clayton	$33.2	$4.6	250	$2.2	$670,000
Dubuque	$338.1	$55.9	2,980	$19.9	$4,720,000
State of Iowa	$8,225.2	$1,350.5	69,450	$502.3	$121,980,000

Source: Research Department of the U.S. Travel Association (2017)

Table 3.12-8. Tourism Economic Statistics for Analysis Area Counties in Wisconsin (2017)

County	Direct Visitor Spending (Millions)	Total Business Sales (Millions)	Employment	Total Labor Income (Millions)	State and Local Taxes (Millions)
Dane County	$1,246.8	$2,136.3	21,918	$653.6	$159.4
Iowa County	$36.2	$57.5	423	$11.3	$3.5
Lafayette County	$13.4	$23.2	233	$3.4	$1.7
Grant County	$43.9	$82.9	863	$21.4	$5.4
State of Wisconsin	$12,701.1	$20,607.4	195,255	$5,368.1	$1,536.8

Source: Wisconsin Department of Tourism (2018c)

3.12.1.5 PROPERTY VALUES

Much of the analysis area consists of agricultural, undeveloped, or forested lands. Table 3.12-9 summarizes the acres and value of these lands in analysis area municipalities. Table 3.12-10 summarizes median home values and median property taxes collected on homes in the analysis area counties.

Table 3.12-9. Acres and Value of Agricultural, Undeveloped, and Forested Lands in Analysis Area Municipalities

	Agricultural Land (acres) / Value of Land ($)	Undeveloped Land (acres) / Value of Land ($)	Agricultural Forest Land (acres) / Value of Land ($)	Forest Lands (acres) / Value of Land ($)	Total Acres / Total Value ($)
Town of Black Earth, WI	4,867 / 1,084,600	800 / 1,287,200	1,809 / 3,894,100	981 / 4,500,500	8,457 / 10,766,400
Town of Blue Mounds, WI	12,552 / 2,384,300	1,423 / 2,675,400	2,883 / 6,296,700	749 / 3,247,000	17,607 / 14,603,400
Village of Blue Mounds, WI	130 / 26,600	15 / 22,100	29 / 50,800	15 / 59,700	189 / 159,200
Town of Middleton, WI	3,129 / 786,700	63 / 3,800	218 / 415,000	67 / 418,800	3,477 / 1,624,300
Town of Cross Plains, WI	11,653 / 2,701,000	1,597 / 4,047,400	3,449 / 8,643,800	1,212 / 6,031,500	17,911 / 21,423,700
Town of Mazomanie, WI	6,776 / 1,406,600	1,386 / 2,289,300	1,323 / 3,424,600	482 / 2,382,700	9,967 / 9,503,200
Village of Mount Horeb, WI	78 / 19,000	15 / 32,600	0 / 0	0 / 0	93 / 51,600
Town of Arena, WI	25,123 / 4,018,500	2,643 / 620,400	7,537 / 13,766,200	2,727 / 9,284,500	38,030 / 27,689,600
Village of Arena, WI	382 / 71,700	16 / 3,900	10 / 15,700	0 / 0	408 / 91,300
Village of Barneveld, WI	578 / 80,900	81 / 98,200	7 / 9,800	3 / 8,400	669 / 197,300
Village of Cobb, WI	195 / 44,300	1 / 1,800	1 / 300	0 / 0	197 / 46,400
City of Dodgeville, WI	816 / 155,100	61 / 151,200	25 / 62,500	0 / 0	902 / 368,800
Town of Dodgeville	34,771 / 5,543,200	1,766 / 848,500	3,629 / 6,904,500	1,986 / 7,470,800	42,152 / 20,767,000
Town of Highland, WI	29,158 / 3,853,000	1,671 / 822,000	3,127 / 4,356,000	918 / 2,570,700	34,874 / 11,601,700
Town of Linden, WI	33,463 / 5,647,800	882 / 978,000	342 / 513,600	264 / 777,100	34,951 / 7,916,500
Village of Rewey, WI	218 / 49,500	15 / 4,200	0 / 0	0 / 0	233 / 53,700
Town of Ridgeway, WI	15,502 / 2,437,400	1,553 / 1,924,200	2,231 / 4,647,800	1,056 / 4,428,900	20,342 / 13,438,300
Village of Ridgeway, WI	215 / 34,800	56 / 14,300	77 / 96,300	90 / 232,600	438 / 348,000
Village of Livingston, WI	448 / 115,100	1 / 200	0 / 0	0 / 0	449 / 115,300
Town of Montfort, WI	126 / 20,700	10 / 3,200	0 / 0	0 / 0	136 / 23,900
Village of Montfort, WI	122 / 19,800	10 / 3,200	0 / 0	0 / 0	132 / 23,000
Bloomington, WI	18,316 / 3,931,400	437 / 88,300	1,190 / 1,667,800	372 / 1,043,400	20,315 / 6,730,900
Town of Cassville, WI	13,868 / 2,192,100	663 / 276,900	2,414 / 2,292,600	692 / 1,327,100	17,637 / 6,088,700
Village of Cassville, WI	9 / 2,600	0 / 0	33 / 39,600	0 / 0	42 / 42,200

	Agricultural Land (acres) / Value of Land ($)	Undeveloped Land (acres) / Value of Land ($)	Agricultural Forest Land (acres) / Value of Land ($)	Forest Lands (acres) / Value of Land ($)	Total Acres / Total Value ($)
Town of Fennimore, WI	20,302 / 4,480,700	438 / 131,600	587 / 734,700	121 / 303,500	21,448 / 5,650,500
City of Lancaster, WI	455 / 108,100	21 / 26,800	0 / 0	3 / 4,500	479 / 139,400
Town of South Lancaster	18,587 / 3,494,200	675 / 161,800	447 / 672,700	70 / 209,000	19,779 / 4,537,700
City of Platteville, WI	521 / 128,900	103 / 236,900	0 / 0	25 / 79,900	649 / 445,700
Town of Platteville, WI	15,171 / 2,745,100	898 / 479,600	460 / 460,600	417 / 833,700	16,946 / 4,519,000
Town of Springdale, WI	11,985 / 2,477,400	2,492 / 7,443,800	2,136 / 4,285,400	624 / 2,447,900	17,237 / 16,654,500
Town of Beetown, WI	25,788 / 4,731,000	1,029 / 1,004,100	1,472 / 1,621,400	448 / 984,700	28,737 / 8,341,200
Town of Clifton, WI	18,577 / 3,251,200	1,485 / 1,003,300	1,159 / 1,275,700	370 / 639,700	21,591 / 6,169,900
Town of Ellenboro, WI	18,637 / 2,804,500	1,330 / 920,100	1,969 / 2,285,800	104 / 248,600	22,040 / 6,259,000
Town of Liberty, WI	19,671 / 2,597,700	561 / 236,800	1,674 / 1,762,100	221 / 464,400	22,127 / 5,061,000
Town of Waterloo, WI	16,133 / 2,685,800	833 / 476,700	3,721 / 4,283,800	557 / 1,261,900	21,244 / 8,708,200
Town of Wingville, WI	20,877 / 3,274,850	435 / 44,600	0 / 0	654 / 857,000	21,966 / 4,176,450
Town of Brigham, WI	24,797 / 3,922,600	3,907 / 6,891,200	1,984 / 3,948,300	1,379 / 5,500,400	32,067 / 20,262,500
Town of Eden, WI	17,642 / 3,076,900	839 / 754,900	524 / 786,100	350 / 1,019,300	19,355 / 5,637,200
Town of Vermont, WI	8,261 / 1,480,900	2,334 / 2,768,600	4,779 / 10,731,000	1,648 / 7,155,000	17,022 / 22,135,500
Town of Harrison, WI	18,904 / 2,870,600	891 / 536,400	1,690 / 2,183,600	557 / 1,448,100	22,042 / 7,038,700
Town of Potosi, WI	22,731 / 3,396,800	1,032 / 185,600	2,363 / 2,013,600	944 / 1,616,400	27,070 / 7,212,400
Town of Mifflin, WI	30,146 / 4,809,500	568 / 101,600	330 / 513,000	32 / 98,900	31,076 / 5,523,000
Town of Wyoming, WI	6,920 / 1,157,000	2,094 / 2,853,000	3,451 / 6,884,900	3,722 / 14,319,000	16,187 / 25,213,900
Town of Belmont, WI	21,809 / 4,671,400	1,142 / 560,500	476 / 638,300	152 / 392,600	23,579 / 6,262,800
Town of Elk Grove, WI	21,234 / 4,952,200	640 / 390,300	172 / 215,900	7 / 17,200	22,053 / 5,575,600
Millville, IA*	N/A	N/A	N/A	N/A	
Luxemburg, IA*	N/A	N/A	N/A	N/A	
Holy Cross, IA*	N/A	N/A	N/A	N/A	

Source: Wisconsin Department of Revenue (2017)

*Acreages and values not available (N/A) for municipalities in the State of Iowa.

Table 3.12-10. Median Home Value in Analysis Area Counties

	Dane County	Iowa County	Lafayette County	Grant County	State of Wisconsin	Clayton County	Dubuque County	State of Iowa
Median Home Value (2016)	$236,000	$166,900	$124,100	$135,400	$167,000	$111,500	$153,000	$132,800

Source: U.S. Census Bureau (2016a)

3.12.1.6 ENVIRONMENTAL JUSTICE

Environmental justice includes the fair treatment and meaningful involvement of all people—regardless of race, ethnicity, or income level—in Federal environmental decision-making. Environmental justice programs promote the protection of human health and the environment, empowerment by means of public participation, and the dissemination of relevant information to inform and educate affected communities. Consideration of environmental justice issues is mandated by EO 12898, which was published on February 11, 1994. This EO requires that all Federal agencies incorporate environmental justice into their mission by "identifying and addressing . . . disproportionately high and adverse human health or environmental effects of [their] programs, policies and activities on minority and low-income populations in the United States" (USEPA 1994).

The USEPA defines a community with potential environmental justice populations as one that has a greater percentage of minority or low-income populations than does an identified reference community. Minority populations are those populations having 1) 50% minority population in the affected area, or 2) a significantly greater minority population than the reference area (USEPA 1994). The USEPA has not specified what percentage of the population can be characterized as "significantly greater" in order to define environmental justice populations. Therefore, for the purposes of this analysis, a conservative approach is used to identify potential environmental justice populations; it is assumed that if an analysis area county's minority and/or poverty status population is at least 20% greater than the respective state's minority and/or poverty status populations, there is likely an environmental justice population of concern. Low-income populations were defined as those individuals who are considered living below poverty levels, as defined by the U.S. Census Bureau. The U.S. Census Bureau's poverty thresholds are adjusted to reflect the needs of families of different types and sizes. The poverty threshold is the same throughout the United States and in 2016, the poverty threshold for a family with two adults and two children was $24,339 (U.S. Census Bureau 2017b).

In the states of Wisconsin and Iowa as a whole, the majority of the population is white (82.1% and 87.0%, respectively) (Table 3.12-11). The largest minority group in the states of Wisconsin and Iowa is Hispanic or Latino (6.5% and 5.6%, respectively). Compared with the states, all the analysis area counties except Dane County, Wisconsin, have higher percentages of white residents and smaller percentages of Hispanic or Latino residents. Dane County's Hispanic or Latino population percentage (6.2%) is similar to the state of Wisconsin's percentage. Black or African American residents constitute approximately 6.2% of the population of the state of Wisconsin and approximately 3.2% of the population of the state of Iowa. Compared to the states, all the analysis area counties have lower percentages of black or African American residents. Asian residents comprise approximately 2.6% and 2.1% of the total populations of the states of Wisconsin and Iowa, respectively. Compared with the states, all analysis area counties have smaller percentages of Asian residents except for Dane County, Wisconsin, which has an Asian population percentage (5.5%) that is approximately double the state's percentage. Other minority groups, including American Indian or Alaskan Native, Native Hawaiian or Pacific Islander, and others comprise similar percentages of the population in all of the study area counties, compared with the state as a whole. None of the analysis area counties have minority populations that exceed 50% of their total population, and none of the analysis area counties have minority populations at least 20% greater than the states' minority population percentage.

Table 3.12-11. Racial Characteristics in the Study Area Counties (2016)

County/State	2016 Population	White, not Hispanic or Latino (% of state or county pop.)	Hispanic or Latino (% of state or county pop.)	Black or African American (% of state or county pop.)	American Indian or Alaskan Native (% of state or county pop.)	Asian (% of state or county pop.)	Native Hawaiian/ Pacific Islander (% of state or county pop.)	Other (% of state or county pop.)	Two or More Races (% of state or county pop.)
Dane County	516,818	416,468 (80.6)	32,088 (6.2)	25,959 (5.0)	1,117 (0.2)	28,466 (5.5)	147 (0.0)	214 (0.0)	12,359 (2.4)
Iowa County	23,751	22,778 (95.9)	393 (1.7)	112 (0.5)	61 (0.3)	108 (0.5)	25 (0.1)	42 (0.2)	232 (1.0)
Lafayette County	16,793	15,915 (94.8)	589 (3.5)	57 (0.3)	60 (0.4)	40 (0.2)	0 (0.0)	2 (0.0)	130 (0.8)
Grant County	51,723	49,390 (95.5)	733 (1.4)	710 (1.4)	79 (0.2)	373 (0.7)	18 (0.0)	42 (0.1)	378 (0.7)
State of Wisconsin	5,628,875	4,727,553 (82.1)	371,205 (6.5)	355,387 (6.2)	47,157 (0.8)	147,191 (2.6)	1,149 (0.0)	3,464 (0.1)	101,692 (1.8)
Clayton County	17,735	17,064 (96.2)	331 (1.9)	110 (0.6)	40 (0.2)	80 (0.5)	0 (0.0)	0 (0.0)	110 (0.6)
Dubuque County	96,359	88,470 (91.8)	2,126 (2.2)	2,558 (2.7)	34 (0.0)	1,230 (1.3)	338 (0.4)	53 (0.1)	1,550 (1.6)
State of Iowa	3,106,589	2,701,600 (87.0)	172,707 (5.6)	100,660 (3.2)	8,310 (0.3)	66,187 (2.1)	2,276 (0.1)	2,756 (0.1)	52,093 (1.7)
Total Study Area	**723,179**	**610,085 (84.4)**	**36,260 (5.0)**	**29,506 (4.1)**	**1,391 (0.2)**	**30,297 (4.2)**	**528 (0.1)**	**353 (0.1)**	**14,759 (2.0)**

Source: U.S. Census Bureau (2016a)

Between 2010 and 2016, median household incomes increased in all the analysis area counties and in the states as a whole (Table 3.12-12). However, poverty rates in the states and all analysis area counties except for Clayton County, Iowa also rose between 2010 and 2016. The largest increases in the populations living below the poverty threshold over this time period were experienced in Dubuque County, Iowa (3.4%), and Grant County, Wisconsin (2.0%). Dubuque and Grant Counties were the only analysis area counties that had higher poverty rates than the states in 2016. The poverty rates in these two counties were 0.2% and 2.6% higher than the poverty rates in the states, respectively. None of the analysis area counties have poverty levels that exceed 50%. Grant County, Wisconsin, is the only analysis area county that has a poverty rate that is at least 20% greater than the state's poverty rate percentage, indicating a potential environmental justice community.

Table 3.12-12. Income and Poverty in the Study Area (2010, 2016)

County/State	Median Household Income (2010)	Median Household Income (2016)	Percentage Change in Median Household Income (2010 to 2016)	Percentage Below Poverty Level (2010)	Percentage Below Poverty Level (2016)
Dane County	$60,519	$64,773	7.0%	11.6%	12.7%
Iowa County	$54,737	$56,641	3.5%	7.2%	9.7%
Lafayette County	$48,114	$53,038	10.2%	9.1%	11.2%
Grant County*	$43,889	$49,077	11.8%	13.3%	15.3%
State of Wisconsin	$51,598	$54,610	5.8%	11.6%	12.7%
Clayton County	$45,873	$48,482	5.7%	11.3%	10.5%
Dubuque County	$48,573	$56,154	15.6%	9.1%	12.5%
State of Iowa	$48,872	$54,570	11.7%	11.6%	12.3%

Source: U.S. Census Bureau (2010, 2016b)

* Poverty rate exceeds 120% of the state's poverty rate

3.12.2 *Environmental Consequences*

This section describes the potential impacts to socioeconomics and environmental justice communities associated with the construction, operation, and maintenance of the transmission line, substations, and ancillary facilities. Impacts to socioeconomics are discussed in terms of effects on the economy, population, housing, property values, and tourism. The impacts described in this section are based on prior experience and analyses in other locations, as well as other resource assessments provided in this EIS.

3.12.2.1 DATA SOURCES, METHODS, AND ANALYSIS ASSUMPTIONS

Data sources that were considered when analyzing impacts to socioeconomics and environmental justice include U.S. Census Bureau statistics, employment and wage data from the U.S. Bureau of Labor Statistics (BLS) and U.S. Department of Commerce, property value statistics from the Wisconsin Department of Revenue,[4] and studies regarding transmission line impacts on property values.

[4] Property tax statistics for the analysis area counites in Iowa were not available from the Iowa Department of Revenue.

The following impact indicators were considered when analyzing impacts to socioeconomics and environmental justice:

- Changes in employment within the counties crossed by the project.
- Revenue generated by the proposed project
- Qualitative discussion of impacts to tourism revenue within the counties crossed by the project.
- Changes in property values in close proximity to the project.
- Minor population increase or decrease impacts are 0% to 10% over 10 years (i.e., an average of 0% to 1% per year), moderate impacts are 11% to 20% over 10 years (i.e., an average of 1% to 2% per year), and major impacts are 21% or more over 10 years (i.e., greater than 2% per year).
- Minor unemployment levels are 6% or less, moderate levels are 6% to 8%, and major levels are greater than 8%.

While it is possible that property owners near the proposed project may have the perception that their homes will diminish in value because of project implementation, the actual loss of property value and potential effects can only be tested through data from home sales. The multiple regression analysis method requires that data be collected on as many market sales transactions as possible within the impact area and within one or more similar control areas over a few years prior to an awareness of a project to accurately reflect what buyers and sellers actually do as opposed to what potential buyers say they might do under specified hypothetical circumstances (Kinnard and Dickey 1995). It has been suggested that understanding the effects of transmission lines on home prices is a dynamic process, requiring on-going study, identification of accurate and reliable sources of data, consistency in measurement, and rich data sets, allowing for variety in analytical methods (Wolverton and Bottemiller 2003).

To assess what particular environmental and physical changes associated with the proposed project could affect property values within an immediate distance, a market study of current and future values of properties potentially affected by the proposed project would have to be conducted to evaluate property values with and without the proposed project being constructed. The data that would be required to conduct a more detailed analysis are unavailable, consequently, the proposed project's impacts on property values, any conclusions regarding effects on property values are speculative. Studies have shown a wide range of potential impacts to property values from transmission lines, from a 0% decrease to a more than 20% decrease in property values, but this impact decreases over time (see discussion in Section 3.12.2.3.5). One study has also shown a potential increase in property values from transmission lines (see discussion in Section 3.12.2.3.5). This analysis assumes that the proposed transmission line could reduce property values from 0% to 20% within 150 feet of the ROW centerline, but that the impact would decrease over time. Therefore, impacts to property values within 150 feet of the ROW centerline under all action alternatives are expected to be moderate in the short term and minor in the long term.

Table 3.12-13 defines the impact thresholds for defining impacts to socioeconomics and environmental justice. These thresholds are used below to characterize the intensity of impacts that are estimated for each alternative.

Table 3.12-13. Impact Thresholds and Descriptions for Socioeconomics and Environmental Justice

	Minor Impact	Moderate Impact	Major Impact
Socioeconomics and Environmental Justice	Population changes of 0% to 10% over 10 years (i.e., an average of 0% to 1% per year). A few individuals, groups, businesses, properties or institutions would be impacted. Impacts would be minor and limited to a small geographic area. These impacts are not expected to substantively alter social and/or economic conditions. No impacts to environment justice communities.	Population changes of 11% to 20% over 10 years (i.e., an average of 1% to 2% per year). Many individuals, groups, businesses, properties, or institutions would be impacted. Impacts would be readily apparent and detectable across a wider geographic area and could have a noticeable effect on social and/or economic conditions. No impacts to environment justice communities.	Population changes of 21% or more over 10 years (i.e., greater than 2% per year). A large number of individuals, groups, businesses, properties, or institutions would be impacted. Impacts would be readily detectable and observed, extend to a wider geographic area, possibly regionally, and have a substantial influence on social and/or economic conditions. Greater than 50% of a county's total population and/or a significantly greater the percentage of the county (i.e., 20 percentage points or more) is composed of minorities or low-income households (i.e., living below the poverty level). One or more environmental justice communities or groups would be disproportionately impacted.

3.12.2.2 NO ACTION

Under the No Action Alternative, existing socioeconomic trends in the analysis area counties are expected to continue. In general, gradual population growth would likely continue in the analysis area. The employment rate in the analysis area would likely continue to fluctuate. The agricultural industry would likely continue to play a large role in the analysis area. Existing levels of tourism in the analysis area are also expected to continue under the No Action Alternative.

3.12.2.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

3.12.2.3.1 DEMOGRAPHICS

Under all action alternatives, the potential impact to populations in the analysis area counties is expected to be minor and short term. It is expected that the construction phase of the proposed project would require approximately 170 temporary workers. These workers would likely already live in the analysis area or would temporarily relocate to the analysis area during the construction phase of the proposed project. If all 170 temporary workers were to come from outside the analysis area and temporarily reside in the analysis area during the construction phase, it would represent an approximately 0.02% increase in the population of the analysis area, and no greater than a 1% increase in any of the individual analysis area counties. The potential increase in population would be short term because the overall construction phase for the entire project would last 2 years; however, construction in any one location would be significantly less and intermittent because of the construction process (see Chapter 2).

No more than two additional full-time employees would be needed for operation of the C-HC Project. These staff would have no impacts on area populations during operation and maintenance.

3.12.2.3.2 HOUSING

Under all action alternatives, the potential impact to housing in the analysis area counties is expected to be minor and short term. As described in the section above, 170 temporary workers would be needed during the construction phase of the proposed project. The construction workers would likely already live in the analysis area or would temporarily relocate to the analysis area. Workers who temporarily relocate to the analysis area would likely stay at hotels, motels or other temporary housing within a reasonable commuting distance from the construction locations. Assuming a reasonable commute time to be approximately 15 to 60 minutes, the majority of the proposed transmission line routes are within an approximately 15-to-60-minute commute distance from larger towns and cities in the analysis area counties, such as Dubuque, Iowa; Platteville, Wisconsin; and Madison, Wisconsin. If construction workers were to rent temporary housing rather than stay in hotels or motels, there would likely be sufficient housing for the temporary employees in larger towns and cities in the analysis area counties. For example, the number of vacant housing units is approximately 1,634 in Dubuque, 218 in Platteville, 4,751 in Madison, and 17,148 in all analysis area counties combined (U.S. Census Bureau 2016a).

As described in the previous section, no more than two additional full-time employees would be required for operation and maintenance of the transmission line. These staff would likely be existing employees of the Utilities and would provide operation and maintenance support to other transmission lines and substations outside the analysis area. The operation and maintenance personnel would have no impact on housing in the analysis area.

3.12.2.3.3 EMPLOYMENT AND INCOME

Employment

Under all action alternatives, the potential construction impact to employment in the analysis area counties is expected to be minor and short term. An estimated 170 temporary workers would be employed during the construction phase of the proposed project, representing approximately 0.04% of the analysis area's total labor force and approximately 0.6% of the analysis area's utilities and construction workforce. The employment of approximately 170 employees during the construction phase would be minor, positive, and temporary because construction is expected to take place over a 2-year period.

It is anticipated that no more than two full-time employees would be needed to operate the transmission line. Additional workers also could be temporarily hired on an as-needed basis to make any repairs to the transmission line during or following storm events. These workers would have no impact on employment levels during operation and maintenance in the analysis area counties.

Income

The Utilities plan to use regional union construction workers whose salaries are estimated to be approximately $70,000 to $150,000 annually, depending on the level of expertise and the number of hours worked per week. These annual salaries exceed the 2016 median annual household incomes of $54,610 for Wisconsin (with project counties ranging from $49,077 to $64,773) and $54,570 for Iowa (with project counties ranging from $48,482 to $56,154). As a result, project construction would have a minor, short-term positive impact on income levels.

The Utilities' operations or maintenance employees are estimated to earn about $82,000 to $104,000 annually. As stated above, these staff would likely be existing employees of the Utilities and would provide operation and maintenance support to other transmission lines and substations outside the analysis area. As a result, project operation and maintenance would have no impact on income levels within the analysis area.

Project Spending and Impact Fees

The total construction costs under the action alternatives would range between approximately $465.1 million and $548.4 million. The Utilities expect to spend approximately $28.5 million annually on construction wages during the construction period in Wisconsin and $5 million annually on construction wages during the construction period in Iowa.

Under Wisconsin Statutes 196.491(3g), operators of 345-kV or greater transmission lines are required to pay impact fees to each city, village, town, and county affected by the construction and operation of the transmission lines. There are two types of community income from high-voltage transmission impact fees: a one-time environmental impact fee and an annual impact fee. These impact fees are paid to each affected city, village, town, and county in Wisconsin. Impact fees would be paid under each action alternative and the amount paid would vary according to the route and the number of municipalities affected. The State of Iowa does not have a similar statute requiring impact fees. There would be minor and short term positive potential impacts from project impact fees because they would represent a small portion of all governmental jurisdictional spending in the analysis area.

It is estimated that $120.6 to $159.5 million will be spent on materials to construct the proposed project, depending upon the alternative. Under all action alternatives, potential fiscal impacts from the purchase of project construction materials and equipment would be minor, short term, and positive because the spending would represent a small portion of all spending within and outside the analysis area. Equipment and materials for construction of the proposed project would likely be obtained from suppliers in larger metropolitan areas such as Chicago, Milwaukee, or even Madison, but equipment and materials (e.g., gravel, concrete, culverts, erosion-control matting, and seeding) would likely be purchased locally in analysis area counties where available and convenient. These purchases would generate minor sales tax revenues within and outside the analysis area; the Wisconsin sales tax rate includes 5.0% for the state and also 0.10% to 0.60% for applicable cities, for a maximum total rate of 5.6% in certain cities.

Also under all action alternatives, potential operation and maintenance impacts from impact fees and sales tax revenues would be minor, positive, and long term for the operational life of the project.

Agriculture

Studies by Gustafson et al. (1979) and Scott (1981) found that approximately 70% of the costs of transmission towers to farmers resulted from the nonproductive area created by the presence of the tower. Those studies also estimated that the remaining 30% of costs to famers resulted from factors such as the time lost in working around towers and crop damage. Comprehensive studies of the estimated costs from farming around transmission structures based on Wisconsin- or Iowa-specific farm operations are not available. An environmental impact assessment conducted for a transmission project in Montana included estimates of costs to farming based on a model for typical Montana farming operations. Although the Montana model was based on different crops from those in Wisconsin and Iowa, the basic sequence of farm operations involved is similar to that found in Wisconsin and Iowa and included: pesticide use, fertilizer application, planting, in-crop spraying, harvesting, and post-harvest harrowing. The model also included an estimate for labor time and equipment. It adjusted for the presence of the structure in the field causing “overlap areas” where equipment passes through more than once. Based on 2007 prices, it was estimated that the annual cost of farming around a regular span mono-pole at the field edge ranged from $13 to $16 per structure; a similar amount for H-frames parallel to the field edge; $40 for H-frames perpendicular to the field edge; $150 for mono-poles in the field interior; and $177 for H-frames in the field interior (HydroSolutions, Inc., and Fehringer Agricultural Consulting Inc. 2007). It has also been estimated that the 2007 annual costs to farm around a small monopole, a large monopole, and an H-pole in the middle of a field planted with spring wheat are $105.09, $107.98 and $120.57, respectively (Thornton 2007).

Farming around transmission line poles can be difficult, particularly when larger farm equipment is used. Farmers may attempt to reduce the area that cannot be cropped around the pole by planting as close as possible to the transmission line structure. This increases the likelihood of hitting the pole with farm implements. It is unlikely that the transmission line structures proposed for the proposed project would be damaged. However, the farm implements may be damaged. Potential damage to farm implements would be especially troublesome if it occurred during planting or harvesting when time is especially crucial.

Wisconsin Statutes 182.017(7)(b) states: "In determining just compensation for the interest under [Wisconsin Statutes 32.09], damages shall include losses caused by placement of the line and associated facilities near fences or natural barriers such that lands not taken are rendered less readily accessible to vehicles, agricultural implements and aircraft used in crop work."

IAC 478.17 provides operators of transmission lines reasonable access to the lines "for the purpose of constructing, reconstructing, enlarging, repairing, or locating the poles, wires, or construction and other devices used in or upon such line, but [the operator] shall pay to the owner of such lands and of crops thereon all damages to said lands or crops caused by entering, using, and occupying said lands for said purposes."

Potential negative economic impacts to farming operations in the analysis area, including organic farming operations, would generally result from lost acreages of agricultural lands caused by placement of transmission line structures, associated facilities, and access roads, as well as an increase in the costs associated with working around transmission line structures. Under all action alternatives, given the relatively small acreage of agricultural lands that would be affected when compared to the total agricultural lands available in the analysis area, potential impacts to agriculture would be minor, negative, localized, and long term.

3.12.2.3.4 TOURISM

Under all action alternatives, the potential negative impact to tourism in the analysis area counties as a whole is expected to be minor and short term during the construction phase of the proposed project. Impacts are expected to be minor because they would only occur in the specific parts of the analysis area that have tourist destinations that are crossed by the proposed transmission line and associated facilities. The presence of construction equipment, vehicles, and personnel, and the resulting noise, visual, and traffic impacts could result in negative impacts on tourism in the form of a diminished tourist experience and possibly reduced tourist visitation to areas near construction activities (relative to the tourism expenditures listed in Section 3.12.1.4). Potential negative impacts on tourism at specific tourist destinations overlapped by the project area would be moderate, localized, and short term during the construction phase because the transmission line would be constructed in segments over the course of 2 years and would not affect the specific destinations for the entire 2 years. As discussed in Section 3.12.1, tourism in the analysis area counties results in approximately $1.7 billion in direct visitor spending and approximately $197.5 million in state and local tax revenue annually. Construction activities associated with the proposed transmission line and associated facilities are expected to have a minor, short-term, and negative impact on tourism income in the analysis area counties as a whole, but a moderate, localized, short term, and negative impact on tourism income in the specific tourist destinations overlapped by the project area.

Under all action alternatives, the potential negative impacts to tourism during the operations phase of the proposed project would be minor, localized, and long term. Where the proposed transmission line crosses tourist destinations in rural and less developed landscapes, the potential impacts to tourism in these areas would be moderate and long term because the alteration of the landscape could deter visitation from tourists seeking a less developed setting (Stefansson et al. 2017). However, a New Hampshire study concluded that while factors such as transmission lines, wind turbines, and traffic delays could deter visitors from tourist destinations, the destinations' benefits were much more important to visitors than these perceived deterrents (Nichols Tourism Group 2015). Where the proposed transmission line crosses tourist destinations in more developed landscapes, the potential impacts to tourism would be minor and long term because transmission lines would be less of a deterrent to tourists during the operations phase. For both the less developed and more developed landscapes that the proposed transmission line would cross, operations activities are expected to have a minor negative impact on the approximately $1.7 billion in direct visitor spending and approximately $197.5 million in state and local taxes that the analysis area counties receive annually from tourism income.

Because all action alternatives cross the Mississippi River, there is a potential for birdwatching tourism along the Great River Birding Trail and other spots along the river to be negatively impacted under all the action alternatives. Potential impacts to birdwatching tourism along the Mississippi River during the construction phase would be moderate, localized, and short term in the portions of the river overlapped by the project area because of the noise, visual, and traffic impacts associated with construction equipment and vehicles. Impacts to birdwatching tourism along the Mississippi River overlapped by the project area during the operations phase of the proposed project would be minor, negative, localized, and short term in any one location for the life of the project, because the noise, visual, and traffic caused by maintenance activities would be intermittent and less intensive than construction activities. Other popular birdwatching areas in the analysis area, such as Governor Dodge State Park and Festge County Park, are not expected to be affected by any of the action alternatives because of their distance from the proposed routes (approximately 1.7 miles).

There is a potential for negative impacts to tourism in the Driftless Area under all action alternatives because all action alternatives would overlap the Driftless Area. The potential for impacts would be greatest during the construction phase of the proposed project because of the noise, visual, and traffic associated with construction equipment and vehicles could deter visitation. The potential negative impacts on tourism during the construction phase would be moderate, localized, and short term in the portions of the Driftless Area overlapped by the project area. Potential negative impacts to tourism in the portions of the Driftless Area overlapped by the project area during the operations phase of the proposed project would be minor, localized, and short term for the life of the project, because the noise, visual, and traffic impacts resulting from maintenance activities would be intermittent and less intensive than construction activities.

Because all action alternatives intersect the Ice Age National Scenic Trail, there would be potential negative impacts on tourism at the portion of the Trail overlapped by the project area. The potential impacts on tourism at the portion of the Ice Age National Scenic Trail overlapped by the project area during the construction phase would be moderate, localized, and short term. Potential negative impacts to tourism at the portion of the Trail overlapped by the project area during the operations phase of the proposed project would be minor, localized, and short term for the life of the project because maintenance activities would be intermittent and less intensive than construction activities.

3.12.2.3.5 PROPERTY VALUES

An area of concern with transmission line projects has been the way that the market value of the property for resale could be affected, involving the right of the landowner to dispose of the property. Damages related to increased risk of economic loss associated with impairments to a property that exist or may occur are sometimes known as "stigma" damages (Mitchell 2000:162–163). In many cases, landowners have sought to demonstrate that the fear of adverse health effects from exposure to transmission line electromagnetic fields (EMF) on their land contributes to reduced resale value for their parcel.

In general, claims of diminished property value through decreased marketability are based on the reported concern about hazards to human health and safety; and increased noise, traffic, and visual impacts associated with living in proximity to locally unwanted land uses such as power plants, freeways, high-voltage transmission lines, landfills, hazardous waste sites, etc. The issue of property value impacts associated with such industrial facilities has been given much attention over the past 20 years, and as a result, has been the subject of extensive study.

Studies of the effects of high-voltage transmission lines on property values have found wide-ranging results, from negative, to neutral, to positive impacts. A review summarized by the PSCW found that the presence of a power line on a property can reduce home values up to 14%, but that effects tend to decrease over time (PSCW 2000:214–215). Similar findings were seen in the Mountain States Transmission Initiative Review Project (2012:12–13).

Negative proximity effects on residential properties are not limited to properties actually crossed by a line (Colwell 1990:127). Other studies have shown negative impacts on property values for homes abutting transmission lines; these negative impacts have been shown to vary from 0% to in excess of 20% (Bottemiller and Wolverton 2013; Cowger et al. 1996; Des Rosiers 2002; Pitts and Jackson 2007; Tatos et al. 2016). One review of such studies found that, on average, property value decreases ranged between 2% and 7% for homes adjacent to transmission lines and between 0% and 5% for homes not directly adjacent to a transmission line but with a view of the transmission lines (Pitts and Jackson 2007). Another study found no evidence of systematic effects of either proximity or visibility of 345-kV transmission lines on residential real estate values (Chalmers and Voorvaart 2009). One study concluded that homes abutting 345-kV corridors often experience an increase in property values because of the benefit of having an open space, compared to similar unavailable space to other homes (Tatos et al. 2016). For example, the transmission line ROW might include a greenway where no other homes can be built in the ROW (Tatos et al. 2016). Based on the range of potential impacts to property values noted in the studies discussed above, potential negative impacts to property values in the analysis area counties would be moderate. Because impacts would likely lessen over time, according to the studies discussed above, the impacts would be short term.

3.12.2.3.6 ENVIRONMENTAL JUSTICE

Grant County, Wisconsin was the only analysis area county identified as a potential environmental justice community. However, the potential negative impacts from the proposed transmission line and facilities experienced in Grant County would be the same in nature and intensity as those experienced by all other analysis area counties. Therefore, there would be no disproportionate impacts to Grant County under any of the action alternatives.

3.12.2.4 ALTERNATIVE 1

3.12.2.4.1 DEMOGRAPHICS

Under Alternative 1, potential impacts on demographics would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Potential impacts would be minor and short term.

3.12.2.4.2 HOUSING

Under Alternative 1, potential impacts on housing would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Potential negative impacts would be minor and short term.

3.12.2.4.3 EMPLOYMENT INCOME

Employment

Under Alternative 1, potential impacts on employment would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Potential positive impacts would be minor and short term.

Project Spending and Impact Fees

Under Alternative 1, the total construction costs would be approximately $465.1 million, including $120.6 million in materials, $210.8 million in labor, and $133.8 million in other costs. The estimated one-time environmental impact fee would be $15,801,754, and the estimated annual environmental impact fee would be $948,105 (American Transmission Company et al. 2018). Because the project spending and impact fees would represent a small fraction of the annual earnings for the construction industry in the analysis area (approximately $1.9 billion in 2016), potential positive impacts would be minor and long term.

Agriculture

Under Alternative 1, the general nature of the potential negative economic impacts on agriculture would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). However, the total acres of agricultural land affected would vary among the alternatives. Because the primary economic impact on agriculture would be the acres of land disturbed or taken out of production, the more acres that are affected, the larger the expected impact would be. Under Alternative 1, approximately 881 acres of agricultural lands, including 364 acres of prime farmland and 511 acres of farmland of statewide importance, would be within the ROW under this alternative. Under this alternative, there would be approximately 101 acres of agricultural land cover type affected by surface disturbances associated with proposed access roads, approximately 28 acres of which would be prime farmland. Approximately 22 acres of agricultural lands would be permanently disturbed by the transmission line structure and substation footprints, 11 acres of which would be prime farmland. Potential negative impacts would be minor, localized, and short term.

3.12.2.4.4 TOURISM

Under Alternative 1, the general nature of the potential negative impacts on tourism would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives), including potential impacts on tourism in the Driftless Area and at the Ice Age National Scenic Trail. Potential negative impacts during the construction phase would be minor and short term for the analysis area as a whole, but moderate, localized, and short term for the specific tourist destinations overlapped by the project area. Potential negative impacts during the operations phase would be minor and short term for the analysis area as a whole. However, potential negative impacts at tourist destinations in more rural, undeveloped landscapes would be moderate, localized, and long term, while potential impacts at tourist destinations in more developed areas would be minor, localized, and long term during the operations phase.

Under Alternative 1, the general nature of the potential negative impacts on birdwatching tourism along the Mississippi River during the construction phase would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Because this alternative would create new disturbances within the Refuge, it would likely have a minor, long-term, negative impact on birdwatching tourism at this location during the operations phase.

No negative impacts to tourism at Military Ridge State Trail or Blue Mound State Park are expected to occur under Alternative 1 because of the distances between these sites and the proposed transmission line route (approximately 5.0 and 4.5 miles, respectively).

3.12.2.4.5 PROPERTY VALUES

Under Alternative 1, the general nature of the potential negative impacts to property values would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Table 3.12-14 summarizes the residential buildings (houses/apartments) that would occur within the 150-foot ROW (within 75 feet of ROW centerline), and residential buildings that would occur outside the ROW but within 150 feet of the ROW centerline under Alternative 1.

Table 3.12-14. Residential Buildings within ROW and within 150 feet of ROW Centerline under Alternative 1

	Residential Buildings within 150-foot ROW	Residential Buildings Outside ROW but within 150 feet of ROW Centerline	Total
Alternative 1	2	19	**21**

Existing median home values in the analysis area counties are listed in Table 3.12-10. The majority of the property that would be affected by the proposed transmission line is agricultural, undeveloped, and forested land. The acres and values of agricultural, undeveloped, and forested lands in analysis area municipalities are listed in Table 3.12-9. As discussed in the analysis assumptions (Section 3.12.2.1), it is assumed that the proposed transmission line could reduce property values between 0% to 20% within 150 feet of the ROW centerline, but these impacts would likely decrease over time. Therefore, impacts to property values under Alternative 1 are expected to be moderate and localized in the short term, and minor and localized in the long term.

3.12.2.4.6 ENVIRONMENTAL JUSTICE

Under Alternative 1, there would be no environmental justice impacts, as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives).

3.12.2.5 ALTERNATIVE 2

3.12.2.5.1 DEMOGRAPHICS

Under Alternative 2, potential impacts on demographics would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Potential impacts would be minor and short term.

3.12.2.5.2 HOUSING

Under Alternative 2, potential impacts on housing would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Potential negative impacts would be minor and short term.

3.12.2.5.3 EMPLOYMENT AND INCOME

<u>Employment</u>

Under Alternative 2, potential impacts on employment would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Potential positive impacts would be minor and short term.

Project Spending and Impact Fees

Under Alternative 2, the total construction costs would be approximately $478.8 million, including $126.4 million for materials, $215.4 million for labor, and $136.9 million for other costs. The estimated one-time environmental impact fee would be $15,909,022, and the estimated annual environmental impact fee would be $954,541 (American Transmission Company et al. 2018). Because the project spending and impact fees would represent a small fraction of the annual earnings for the construction industry in the analysis area (approximately $1.9 billion in 2016), potential positive impacts would be minor and long term.

Agriculture

Under Alternative 2, the general nature of the potential negative economic impacts on agriculture would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). However, the total acres of agricultural land affected would vary among the alternatives. Because the primary economic impact on agriculture would be the acres of land disturbed or taken out of production, the more acres that are affected, the larger the expected impact would be. Under Alternative 2, approximately 916 acres of agricultural lands, including approximately 349 acres of prime farmland and approximately 587 acres of farmland of statewide importance, would be within the ROW under this alternative. Under this alternative, there would be approximately 102 acres of agricultural land cover type affected by surface disturbances associated with proposed access roads, approximately 26 acres of which would be prime farmland. Approximately 22 acres of prime farmland would be permanently disturbed by the transmission line structure and substation footprints. Potential negative impacts would be minor, localized, and short term.

3.12.2.5.4 TOURISM

Under Alternative 2, the general nature of the potential negative impacts on tourism would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives), including potential impacts on tourism in the Driftless Area, at the Ice Age National Scenic Trail, and birdwatching areas at the proposed Mississippi River crossing. Impacts to birdwatching tourism along the portion of the Mississippi River overlapped by the project area during the operations phase of the proposed project would be minor, negative, localized, and short term because the noise, visual, and traffic caused by maintenance activities would be intermittent and would be similar to the maintenance activities that occur for the existing transmission line at this location. Because this alternative would replace an existing transmission line that crosses the Mississippi River within the Refuge, it would likely have a lesser negative impact on birdwatching tourism at this location than the alternatives that would create new disturbances across the Mississippi River (Alternatives 1, 5, and 6).

No impacts to tourism at Military Ridge State Trail or Blue Mound State Park are expected to occur under Alternative 2 because of the distances between these sites and the proposed transmission line route (approximately 5.0 and 4.5 miles, respectively).

3.12.2.5.5 PROPERTY VALUES

Under Alternative 2, the general nature of the potential negative impacts to property values would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Table 3.12-15 summarizes the residential buildings (houses/apartments) that would occur within the 150-foot ROW (within 75 feet of ROW centerline), and residential buildings that would occur outside the ROW but within 150 feet of the ROW centerline under Alternative 2.

Table 3.12-15. Residential Buildings within ROW and within 150 feet of ROW Centerline under Alternative 2

	Residential Buildings within 150-foot ROW	Residential Buildings Outside ROW but within 150 feet of ROW Centerline	Total
Alternative 2	2	26	**28**

Existing median home values in the analysis area counties are listed in Table 3.12-10. The majority of the property that would be affected by the proposed transmission line is agricultural, undeveloped, and forested land. The acres and values of agricultural, undeveloped, and forested lands in analysis area municipalities are listed in Table 3.12-9. As discussed in the analysis assumptions (Section 3.12.2.1), it is assumed that the proposed transmission line could reduce property values between 0% to 20% within 150 feet of the ROW centerline, but these impacts would likely decrease over time. Therefore, impacts to property values under Alternative 1 are expected to be moderate and localized in the short term, and minor and localized in the long term.

3.12.2.5.6 ENVIRONMENTAL JUSTICE

Under Alternative 2, there would be no environmental justice impacts, as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives).

3.12.2.6 ALTERNATIVE 3

3.12.2.6.1 DEMOGRAPHICS

Under Alternative 3, potential impacts on demographics would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Potential impacts would be minor and short term.

3.12.2.6.2 HOUSING

Under Alternative 3, potential impacts on housing would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Potential negative impacts would be minor and short term.

3.12.2.6.3 EMPLOYMENT AND INCOME

Employment

Under Alternative 3, potential impacts on employment would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Potential positive impacts would be minor and short term.

Project Spending and Impact Fees

Under Alternative 3, the total construction costs would be approximately $526.3 million, including $141.7 million for materials, $238.0 million for labor, and $146.6 million for other costs. The estimated one-time environmental impact fee would be $18,657,445, and the estimated annual environmental impact fee would be $1,119,447 (American Transmission Company et al. 2018). Because the project spending and impact fees would represent a small fraction of the annual earnings for the construction industry in the analysis area (approximately $1.9 billion in 2016), potential positive impacts would be minor and long term.

<u>Agriculture</u>

Under Alternative 3, the general nature of the potential negative economic impacts on agriculture would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). However, the total acres of agricultural land affected would vary among the alternatives. Because the primary economic impact on agriculture would be the acres of land disturbed or taken out of production, the more acres that are affected, the larger the expected impact would be. Under Alternative 3, approximately 1,098 acres of agricultural lands, approximately 614 acres of prime farmland and approximately 616 acres of farmland of statewide importance, would be within the ROW under this alternative. Under this alternative, there would be approximately 73 acres of agricultural land cover type affected by surface disturbances associated with proposed access roads, approximately 22 acres of which would be prime farmland. Approximately 22 acres of prime farmland would be permanently disturbed by the transmission line structure and substation footprints. Potential negative impacts would be minor, localized, and short term.

3.12.2.6.4 TOURISM

Under Alternative 3, the general nature of the potential negative impacts on tourism would be the same as those described in Section 3.12.2.3 (Impacts Common to All Action Alternatives), including potential impacts on tourism in the Driftless Area, at the Ice Age National Scenic Trail, and birdwatching areas at the proposed Mississippi River crossing. Impacts to birdwatching tourism along the portion of the Mississippi River overlapped by the project area during the operations phase of the proposed project would be minor, negative, localized, and short term because the noise, visual, and traffic caused by maintenance activities would be intermittent and would be similar to the maintenance activities that occur for the existing transmission line at this location. Because this alternative would replace an existing transmission line that crosses the Mississippi River within the Refuge, it would likely have a lesser negative impact on birdwatching tourism at this location than the alternatives that would create new disturbances across the Mississippi River (Alternatives 1, 5, and 6).

No impacts to tourism at Military Ridge State Trail or Blue Mound State Park are expected to occur under Alternative 2 because of the distances between these sites and the proposed transmission line route (approximately 5.0 and 4.5 miles, respectively).

3.12.2.6.5 PROPERTY VALUES

Under Alternative 3, the general nature of the potential negative impacts to property values would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Table 3.12-16 summarizes the residential buildings (houses/apartments) that would occur within the 150-foot ROW (within 75 feet of ROW centerline), and residential buildings that would occur outside the ROW but within 150 feet of the ROW centerline under Alternative 3.

Table 3.12-16. Residential Buildings within ROW and within 150 feet of ROW Centerline under Alternative 3

	Residential Buildings within 150-foot ROW	Residential Buildings Outside ROW but within 150 feet of ROW Centerline	Total
Alternative 3	3	34	37

Existing median home values in the analysis area counties are listed in Table 3.12-10. The majority of the property that would be affected by the proposed transmission line is agricultural, undeveloped, and forested land. The acres and values of agricultural, undeveloped, and forested lands in analysis area municipalities are listed in Table 3.12-9. As discussed in the analysis assumptions (Section 3.12.2.1), it is assumed that the proposed transmission line could reduce property values between 0% to 20% within 150 feet of the ROW centerline, but these impacts would likely decrease over time. Therefore, impacts to property values under Alternative 1 are expected to be moderate and localized in the short term, and minor and localized in the long term.

3.12.2.6.6 ENVIRONMENTAL JUSTICE

Under Alternative 3, there would be no environmental justice impacts, as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives).

3.12.2.7 ALTERNATIVE 4

3.12.2.7.1 DEMOGRAPHICS

Under Alternative 4, potential impacts on demographics would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Potential impacts would be minor and short term.

3.12.2.7.2 HOUSING

Under Alternative 4, potential impacts on housing would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Potential negative impacts would be minor and short term.

3.12.2.7.3 EMPLOYMENT AND INCOME

Employment

Under Alternative 4, potential impacts on employment would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Potential positive impacts would be minor and short term.

Project Spending and Impact Fees

Under Alternative 4, the total construction costs would be approximately $538.5 million, including $153.3 million for materials, $240.7 million for labor, and $144.4 million for other costs. The estimated one-time environmental impact fee would be $19,249,750, and the estimated annual environmental impact fee would be $1,154,985 (American Transmission Company et al. 2018). Because the project spending and impact fees would represent a small fraction of the annual earnings for the construction industry in the analysis area (approximately $1.9 billion in 2016), potential positive impacts would be minor and long term.

Agriculture

Under Alternative 4, the general nature of the potential negative economic impacts on agriculture would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). However, the total acres of agricultural land affected would vary among the alternatives. Because the primary economic impact on agriculture would be the acres of land disturbed or taken out of production, the more acres that are affected, the larger the expected impact would be. Under Alternative 4, approximately 1,175 acres of agricultural lands, including approximately 855 acres of prime farmland and approximately 685 acres of farmland of statewide importance, would be within the ROW under this alternative. Under this alternative, there would be approximately 58 acres of agricultural land cover type affected by surface disturbances associated with proposed access roads, approximately 17 acres of which would be prime farmland. Approximately 22 acres of prime farmland would be permanently disturbed by the transmission line structure and substation footprints. Potential negative impacts would be minor, localized, and short term.

3.12.2.7.4 TOURISM

Under Alternative 4, the general nature of the potential negative impacts on tourism would be the same as those described in Section 3.12.2.3 (Impacts Common to All Action Alternatives), including potential impacts on tourism in the Driftless Area, at the Ice Age National Scenic Trail, and birdwatching areas at the proposed Mississippi River crossing. Impacts to birdwatching tourism along the portion of the Mississippi River overlapped by the project area during the operations phase of the proposed project would be minor, negative, localized, and short term because the noise, visual, and traffic caused by maintenance activities would be intermittent and would be similar to the maintenance activities that occur for the existing transmission line at this location. Because this alternative would replace an existing transmission line that crosses the Mississippi River within the Refuge, it would likely have a lesser negative impact on birdwatching tourism at this location than the alternatives that would create new disturbances across the Mississippi River (Alternatives 1, 5, and 6).

Tourism related to the Military Ridge State Trail could be negatively impacted under this alternative, as the proposed transmission line route would run parallel to Military Ridge State Trail for approximately 9 miles between Mount Horeb, Wisconsin and Dodgeville, Wisconsin. Potential negative impacts would be most likely during the construction phase because of the increased presence of construction equipment and vehicles and the associated noise. Impacts to tourism at the portion of Military Ridge State Trail paralleling the proposed transmission line during the construction phase would be moderate and short term. Negative impacts on tourism related to the Military Ridge State Trail would likely decrease following the construction phase, because disturbances associated with construction equipment and vehicles would cease and maintenance activities would only be intermittent; however, some tourists may be deterred by the visual impacts created by the transmission line. Negative impacts to tourism on the portion of the Military Ridge State Trail paralleling the proposed transmission line would be minor and long term during the operations phase. Impacts to tourism during the operations phase would primarily result from the intermittent maintenance activities that could cause noise and traffic impacts, as well as tourists that may be deterred from visiting the area because of the visual impact caused by the transmission line.

Blue Mound State Park is approximately 1 mile north of the proposed transmission line route under this alternative. There is a potential for negative impacts on tourism at Blue Mound State Park during the construction phase of the proposed project, because tourists traveling to and from the park may experience noise, visual, and traffic impacts associated with construction equipment and vehicles. However, because the construction activities would occur approximately 1 mile from the state park, these impacts are expected to be minor and short term.

3.12.2.7.5 PROPERTY VALUES

Under Alternative 4, the general nature of the potential negative impacts to property values would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Table 3.12-17 summarizes the residential buildings (houses/apartments) that would occur within the 150-foot ROW (within 75 feet of ROW centerline), and residential buildings that would occur outside the ROW but within 150 feet of the ROW centerline under Alternative 4.

Table 3.12-17. Residential Buildings within ROW and within 150 feet of ROW Centerline under Alternative 4

	Residential Buildings within 150-foot ROW	Residential Buildings Outside ROW but within 150 feet of ROW Centerline	Total
Alternative 4	9	52	**61**

Existing median home values in the analysis area counties are listed in Table 3.12-10. The majority of the property that would be affected by the proposed transmission line is agricultural, undeveloped, and forested land. The acres and values of agricultural, undeveloped, and forested lands in analysis area municipalities are listed in Table 3.12-9. As discussed in the analysis assumptions (Section 3.12.2.1), it is assumed that the proposed transmission line could reduce property values between 0% to 20% within 150 feet of the ROW centerline, but these impacts would likely decrease over time. Therefore, impacts to property values under Alternative 1 are expected to be moderate and localized in the short term, and minor and localized in the long term.

3.12.2.7.6 ENVIRONMENTAL JUSTICE

Under Alternative 4, there would be no environmental justice impacts, as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives).

3.12.2.8 ALTERNATIVE 5

3.12.2.8.1 DEMOGRAPHICS

Under Alternative 5, potential impacts on demographics would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Potential impacts would be minor and short term.

3.12.2.8.2 HOUSING

Under Alternative 5, potential impacts on housing would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Potential negative impacts would be minor and short term.

3.12.2.8.3 EMPLOYMENT AND INCOME

<u>Employment</u>

Under Alternative 5, potential impacts on employment would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Potential positive impacts would be minor and short term.

<u>Project Spending and Impact Fees</u>

Under Alternative 5, the total construction costs would be approximately $548.4 million, including $159.5 million for materials, $242.5 million for labor, and $146.4 million for other costs. The estimated one-time environmental impact fee would be $20,172,762, and the estimated annual environmental impact fee would be $1,210,366 (American Transmission Company et al. 2018). Because the project spending and impact fees would represent a small fraction of the annual earnings for the construction industry in the analysis area (approximately $1.9 billion in 2016), potential positive impacts would be minor and long term.

Agriculture

Under Alternative 5, the general nature of the potential negative economic impacts on agriculture would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). However, the total acres of agricultural land affected would vary among the alternatives. Because the primary economic impact on agriculture would be the acres of land disturbed or taken out of production, the more acres that are affected, the larger the expected impact would be. Under Alternative 5, approximately 1,355 acres of agricultural lands, including approximately 908 acres of prime farmland and approximately 774 acres of farmland of statewide importance, would be within the ROW under this alternative. Under this alternative, there would be approximately 65 acres of agricultural land cover type affected by surface disturbances associated with proposed access roads, approximately 20 acres of which would be prime farmland. Approximately 22 acres of agricultural lands would be permanently disturbed by the transmission line structure and substation footprints, 11 acres of which would be prime farmland. Potential negative impacts would be minor, localized, and short term.

3.12.2.8.4 TOURISM

Under Alternative 5, the general nature of the potential negative impacts on tourism would be the same as those described in Section 3.12.2.3 (Impacts Common to All Action Alternatives), including impacts on tourism in the Driftless Area and at the Ice Age National Scenic Trail.

Under Alternative 5, the general nature of the potential negative impacts on birdwatching tourism along the Mississippi River during the construction phase would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Because this alternative would create new disturbances within the Refuge, it would likely have a minor, long-term, negative impact on birdwatching tourism at this location during the operations phase.

Tourism related to the Military Ridge State Trail and Blue Mound State Park could potentially be negatively impacted under this alternative as well. These impacts would be the same as those described under Alternative 4.

3.12.2.8.5 PROPERTY VALUES

Under Alternative 5, the general nature of the potential negative impacts to property values would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Table 3.12-18 summarizes the residential buildings (houses/apartments) that would occur within the 150-foot ROW (within 75 feet of ROW centerline), and residential buildings that would occur outside the ROW but within 150 feet of the ROW centerline under Alternative 5.

Table 3.12-18. Residential Buildings within ROW and within 150 feet of ROW Centerline under Alternative 5

	Residential Buildings within 150-foot ROW	Residential Buildings Outside ROW but within 150 feet of ROW Centerline	Total
Alternative 5	2	53	**56**

Existing median home values in the analysis area counties are listed in Table 3.12-10. The majority of the property that would be affected by the proposed transmission line is agricultural, undeveloped, and forested land. The acres and values of agricultural, undeveloped, and forested lands in analysis area municipalities are listed in Table 3.12-9. As discussed in the analysis assumptions (Section 3.12.2.1), it is assumed that the proposed transmission line could reduce property values between 0% to 20% within

150 feet of the ROW centerline, but these impacts would likely decrease over time. Therefore, impacts to property values under Alternative 1 are expected to be moderate and localized in the short term, and minor and localized in the long term.

3.12.2.8.6 ENVIRONMENTAL JUSTICE

Under Alternative 5, there would be no environmental justice impacts, as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives).

3.12.2.9 ALTERNATIVE 6

3.12.2.9.1 DEMOGRAPHICS

Under Alternative 6, potential impacts on demographics would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Potential impacts would be minor and short term.

3.12.2.9.2 HOUSING

Under Alternative 6, potential impacts on housing would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Potential negative impacts would be minor and short term.

3.12.2.9.3 EMPLOYMENT AND INCOME

Employment

Under Alternative 6, potential impacts on employment would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Potential positive impacts would be minor and short term.

Project Spending and Impact Fees

Under Alternative 6, the total construction costs would be approximately $479.2 million, including $132.6 million for materials, $212.4 million for labor, and $131.2 million for other costs. The estimated one-time environmental impact fee would be $14,082,221, and the estimated annual environmental impact fee would be $844,933 (American Transmission Company et al. 2018). Because the project spending and impact fees would represent a small fraction of the annual earnings for the construction industry in the analysis area (approximately $1.9 billion in 2016), potential positive impacts would be minor and long term.

Agriculture

Under Alternative 6, the general nature of the potential negative economic impacts on agriculture would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). However, the total acres of agricultural land affected would vary among the alternatives. Because the primary economic impact on agriculture would be the acres of land disturbed or taken out of production, the more acres that are affected, the larger the expected impact would be. Under Alternative 6, approximately 968 acres of agricultural lands, including approximately 619 acres of prime farmland and approximately 576 acres of farmland of statewide importance, would be within the ROW under this alternative. Under this alternative, there would be approximately 85 acres of agricultural land cover type affected by surface disturbances associated with proposed access roads, approximately 24 acres of which would be prime farmland. Approximately 1 acre of prime farmland would be permanently disturbed by transmission line structures. Approximately 22 acres of agricultural lands would be permanently disturbed by the Hill

Valley Substation, 11 acres of which would be prime farmland. Potential negative impacts would be minor, localized, and short term.

3.12.2.9.4 TOURISM

Under Alternative 6, the general nature of the potential negative impacts on tourism would be the same as those described in Section 3.12.2.3 (Impacts Common to All Action Alternatives), including impacts on tourism in the Driftless Area and at the Ice Age National Scenic Trail.

Under Alternative 6, the general nature of the potential negative impacts on birdwatching tourism along the Mississippi River during the construction phase would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Because this alternative would create new disturbances within the Refuge, it would likely have a minor, long-term, negative impact on birdwatching tourism at this location during the operations phase.

Tourism related to the Military Ridge State Trail and Blue Mound State Park could potentially be negatively impacted under this alternative as well. These impacts would be the same as those described under Alternative 4.

3.12.2.9.5 PROPERTY VALUES

Under Alternative 6, the general nature of the potential negative impacts to property values would be as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives). Table 3.12-19 summarizes the residential buildings (houses/apartments) that would occur within the 150-foot ROW (within 75 feet of ROW centerline), and residential buildings that would occur outside the ROW but within 150 feet of the ROW centerline under Alternative 6.

Table 3.12-19. Residential Buildings within ROW and within 150 feet of ROW Centerline under Alternative 6

	Residential Buildings within 150-foot ROW	Residential Buildings Outside ROW but within 150 feet of ROW Centerline	Total
Alternative 6	8	39	**47**

Existing median home values in the analysis area counties are listed in Table 3.12-10. The majority of the property that would be affected by the proposed transmission line is agricultural, undeveloped, and forested land. The acres and values of agricultural, undeveloped, and forested lands in analysis area municipalities are listed in Table 3.12-9. As discussed in the analysis assumptions (Section 3.12.2.1), it is assumed that the proposed transmission line could reduce property values between 0% to 20% within 150 feet of the ROW centerline, but these impacts would likely decrease over time. Therefore, impacts to property values under Alternative 1 are expected to be moderate and localized in the short term, and minor and localized in the long term.

3.12.2.9.6 ENVIRONMENTAL JUSTICE

Under Alternative 6, there would be no environmental justice impacts, as described in Section 3.12.2.3 (Impacts Common to All Action Alternatives).

3.12.3 *Summary of Impacts*

Table 3.12-20 summarizes the potential socioeconomic impacts by alternative. Potential impacts to demographics and housing would be the same for all action alternatives. Alternative 5 would result in the highest project spending and environmental impact fees, while Alternatives 1 and 6 would result in the lowest spending and environmental impact fees, respectively. Alternative 5 would result in the largest negative impact on agriculture, while Alternative 1 would result in the smallest impact on agriculture. Negative impacts on tourism would be highly site-specific across the alternatives, with potential impacts being general similar between Alternatives 1, 2, and 3, and potential impacts being generally similar between Alternatives 4, 5, and 6. However, potential negative impacts to birdwatching tourism at proposed Mississippi River crossings would differ when comparing Alternatives 1, 5, and 6 to Alternatives 2, 3, and 4. Alternative 4 would have the highest potential for negatively affecting residential property values with 61 residential properties within 300 feet of the ROW centerline, while Alternative 1 would have the lowest potential for negatively affecting residential property values with 21 residential properties within 300 feet of the ROW centerline. None of the alternatives would result in environmental justice impacts.

Table 3.12-20. Socioeconomic Impact Summary

	Demographics and Housing	Employment and Income	Agriculture	Tourism	Property Values	Environmental Justice
Alternative 1	Potential impact to demographics and housing would be minor and short term. Up to 170 employees would find temporary housing in the analysis area during construction phase.	Potential positive impacts to employment would be minor and short term (170 employees during construction phase, up to 2 full-time employees during operations phase). Potential positive impacts from project spending would be minor and short term (approximately $465,135,500 million during construction phase). Environmental impact fees would include an estimated $15,801,754 one-time fee and an estimated $948,105 annual fee.	Potential negative impacts to agriculture would be minor, localized, and long term, affecting agricultural lands along Alternative 1 route. Approximately 881 acres of agricultural lands, including approximately 364 acres of prime farmland and 511 acres of farmland of statewide importance, would be within the ROW.	Potential negative impacts to tourism would be moderate, localized, and short term during the construction phase, and minor, localized, and long term during the operations phase. Examples of specific tourism sites that could experience negative impacts include the Driftless Area, birdwatching areas near the proposed crossing at the Mississippi River (Refuge), and the Ice Age National Scenic Trail.	Potential negative impacts to property values within 150 feet of the ROW centerline would be moderate in the short term and minor in the long term. Property values could be reduced by between 0% and 20% in the short term, but those impacts would likely decrease over time. Two residential buildings would be within the ROW and 19 residential buildings would be outside the ROW but within 150 feet of the ROW centerline.	No potential for environmental justice impacts.

	Demographics and Housing	Employment and Income	Agriculture	Tourism	Property Values	Environmental Justice
Alternative 2	Same as Alternative 1.	Same as Alternative 1. However, project spending would include approximately $478,766,500 in construction costs, and environmental impact fees would include an estimated $15,909,022 one-time fee and an estimated $954,541 annual fee.	Same as Alternative 1 but affecting agricultural lands along Alternative 2 route. Approximately 916 acres of agricultural lands, including approximately 349 acres of prime farmland and 587 acres of farmland of statewide importance, would be within the ROW.	Potential negative impacts to tourism would be moderate, localized, and short term during the construction phase, and minor, localized, and long term during the operations phase. Examples of specific tourism sites that could experience negative impacts include the Driftless Area, birdwatching areas near the proposed crossing at the Mississippi River, and the Ice Age National Scenic Trail. Lesser potential negative impacts on tourism at birdwatching areas at proposed Mississippi River crossing than Alternatives 1, 5, and 6.	Same as Alternative 1 but including 2 residential buildings within the ROW and 26 residential buildings outside ROW but within 150 feet of the ROW centerline.	Same as Alternative 1.
Alternative 3	Same as Alternative 1.	Same as Alternative 1. However, project spending would include approximately $526,291,500 in construction costs, and environmental impact fees would include an estimated $18,657,445 one-time fee and an estimated $1,119,447 annual fee.	Same as Alternative 1 but affecting negatively agricultural lands along Alternative 3 route. Approximately 1,098 acres of agricultural lands, including approximately 614 acres of prime farmland and 616 acres of farmland of statewide importance, would be within the ROW.	Potential negative impacts to tourism would be minor, localized, and short term during the construction phase, and minor, localized, and long term during the operations phase. Examples of specific tourism sites that could experience negative impacts would be the same as described under Alternative 2.	Same as Alternative 1 but including 3 residential buildings within the ROW and 34 residential buildings outside ROW but within 150 feet of the ROW centerline.	Same as Alternative 1.
Alternative 4	Same as Alternative 1.	Same as Alternative 1. However, project spending would include approximately $538,353,500 in construction costs, and environmental impact fees would include an estimated $19,249,750 one-time fee and an estimated $1,154,985 annual fee.	Same as Alternative 1 but negatively affecting agricultural lands along Alternative 4 route. Approximately 1,175 acres of agricultural lands, including approximately 855 acres of prime farmland and 685 acres of farmland of statewide importance, would be within the ROW.	Potential negative impacts to tourism would be moderate, localized, and short term during the construction phase, and minor, localized, and long term during the operations phase. Examples of specific tourism sites that could experience negative impacts would be the same as described under Alternative 2, as well as potential impacts on tourism at Military Ridge State Trail and Blue Mound State Park.	Same as Alternative 1 but including 9 residential buildings within the ROW and 52 residential buildings outside ROW but within 150 feet of the ROW centerline.	Same as Alternative 1.

	Demographics and Housing	Employment and Income	Agriculture	Tourism	Property Values	Environmental Justice
Alternative 6	Same as Alternative 1.	Same as Alternative 1. However, project spending would include approximately $476,219,500 in construction costs, and environmental impact fees would include an estimated $14,082,221 one-time fee and an estimated $844,933 annual fee.	Same as Alternative 1 but negatively affecting agricultural lands along Alternative 6 route. Approximately 968 acres of agricultural lands, including approximately 619 acres of prime farmland and 576 acres of farmland of statewide importance, would be within the ROW.	Potential negative impacts to tourism would be moderate, localized, and short term during the construction phase, and minor, localized, and long term during the operations phase. Examples of specific tourism sites that could experience negative impacts would be the same as described under Alternative 1, as well as potential negative impacts on tourism at Military Ridge State Park and Blue Mound State Park.	Same as Alternative 1, but including 8 residential buildings within the ROW and 39 residential buildings outside ROW but within 150 feet of the ROW centerline.	Same as Alternative 1.

3.13 Public Health and Safety

This section analyzes issues raised by the public and agencies during public scoping and preparation of the EIS related to potentially significant effects on public health and safety. This section describes the existing environmental conditions that may affect human health and safety, including exposure to EMFs, risk of fire from severe weather, worker safety, and solid, hazardous, and toxic materials and waste.

3.13.1 *Affected Environment*

The analysis area for public health and safety includes 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). This 300-foot span area was identified to allow flexibility in where the ROW is ultimately sited.

3.13.1.1 ELECTRIC AND MAGNETIC FIELDS

EMFs are a combination of electric and magnetic fields that occur both naturally and as a result of human activity. Naturally occurring EMFs are caused by the weather and Earth’s geomagnetic field. EMFs are also created by household appliances such as hair dryers, microwave ovens, power tools, and current flowing through power lines. The strength of the fields is determined mainly by line current and distance from the line. The EMFs from power lines occur mainly within the ROW and can extend for a short distance beyond. EMFs currently occur within the analysis area due to several existing operating transmission lines, including 69-kV, 138-kV, 161-kV, 345-kV lines, and associated distribution lines (see Figure 1.4-1 in Chapter 1).

Research on the potential influence of EMFs on organisms and human health has been conducted over many decades to understand basic interactions of EMFs with biological organisms and cells, and to investigate potential therapeutic applications. In the 1970s, questions arose about potential adverse health effects from EMFs because of epidemiology studies that had suggested statistical associations between exposure to EMFs and health conditions, including cancer. Over the past 40 years, considerable additional research has been conducted to address uncertainties in those studies and to determine if there was any consistent pattern of results from human, animal, and cell studies that would support such an association.

The quantity and complexity of the research has led scientific and government health agencies to assemble multidisciplinary panels of scientists to conduct weight-of-evidence reviews and arrive at conclusions about the possible effects associated with EMFs. The listing of these agencies (in ascending, chronological order of their most recent publication) is provided below:

The National Institute for Environmental Health Sciences assembled a 30-person Working Group to review the cumulative body of epidemiologic and experimental data and provide conclusions and recommendations to the U.S. government (National Institute for Environmental Health Sciences 1999).

The International Agency for Research on Cancer completed a full carcinogenic evaluation of EMF in 2002 (IARC 2002).

The National Radiological Protection Board of the United Kingdom issued full evaluations of the research in 1992, 2001, and 2004 with supplemental updates and topic-specific reports published in the interim and subsequent to their last full evaluation in 2004 (National Radiological Protection Board 1992, 1994a, 1994b, 2001a, 2001b, 2004).

The Health Council of the Netherlands, using other major scientific reviews as a starting point, evaluated recent studies in several periodic reports (Health Council of the Netherlands 2001, 2004, 2005, 2007, 2009).

The Scientific Committee on Emerging and Newly Identified Health Risks issued a report to the Health Directorate of the European Commission in March 2007 and March 2009 updating previous conclusions (Scientific Committee on Emerging and Newly Identified Health Risks 2007, 2009; Scientific Committee on Toxicity, Ecotoxicity and the Environment 2001; Scientific Steering Committee of the European Commission 1998). Their most recent report was issued in January 2015, which updated their 2009 report (Scientific Committee on Emerging and Newly Identified Health Risks 2015).

The European Commission also has funded the European Health Risk Assessment Network on Electromagnetic Fields Exposure (EFHRAN), a network of scientists convened to perform health risk assessments and provide scientifically based recommendations to the European Commission. EFHRAN consulted other major reviews and evaluated epidemiologic and experimental research published after August 2008 to provide an updated health assessment (EFHRAN 2010, 2012).

The International Commission on Non-Ionizing Radiation Protection (ICNIRP), the formally recognized organization for providing guidance on standards for non-ionizing radiation exposure for the World Health Organization, published a review of the cumulative body of epidemiologic and experimental data on EMF in 2003. The ICNIRP released exposure guidelines in 2010 that updated their 1998 exposure guidelines. For both guidelines, they relied heavily on previous reviews of the literature related to long-term exposure, but provided some relevant conclusions as part of their update process (ICNIRP 2010).

The Swedish Radiation Protection Authority (SSI), which became the Swedish Radiation Safety Authority (SSM) in 2009, evaluated current studies in several reports, using other major scientific reviews as a starting point (SSI 2007, 2008; SSM 2009, 2010, 2013, 2014, 2015, 2018).

Overall, the published conclusions of these scientific review panels have been consistent. None of the panels concluded that either electric fields or magnetic fields are a known or likely cause of any adverse health effect at the long-term, low exposure levels found in the environment. As a result, no standards or guidelines have been recommended to prevent this type of exposure; however, from all the research that has been conducted, it was confirmed that short-term exposure to higher intensities of EMF (above exposure levels of electrical and industrial workers) could produce adverse stimulation of nerves and muscles (World Health Organization 2018). Although electric and magnetic fields induce voltages and currents in the body, the induced currents directly beneath high-voltage transmission lines are very small compared to thresholds for producing shock and other harmful electrical effects (World Health Organization 2018). While no adverse health effects from low level, long-term exposure to radiofrequency or power frequency fields have been confirmed, scientists are continuing to research this topic (World Health Organization 2018). Impacts from EMF have also been analyzed in other projects in the analysis area, such as the Badger Coulee 345-kV Transmission Line Project, which is currently under construction (ATC and Xcel Energy 2014).

Neither the Wisconsin and Iowa governments, nor the United States government has regulations limiting EMF exposure from power transmission lines. Several public and industry organizations have developed nonbinding guidelines for EMF exposure. These non-binding guidelines include exposure limits for the general public and for occupational exposure recommended by the ICNIRP, the Institute of Electrical and Electronics Engineers (IEEE), and the American Conference of Governmental Industrial Hygienists (ACGIH) to address health and safety issues. These guidelines are described below.

- The ICNIRP electric field guideline for occupational exposure is 8.3 kilovolts per meter (kV/m), and for members of the public, 4.2 kV/m. The ICNIRP guideline for magnetic fields is 4,200 milliGauss (mG) for occupational exposure, and the guideline for exposure to members of the public is 833 mG (NIEHS 2002).
- The IEEE electric field guideline for occupational exposure is 20 kV/m, and for members of the public, 5 kV/m. The IEEE guideline for magnetic fields is 27,100 mG for occupational exposure, and the guideline for exposure to members of the public is 9,040 mG (IEEE 2002).
- The ACGIH electric field guideline for occupational exposure is 25 kV/m. The ACGIH guideline for the exposure of workers to magnetic fields is 10,000 mG and 1,000 mG for persons with cardiac pacemakers (ACGIH 2011).

Table 3.13-1 lists the typical 60 Hz electric and magnetic levels based on the distance from overhead power lines. Table 3.13-2 lists the estimated average magnetic field exposure of the U.S. population for various activities.

Table 3.13-1. Typical 60 Hz Electric and Magnetic Field Levels from Overhead Power Lines

Line Voltage	Centerline	50 feet from the Centerline	100 feet from Centerline	200 feet from Centerline	300 feet from Centerline
115 kV					
Electric field kV/m	1.0	0.5	0.07	0.01	0.003
Magnetic field mG	29.7	6.5	1.7	0.4	0.2
230 kV					
Electric field kV/m	2.0	1.5	0.3	0.05	0.01
Magnetic field mG	57.5	19.5	7.1	1.8	0.8
500 kV					
Electric field kV/m	7.0	3.0	1.0	0.3	0.1
Magnetic field mG	86.7	29.4	12.6	3.2	1.4

Source: NIEHS (2002)

Table 3.13-2. Estimated Average Magnetic Field Exposure of the U.S. Population for Various Activities

Average Field (mG)	Population Exposed (%)				
	Home	Bed	Work	School	Travel
> 0.5	69.0	48.0	81.0	63.0	87.0
> 1.0	38.0	30.0	49.0	25.0	48.0
> 2.0	14.0	14.0	20.0	3.5	13.0
> 3.0	7.8	7.2	13.0	1.6	4.1
> 4.0	4.7	4.7	8.0	< 1	1.5
> 5.0	3.5	3.7	4.6		1.0
> 7.5	1.2	1.6	2.5		0.5
> 10.0	0.9	0.8	1.3		< 0.2
> 15.0	0.1	0.1	0.9		

Source: NIEHS (2002)

3.13.1.2 RISK OF FIRE FROM SEVERE WEATHER

Lightning strikes can cause fires and transmission outages. Lightning often strikes tall objects because it provides the easiest path for the lightning to take. In a rural region, transmission towers are often the tallest objects available. Severe weather, such as hail, high winds, and tornadoes, can also cause damage to power lines, potentially resulting in fires and transmission outages. A National Weather Service study has shown that a radar based in Milwaukee, Wisconsin, covering an area that includes the analysis area and surrounding areas[5] experienced 12,371 severe weather events between 1980 and 2006, including 762 significantly severe events[6] (NOAA 2007). Compared with the other 141 radar coverage areas in all states across the country that were studied, the area surrounding the analysis area ranked fifty-fifth in the number of severe weather events between 1980 and 2006, and forty-fifth in the number of significantly severe events during that period (NOAA 2007).

3.13.1.3 SAFETY

Work-related fatalities, injuries, and illnesses associated with utility and construction workers can occur in and around utility construction sites. The U.S. Bureau of Labor Statistics and the BLS Injuries, Illnesses and Fatalities Program monitor and track statistics on these injury rates. According to the BLS, “an injury or illness is considered to be work-related if an event or exposure in the work environment either caused or contributed to the resulting condition or significantly aggravated a pre-existing condition” (BLS 2016). Table 3.13-3 provides information on the number of fatalities, and rate of injury and illness cases (per 100 full-time workers) in the construction field from 2013 to 2016 in the United States.

[5] The radar coverage area included southern Wisconsin, as well as small portions of eastern Iowa, northern Illinois, and western Michigan.

[6] Significantly severe events include tornadoes F2 or stronger, wind gusts of 65 knots or stronger, and hail of 2-inch diameter or larger.

Table 3.13-3. Work-Related Fatalities, Injuries, and Illnesses in Construction Field

Data Series	2016	2015	2014	2013
Fatalities				
• Number of fatalities (United States)	991	937	899	828
• Number of fatalities (Wisconsin)	12	10	14	11
• Number of fatalities (Iowa)	13	12	20	12
Rate of injury and illness cases per 100 full-time workers				
• Total recordable cases (United States)	3.2	3.5	3.6	3.8
• Total recordable cases (Wisconsin)	6.1	4.7	5.5	4.6
• Total recordable cases (Iowa)	4.1	4.2	4.5	3.8
• Cases involving days away from work, job restriction, or transfer (United States)	1.9	2.0	2.0	2.2
• Cases involving days away from work, job restriction, or transfer (Wisconsin)	3.3	2.2	2.8	2.5
• Cases involving days away from work, job restriction, or transfer (Iowa)	2.4	2.0	2.1	2.1
• Cases involving days away from work (United States)	1.3	1.3	1.3	1.5
• Cases involving days away from work (Wisconsin)	2.5	2.5	1.8	1.9
• Cases involving days away from work (Iowa)	1.7	1.6	1.3	1.3
• Cases involving days of job transfer or restriction (United States)	0.6	0.6	0.6	0.7
• Cases involving days of job transfer or restriction (Wisconsin)	0.8	0.6	1.0	0.6
• Cases involving days of job transfer or restriction (Iowa)	0.6	0.4	0.8	0.8

Source: BLS (2017, 2018c, 2018d)

With respect to Wisconsin and Iowa, the BLS found that the states' 2016 incidence rates among construction workers (at 6.1 incidents per 100 full-time workers for Wisconsin and 4.1 incidents for Iowa) were both higher overall than the national statistic for construction injuries and illnesses (3.2 incidents). In Wisconsin, incidence rates among utility system construction workers in 2016 was 5.3 incidents per 100 full-time workers, compared with a 2.6 national rate (BLS 2017, 2018d). A utility system construction incident rate is not available for the state of Iowa. Statistics for injuries and illnesses incurred during operations and maintenance activities for transmission lines is not available for Wisconsin or Iowa. The number of nonfatal injuries and illnesses of electrical power-line installers and repairers in the United States averaged 2,300 each year from 2011 to 2015, with 131 total fatalities over that same period (BLS 2018e). The number of nonfatal injuries, illnesses, and fatalities of electrical power-line installers and repairers is not available for Wisconsin or Iowa.

3.13.1.4 SOLID, HAZARDOUS, AND TOXIC MATERIALS AND WASTE

Federal laws addressing solid, hazardous, and toxic materials and waste include the Federal Toxic Substances Control Act (TOSCA) (1976) (15 U.S.C. 2601 et seq.), the Resource Conservation and Recovery Act of 1976, as amended (RCRA) (42 U.S.C. 6901 et seq.), and the Comprehensive Environmental Response, Compensation, and Liability Act, as amended (CERCLA) (42 U.S.C. 9601 et seq.), commonly known as Superfund. TOSCA and RCRA established a program administered by the

USEPA for the regulation of the generation, transportation, treatment, storage, and disposal of toxic substances and hazardous waste. CERCLA provides broad Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment.

The IDNR and WDNR administer the states' solid waste programs, which includes regulation of solid waste handling and disposal facilities. There are at least five solid waste landfills in the counties intersected by the analysis area that are permitted or licensed by the IDNR and WDNR and could be used to dispose of solid waste generated under the action alternatives. These solid waste landfills include Pattison Brothers, Inc. (Clayton County), Dubuque Metropolitan Sanitary Landfill (Dubuque County), Dane County Landfill #2 Rodefeld (Dane County), WMWI – Madison Prairie Landfill (Dane County), and Dairyland Power Cooperative – Cassville (Grant County) (IDNR 2018e; WDNR 2018m).

Publicly available databases were searched to gather information regarding known sites of environmental concern in the analysis area. Sites of potential concern include, but are not limited to, Superfund sites (CERCLA sites), underground storage tanks, and USEPA-permitted hazardous waste facilities (RCRA sites). A search of the publicly available data identified no Superfund sites within the analysis area (USEPA 2018f). There are approximately 431 underground storage tanks in the towns and cities in the analysis area, which store substances such as diesel fuel, leaded and unleaded gasoline, fuel oil, aviation fuel, kerosene, gas/ethanol blend, and waste/used motor oil (IDNR and Public Safety State Fire Marshal Office 2018; Wisconsin Department of Agriculture, Trade and Consumer Protection 2018) There are six USEPA-permitted hazardous waste management facilities in the analysis area, including a farm supply store, an eye care clinic, a school district facility, General Telephone Company of Wisconsin, Inc., a crane service, and a Land's End store (USEPA 2018g). All of the USEPA-permitted hazardous waste management facilities in the analysis area are very small quantity generators, meaning that they may not accumulate more than 1,000 kilograms of hazardous waste at any time (USEPA 2017).

3.13.2 *Environmental Consequences*

This section describes the potential impacts to public health and safety associated with the construction, operation, and maintenance of the transmission line, substations, and ancillary facilities. Impacts to public health and safety are discussed in terms of potential exposure to EMF, risk of fires, risks to worker safety, and potential for spills, releases, and disposal of solid, hazardous, and toxic materials and waste during construction, operations, and maintenance of the proposed project. The impacts described in this section are based on similar prior experience and analyses in other locations, as well as other resource assessments provided in this EIS.

3.13.2.1 DATA SOURCES, METHODS, AND ANALYSIS ASSUMPTIONS

Data sources considered when analyzing impacts to public health and safety include studies of the potential public health concerns associated with EMF exposure, severe weather statistics from the National Weather Service, worker safety statistics from the BLS, applicable laws and regulations regarding solid, hazardous, and toxic wastes and materials, as well as previous EISs of similar transmission line projects.

The following impact indicators were considered when analyzing impacts to public health and safety:

- Amounts and types of hazardous materials and the potential for hazardous materials exposure.
- Number of workers and sensitive receptors within the analysis area.
- Project area severe weather, fire, and lightning strike statistics.

- Transmission line failure rate per mile.
- Amounts and types of potential fire-causing activities or equipment.
- Expected levels of electromagnetic fields within the analysis area.

The analysis assumes that all appropriate environmental commitments would be implemented.

Table 3.13-4 defines the impact thresholds for defining impacts to public health and safety. These thresholds are used below to characterize the intensity of impacts that are estimated for each alternative.

Table 3.13-4. Impact Thresholds and Descriptions for Public Health and Safety

	Minor Impact	Moderate Impact	Major Impact
Public Health and Safety	Construction of the C-HC Project would not result in: 1) exposure of contaminated media to construction workers and/or 2) incidents associated with the installation of the transmission line and supporting infrastructure. Operation of the C-HC Project would not result in increased exposure to EMF levels, which would rise to a level of concern with regard to public health and safety.	Construction of the C-HC Project may result in exposure to contaminated media by construction workers either through the disturbance of hazardous materials and/or chemical spills. The potential for incidents associated with the installation of the transmission line and supporting infrastructure increases. Operation of the C-HC Project would increase exposure to EMF levels, but not to a level that would adversely affect public health and safety.	Construction of the C-HC Project would result in exposure to contaminated media by construction workers either through the disturbance of hazardous materials and/or chemical spills. Incidents associated with the installation of the transmission line and supporting infrastructure would likely result. Operation of the C-HC Project would increase exposure to EMF levels to a level high enough to adversely affect public health and safety.

3.13.2.2 NO ACTION

Under the No Action Alternative, there would be no potential for increase in construction-related injuries or deaths resulting from the proposed project. There would also be no potential for an increase in EMFs or hazardous materials in the analysis area resulting from the proposed project. Existing trends for the risk of fire from severe weather would be expected to continue. Existing trends in worker health and safety, as well as public health and safety in the analysis area would be expected to continue.

3.13.2.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

3.13.2.3.1 ELECTRIC AND MAGNETIC FIELDS

Electric field levels beneath typical overhead transmission lines may vary from a few volts per meter for distribution lines to several thousands of volts per meter for extra-high-voltage power lines (NIEHS 2002). Peak magnetic field levels can vary significantly depending on the amount of current carried by the line. The estimated peak magnetic field levels for the proposed transmission line and the electric field levels associated with typical 230-kV to 500-kV transmission lines are listed in Table 3.13-5.

Table 3.13-5. Estimated Peak Magnetic Field Levels for the C-HC Project Transmission Line and Typical Electric Field Levels for 230-kV to 500-kV Transmission Lines

	Centerline	25 feet from the Centerline	50 feet from the Centerline	100 feet from the Centerline	150 feet from the Centerline	200 feet from the Centerline	300 feet from the Centerline
Magnetic field (mG)	133.0	211.0	70.0	26.0	15.0	9.8	5.7
Electric field (kV/m)	2.0 – 7.0	N/A	1.5 – 3.0	0.3 – 1.0	N/A	0.05 – 0.3	0.01 – 0.1

Source: American Transmission Company et al. (2018) and NIEHS (2002)

Note: N/A = not available

Under all action alternatives, there would be no exposure to EMF during construction because the proposed transmission lines and associated facilities would not yet be energized. Workers would not typically be exposed to EMFs during construction of the proposed transmission line and associated facilities due to precautions during construction that would keep them from working directly under or parallel to the existing facilities for extended periods of time. If constant work were being performed near existing facilities that posed any kind of safety threat, the existing transmission facilities would be turned off, eliminating exposure to EMFs for construction crews.

Once the proposed transmission line is in operation, a potential for increased public exposure to EMFs would occur under all action alternatives. Portions of the proposed transmission line route would be built in areas where no current transmission lines exist in Iowa and Wisconsin. However, other portions of the proposed transmission line route would be built where 69-kV, 138-kV and 161-kV transmission lines already exist in Wisconsin (see Figure 1.4-1 in Chapter 1). As discussed above, the estimated peak magnetic fields for the proposed transmission line are well below the health-based guidelines for EMF exposure both within the ROW and at a distance of 300 feet. As discussed in Section 3.13.1, the guidelines for public exposure to magnetic field levels range from 833 mG to 9,040 mG, and from 4,200 mG to 27,100 mG for occupational exposure. The typical electric fields for 230-kV to 500-kV lines have the potential to exceed the health-based guidelines for electric field exposure directly below the transmission lines at the ROW centerline, but the electric field levels fall below the health-based guidelines less than 50 feet from the centerline. As discussed in Section 3.13.1, the guidelines for public exposure to electric field levels range from 4.2 kV/m to 5.0 kV/m, and from 8.3 kV/m to 25.0 kV/m for occupational exposure. Therefore, under the all action alternatives, the potential for increased exposure to EMFs during the operations phase would be minor and long term for any residences or other occupied buildings within the ROW and negligible for any residences or other occupied buildings at the edge of the ROW and beyond. The potential for workers to be exposed to EMF levels during the operations phase would be minor and periodic because of the intermittent nature of maintenance activities.

3.13.2.3.2 RISK OF FIRES

Under all action alternatives, potential fire-causing activities (such as welding or the use of combustion engines) would occur during construction of the proposed transmission line and associated facilities in areas known for extreme fire danger during the dry season. All action alternatives would increase the reliability of the overall transmission system in the analysis area vicinity during severe weather events, because if an existing transmission line experiences a forced outage, then the proposed transmission line would provide another connection to support local load and generation. Also, if the proposed transmission line has a temporary outage, possibly caused by a lightning strike, the line protection would attempt to automatically reclose the line so the outage duration could be limited to less than a second. The implementation of best management practices would reduce the potential for health and safety impacts that could result from fires associated with construction and/or operation and maintenance of the proposed project. Trees and other vegetation in the ROW would be trimmed and managed as required by the

Electric Reliability Standard FAC-0003-4 to decrease the risk of fire due to flashovers or lines being damaged by falling trees (FERC 2016). Therefore, potential impacts on public and worker health and safety from severe weather hazards and potential fire-causing activities during construction, operations, and maintenance would be minor and long term.

3.13.2.3.3 WORKER SAFETY

Under all action alternatives, potential risks associated with construction activities include, but are not limited to, electrocution, exposure to extreme weather, falling, exposure to hazardous materials, and injury from equipment and materials. Site-specific risks such as difficult or remote terrain or highway crossings would exist. Construction requirements, including workers and types of equipment and materials, are described in Section 2.4.3. The construction of the proposed project would be temporary and would be confined to the footprint of the facilities, access roads, and staging areas. Construction safety requirements would meet the Occupational Safety and Health Administration (OSHA) standards and site-specific occupational safety measures (such as a smoking ban in fire prone areas) would be developed as appropriate. Because construction safety requirements would meet OSHA standards, and additional site-specific safety measures would be developed as appropriate, potential impacts to worker safety during construction, operations, and maintenance activities would be minor and long term.

3.13.2.3.4 SOLID, HAZARDOUS, AND TOXIC MATERIALS AND WASTE

Under all action alternatives, the handling, storage, and disposal of all solid, hazardous, and toxic materials and waste would be done in compliance with applicable state and Federal laws and regulations, such as the RCRA (42 U.S.C. 6901 et seq.), Wisconsin Statutes Chapter 291, and Iowa Code 455B.411–433. The types of solid, hazardous, and toxic materials and waste that would be used during construction and operations under all action alternatives are listed below. No toxic materials or hazardous wastes are expected to be generated or stored under any of the action alternatives.

- Gasoline, diesel fuel, grease (solid wastes) and antifreeze (hazardous substance): Standard construction, operation and maintenance vehicles may contain gasoline/diesel fuel, hydraulic oil, grease, and antifreeze. Antifreeze, grease and hydraulic oil would be contained within the vehicle, unless there is a spill or on-site vehicle maintenance.
  - During construction, one 500-gallon diesel fuel tank would be located in whatever laydown yard is active for refilling construction vehicles. For any potential spills, this tank would have a mobile containment pit underneath it.
  - During construction, the Utilities would use approximately 10 pickup trucks, each of which has a 50-gallon diesel bulk tank.
  - During construction, the Utilities' vegetation-maintenance crews would use approximately 1,000 gallons of diesel fuel, using 10 pieces of equipment and a 1,000-gallon diesel fuel truck.
  - During operation of the line, the Utilities' vegetation-maintenance crews would only use what the truck carries in their tank and refill at a local gas station. No additional tanks or pickup trucks with tanks would be used for this work.
- Oil (solid waste) and SF_6 (hazardous substance) would be located at the new Montfort Substation and would be added to the Cardinal Substation because of the proposed project.

  - Approximately 39,167 gallons of oil would be located at the Montfort Substation, and approximately 128 gallons of oil would be added at the Cardinal Substation. Permanent and secondary containment would be installed for the oil at the Montfort Substation, and the oil at the Cardinal Substation would be placed within the existing secondary containment.
  - Approximately 3,325 pounds of SF_6 would be at the new Montfort Substation, and approximately 621 pounds of SF_6 would be added to the existing Cardinal Substation.

- Herbicides (hazardous substance): where landowner consent is provided, herbicides would be used as follows, and the person applying herbicides would have USEPA certification.
- During construction, for the initial vegetation clearing all vegetation would be mechanically cleared for the full width of the ROW to facilitate construction equipment access and ensure safe clearances between vegetation and the transmission line. Stumps of tall-growing species would be treated with an herbicide pre-mix solution to discourage regrowth.
- During construction, the Utilities expect the following herbicide mix will be used to control the regrowth of incompatible vegetation: Garlon (110 gallons), Milestone (2.5 ounces), Escort (15 ounces), and Rifle (25 gallons).
  - During operation of the line, the Utilities estimate that the quantity of herbicide solution mix applied in a 50-mile span of 150-foot-wide ROW would be approximately 20% less than the initial application and may be reduced even further after each succession cycle.
  - All herbicide applications would be conducted in accordance with Federal, state and local laws, regulations and labels. Herbicide application methods utilized would include high volume foliar, cut stubble, low volume foliar, cut stump and basal applications. The vegetation density, size and location, time of year, control method implemented, environmental conditions and property owner or easement restrictions, would determine the herbicide application treatment method used within the ROW.
- After construction, the Utilities expect to use a similar herbicide pre-mix solution for vegetation maintenance. There would be a mid-year cycle application in 2 to 3 years, and after that the vegetation management cycle would be every 5 years.

Solid wastes generated under the action alternatives may also include paper, wood, metal, and general trash. For example, it is expected that solid waste generated from clearing and grading of the construction sites would go to a landfill that accepts biodegradable yard waste. It is also expected that solid waste generated during the revamping of the substations, which might include metals, could go to a landfill that accepts sorted metals for recycling. Any solid wastes generated by construction workers such as food and beverage containers would be captured at the point of use and collected for off-site disposal at a local landfill, such as those listed in Section 3.13.1.4.

The Utilities would require all contractors to have spill prevention and response plans for the construction phase and a Spill Prevention, Control and Countermeasure Plan (SPCC) for the operations and maintenance phase, where applicable. An SPCC is not typically required because few, if any, sites have the regulated amount of stored oil. An SPCC is required to prevent discharge of oil or other petroleum products into WUS, and is required if the aboveground storage capacity for the substance is greater than 1,320 gallons and there is a potential of a discharge into navigable WUS. The Utilities would update and develop its SPCC plans for the Hickory Creek or Turkey River Substation if they meet the criteria per 40 CFR 112. Any onsite storage for construction would have the necessary containment measures and spill response resources available onsite, as appropriate. The Utilities would follow its spill response plan in the event of a release.

No fueling or maintenance of vehicles or application of herbicides would occur within 100 feet of streams, ditches, and waterways to protect against introduction of these materials into surface or groundwater systems. Materials such as fuels, lubricants, paints, and solvents required for construction would be stored away from surface water resources according to appropriate regulatory standards. Any spills or leaks would be cleaned up immediately and leaking equipment removed from the area for proper maintenance.

For vegetation removal and maintenance of ROWs spanning organic farms, the Utilities would avoid spraying any herbicides at least 50 feet from the posted organic crop ground.

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 potential for public and worker health and safety impacts from spills, releases, or disposal of these materials would be minor and long term.

3.13.2.4 ALTERNATIVE 1

3.13.2.4.1 ELECTRIC AND MAGNETIC FIELDS

Under Alternative 1, the general nature of the potential exposure to EMF that could affect public health and safety would be the same as discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives). Table 3.13-6 lists the number of residences, hospitals/nursing homes, daycares, and schools within the proposed ROW, or not within the ROW but within 300-foot analysis area. The potential exposure to EMF during the operations phase would be minor and long term for any residences or other occupied buildings within the ROW, and negligible for any residences or other occupied buildings at the edge of the ROW and beyond. The potential exposure to EMF for workers during the operations phase would be minor and periodic because of the intermittent nature of maintenance activities.

Table 3.13-6. Numbers of Residences, Hospitals/Nursing Homes, Daycares, and Schools within the ROW and Outside the ROW but within the 300-foot Analysis Area under Alternative 1

Alternative	Residences (Homes/Apartments)		Hospitals/Nursing Homes		Daycares		Schools	
	Within ROW	Outside ROW but within 300-foot analysis area	Within ROW	Outside ROW but within 300-foot analysis area	Within ROW	Outside ROW but within 300-foot analysis area	Within ROW	Outside ROW but within 300-foot analysis area
Alternative 1	2	19	0	0	0	0	0	0

3.13.2.4.2 RISK OF FIRE

Under Alternative 1, the potential risk of fire during construction, operations, and maintenance would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives).

3.13.2.4.3 WORKER SAFETY

Under Alternative 1, the potential impacts to worker safety during construction, operations, and maintenance would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives).

3.13.2.4.4 SOLID, HAZARDOUS, AND TOXIC MATERIALS AND WASTE

Under Alternative 1, the potential impacts to public health and safety from the spill, release, or disposal of solid, hazardous, or toxic materials and waste during construction, operations, and maintenance would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives).

3.13.2.5 ALTERNATIVE 2

3.13.2.5.1 ELECTRIC AND MAGNETIC FIELDS

Under Alternative 2, the general nature of the potential exposure to EMF that could affect public health and safety would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives). Table 3.13-7 lists the number of residences, hospitals/nursing homes, daycares, and schools within the ROW, or not within the ROW but within the 300-foot analysis area. The potential exposure during the operations phase would be minor and long term for any residences or other occupied buildings within the ROW, and negligible for any residences or other occupied buildings at the edge of the ROW and beyond. The potential exposure to EMF for workers during the operations phase would be minor and periodic because of the intermittent nature of maintenance activities.

Table 3.13-7. Numbers of Residences, Hospitals/Nursing Homes, Daycares, and Schools within the ROW and within the 300-foot Analysis Area under Alternative 2

	Residences (Homes/Apartments)		**Hospitals/Nursing Homes**		**Daycares**		**Schools**	
Alternative	Within ROW	Outside ROW but within 300-foot analysis area	Within ROW	Outside ROW but within 300-foot analysis area	Within ROW	Outside ROW but within 300-foot analysis area	Within ROW	Outside ROW but within 300-foot ROW
Alternative 2	2	26	0	0	0	1	1	1

3.13.2.5.2 RISK OF FIRE

Under Alternative 2, the potential risk of fire during construction, operations, and maintenance would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives).

3.13.2.5.3 WORKER SAFETY

Under Alternative 2, the potential impacts to worker safety during construction, operations, and maintenance would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives).

3.13.2.5.4 SOLID, HAZARDOUS, AND TOXIC MATERIALS AND WASTE

Under Alternative 2, the potential impacts to public health and safety from the spill, release, or disposal of solid, hazardous, or toxic materials and waste during construction, operations, and maintenance would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives).

3.13.2.6 ALTERNATIVE 3

3.13.2.6.1 ELECTRIC AND MAGNETIC FIELDS

Under Alternative 3, the general nature of the potential exposure to EMF that could affect public health and safety would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives). Table 3.13-8 lists the number of residences, hospitals/nursing homes, daycares, and schools within the ROW, or not within the ROW but within the 300-foot analysis area. The potential exposure during the operations phase would be minor and long term for any residences or other occupied buildings within the, and negligible for any residences or other occupied buildings at the edge of the ROW and beyond. The potential exposure to EMF forworkers during the operations phase would be minor and periodic because of the intermittent nature of maintenance activities.

Table 3.13-8. Numbers of Residences, Hospitals/Nursing Homes, Daycares, and Schools within the ROW or within the 300-foot Analysis Area under Alternative 3

Alternative	Residences (homes/apartments)		Hospitals/Nursing Homes		Daycares		Schools	
	Within ROW	Outside ROW but within 300-foot analysis area	Within ROW	Outside ROW but within 300-foot analysis area	Within ROW	Outside ROW but within 300-foot analysis area	Within ROW	Outside ROW but within 300-foot analysis area
Alternative 3	3	34	0	0	0	1	1	1

3.13.2.6.2 RISK OF FIRE

Under Alternative 3, the potential risk of fire during construction, operations, and maintenance would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives).

3.13.2.6.3 WORKER SAFETY

Under Alternative 3, the potential impacts to worker safety during construction, operations, and maintenance would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives).

3.13.2.6.4 SOLID, HAZARDOUSM AND TOXIC MATERIALS AND WASTE

Under Alternative 3, the potential impacts to public health and safety from the spill, release, or disposal of solid, hazardous, or toxic materials and waste during construction, operations, and maintenance would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives).

3.13.2.7 ALTERNATIVE 4

3.13.2.7.1 ELECTRIC AND MAGNETIC FIELDS

Under Alternative 4, the general nature of the potential exposure to EMF that could affect public health and safety would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives). Table 3.13-9 lists the number of residences, hospitals/nursing homes, daycares, and schools within the ROW, or not within the ROW but within the 300-foot analysis area. The potential exposure during the operations phase would be minor and long term for any residences or other occupied buildings within the ROW, and negligible for any residences or other occupied buildings at the edge of the ROW and beyond. The potential exposure to EMF for workers during the operations phase would be minor and periodic because of the intermittent nature of maintenance activities.

Table 3.13-9. Numbers of Residences, Hospitals/Nursing Homes, Daycares, and Schools within the ROW or within the 300-foot Analysis Area under Alternative 4

Alternative	Residences (homes/apartments)		Hospitals/Nursing Homes		Daycares		Schools	
	Within ROW	Outside ROW but within 300-foot analysis area	Within ROW	Outside ROW but within 300-foot analysis area	Within ROW	Outside ROW but within 300-foot analysis area	Within ROW	Outside ROW but within 300-foot analysis area
Alternative 4	9	52	0	0	0	1	1	1

3.13.2.7.2 RISK OF FIRE

Under Alternative 4, the potential risk of fire during construction, operations, and maintenance would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives).

3.13.2.7.3 WORKER SAFETY

Under Alternative 4, the potential impacts to worker safety during construction, operations, and maintenance would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives).

3.13.2.7.4 SOLID, HAZADOUS, AND TOXIC MATERIALS AND WASTE

Under Alternative 4, the potential impacts to public health and safety from the spill, release, or disposal of solid, hazardous, or toxic materials and waste during construction, operations, and maintenance would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives).

3.13.2.8 ALTERNATIVE 5

3.13.2.8.1 ELECTRIC AND MAGNETIC FIELDS

Under Alternative 5, the general nature of the potential exposure to EMF that could affect public health and safety resulting from EMFs would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives). Table 3.13-10 lists the number of residences, hospitals/nursing homes, daycares, and schools within the ROW, or not within the ROW but within the 300-foot analysis area. The potential exposure during the operations phase would be minor and long term for any residences or other occupied buildings within the ROW, and negligible for any residences or other occupied buildings at the ROW's edge and beyond. The potential exposure to EMF for workers during the operations phase would be minor and periodic because of the intermittent nature of maintenance activities.

Table 3.13-10. Numbers of Residences, Hospitals/Nursing Homes, Daycares, and Schools within the ROW or within the 300-foot Analysis Area under Alternative 5

Alternative	Residences (homes/apartments)		Hospitals/Nursing Homes		Daycares		Schools	
	Within ROW	Outside ROW but within 300-foot analysis area	Within ROW	Outside ROW but within 300-foot analysis area	Within ROW	Outside ROW but within 300-foot analysis area	Within ROW	Outside ROW but within 300-foot analysis area
Alternative 5	2	53	0	0	0	0	0	0

3.13.2.8.2 RISK OF FIRE

Under Alternative 5, the potential risk of fire during construction, operations, and maintenance would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives).

3.13.2.8.3 WORKER SAFETY

Under Alternative 5, the potential impacts to worker safety during construction, operations, and maintenance would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives).

3.13.2.8.4 SOLID, HAZARDOUS, AND TOXIC MATERIALS AND WASTE

Under Alternative 5, the potential impacts to public health and safety from the spill, release, or disposal of solid, hazardous, or toxic materials and waste during construction, operations, and maintenance would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives).

3.13.2.9 ALTERNATIVE 6

3.13.2.9.1 ELECTRIC AND MAGNETIC FIELDS

Under Alternative 6, the general nature of the potential exposure to EMF that could affect public health and safety resulting from EMFs would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives). Table 3.13-11 lists the number of residences, hospitals/nursing homes, daycares, and schools within the ROW, or not within the ROW but within the 300-foot analysis area. The potential exposure during the operations phase would be minor and long term for any residences or other occupied buildings within the ROW, and negligible for any residences or other occupied buildings at the edge of the ROW and beyond. The potential exposure to EMF for workers during the operations phase would be minor and periodic because of the intermittent nature of maintenance activities.

Table 3.13-11. Numbers of Residences, Hospitals/Nursing Homes, Daycares, and Schools within the ROW or within the 300-foot Analysis Area under Alternative 6

Alternative	Residences (homes/apartments)		Hospitals/Nursing Homes		Daycares		Schools	
	Within ROW	Outside ROW but within 300-foot analysis area	Within ROW	Outside ROW but within 300-foot analysis area	Within ROW	Outside ROW but within 300-foot analysis area	Within ROW	Outside ROW but within 300-foot analysis area
Alternative 6	8	39	0	0	0	0	0	0

3.13.2.9.2 RISK OF FIRE

Under Alternative 6, the potential risk of fire during construction, operations, and maintenance would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives).

3.13.2.9.3 WORKER SAFETY

Under Alternative 6, the potential impacts to worker safety during construction, operations, and maintenance would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives).

3.13.2.9.4 SOLID, HAZARDOUS, AND TOXIC MATERIALS AND WASTE

Under Alternative 6, the potential impacts to public health and safety from the spill, release, or disposal of solid, hazardous, or toxic materials and waste during construction, operations, and maintenance would be the same as those discussed in Section 3.13.2.3 (Impacts Common to All Action Alternatives).

3.13.3 *Summary of Impacts*

Table 3.13-12 includes a summary of impacts for each action alternative.

Table 3.13-12. Impact Summary Table

	EMF	Risk of Fire	Worker Safety	Solid, Hazardous, and Toxic Materials and Waste
Alternative 1	Potential exposure to EMF that could affect public health and safety would be minor and long term for occupied buildings within the ROW and negligible for occupied buildings at the ROW's edge and beyond. Alternative 1 would include 2 residences within the ROW and 19 residences outside the ROW but within 300-foot analysis area. Because the line would not be in operation yet, there would be no potential for exposure to workers during the construction phase. Potential exposure to workers during the operations and maintenance phase would be minor and periodic because of the intermittent nature of the exposure.	BMPs and environmental commitments would reduce the potential for fires from construction, operations, and maintenance activities and potential impacts to public and worker health and safety would be minor and long term.	Construction of the proposed transmission line and associated facilities would not be expected to generate injury or fatality rates that are higher than industry averages. Therefore, potential impacts to worker safety during construction, operations, and maintenance activities would be minor and long term.	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 potential for public and worker health and safety impacts from spills, releases, or disposal of these materials would be minor and long term.

	EMF	Risk of Fire	Worker Safety	Solid, Hazardous, and Toxic Materials and Waste
Alternative 2	Same as Alternative 1 but including 2 residences and 1 school within the ROW; and 26 residences, 1 daycare, and 1 school outside the ROW but within 300-foot analysis area.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
Alternative 3	Same as Alternative 1 but including 3 residences and 1 school within the ROW; and 34 residences, 1 daycare, and 1 school outside the ROW but within 300-foot analysis area.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
Alternative 4	Same as Alternative 1 but including 9 residences and 1 school within the ROW; and 52 residences, 1 daycare, and 1 school outside the ROW but within 300-foot analysis area.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
Alternative 5	Same as Alternative 1 but including 2 residences within the ROW and 53 residences outside the ROW but within 300-foot analysis area.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.
Alternative 6	Same as Alternative 1 but including 8 residences within the ROW and 39 residences outside the ROW but within 300-foot analysis area.	Same as Alternative 1.	Same as Alternative 1.	Same as Alternative 1.

3.14 Upper Mississippi River National Wildlife and Fish Refuge

3.14.1 *Affected Environment*

The Refuge was established by an Act of Congress on June 7, 1924, as a refuge and breeding place for migratory birds, fish, other wildlife, and plants. The Refuge is managed and administered as part of the NWRS and encompasses one of the largest blocks of floodplain habitat in the continental United States. Bordered by steep wooded bluffs that rise 100 to 600 feet above the river valley, the Mississippi River corridor and Refuge offer scenic beauty, a wild character, and productive fish and wildlife habitat unmatched in mid-America. The Refuge covers 240,220 acres and extends 261 river-miles from north to south at the confluence of the Chippewa River in Wisconsin to near Rock Island, Illinois.

The Refuge is administered by the USFWS. Although the USFWS shares this responsibility with other Federal, state, tribal, local, and private entities, the USFWS has specific trust responsibilities for migratory birds, threatened and endangered species, certain interjurisdictional fish and marine mammals, and the NWRS.

No use for which the USFWS has authority to regulate may be allowed on a unit of the NWRS unless it is determined by USFWS to be compatible. A compatible use is a use that, in the sound professional judgment of the Refuge manager, will not materially interfere with or detract from the fulfillment of the NWRS mission or the purposes of the Refuge. USFWS managers must complete a written compatibility determination for proposed use in the NWRS. Therefore, the proposed C-HC Project would be subject to a USFWS compatibility determination (USFWS 2006a).

The USACE, Department of the Army, has played an active role in the physical and environmental changes on the Mississippi River, and thus the Refuge, for more than 100 years. Cooperative agreements between USFWS and USACE, with some limitations, grant to the USFWS the rights to manage fish and wildlife and its habitat on those lands acquired by the USACE. These lands are managed by the USFWS as a part of the Refuge and the NWRS. The USACE retained the rights to manage, as needed, for the navigation project, forestry, and USACE-managed recreation areas, and all other rights not specifically granted to the USFWS (USFWS 2006a).

As described in the Refuge's Comprehensive Conservation Plan (USFWS 2006a), the Refuge is an invaluable natural legacy in a complex geopolitical landscape:

- A national scenic treasure—river, backwaters, islands, and forest framed by 500-foot high bluffs
- Interface with four states, 70 communities, and two USACE districts
- A series of 11 navigation locks and dams within overall boundary
- Represented by eight U.S. Senators and six U.S. Representatives
- National Scenic Byways, designated by the U.S. Secretary of Transportation, on both sides
- 3.7 million annual visits, the most of any national wildlife refuge
- Diverse wildlife: 306 species of birds, 119 species of fish, 51 species of mammals, and 42 species of mussels
- Designated a Globally Important Bird Area by the American Bird Conservancy in 1997
- Up to 40% of the North American continent's waterfowl use the river flyway during migration
- Up to 50% of the world's canvasback ducks stop in the Refuge during fall migration
- Up to 20% of the eastern United States population of tundra swans stop in the Refuge during fall migration
- 167 active bald eagle nests have been identified in the Refuge in recent years
- A peak of 2,700 bald eagles stop in the Refuge during spring migration
- Approximately 5,000 heron and egret nests in up to 15 colonies

The Refuge is divided into four districts for management, administrative, and public service effectiveness and efficiency. The Refuge is further divided geographically by river pools that correspond with the navigation pools created by the series of locks and dams on the Upper Mississippi River. The district office in Prairie Du Chien, Wisconsin, manages Pool 11, which is where the C-HC Project would cross the Mississippi River. The area of river between two dams is called a "pool," each numbered according to the dam that creates it. Pools are river-like in nature, having various flow velocities extending laterally from the navigation channel to the backwaters.

3.14.1.1 RESOURCES WITHIN THE REFUGE

The C-HC Project would cross Pool 11, in the McGregor District. Pool 11 is approximately 31 river miles long. The pool is bounded by Lock and Dam 10 (upstream) and Lock and Dam 11 (downstream). In the vicinity of the C-HC Project, between river-miles 606 and 608, the community of Cassville, Wisconsin serves as an access point to the Mississippi River, and the community sits directly across from refuge lands in Iowa (Figure 3.14-1).

The following discussion summarizes the primary resources that occur within the Refuge between river miles 606 and 608, referred to as the resource evaluation area. This discussion is informed by the detailed resource topics presented elsewhere in this Chapter 3.

3.14.1.1.1 GEOLOGY AND SOILS

The Refuge lies within the Mississippi River floodplain, an ancient river valley filled with alluvial material (mud, sand, and gravel) carried and deposited by surface water. The river and its tributaries traverse sedimentary rock formations (dolomite, sandstone, and shale) that accumulated under inland seas during the early Paleozoic Era about 400 to 600 million years ago (USFWS 2006a).

Bedrock in the resource evaluation area (Witzke et al. 2010a, 2010b) is mostly buried beneath deep alluvial deposits in the Mississippi River valley bottomlands. Along the valley walls and on the bluff tops, bedrock is partly buried in residual soils or remnants of glacial till, which is itself capped by a thin layer of loess.

As discussed in Section 3.2, sensitive soils can be rated based on a capability classification system, which has eight classes and four subclasses (USDA 1962, 1966, 1978, 1982, 1985). For the Refuge resource evaluation area, soils meeting the capability class of 3 or greater may be a concern for the following reasons (USDA 1962, 1966, 1978, 1982, 1985):

Erosion (e): While the silt loam soils that dominate the analysis area are ideal for agricultural production, they are also prone to higher rates of erosion. Silt loam soils are typically the most erodible of all soils. The soil particles are easily detached; tend to crust and produce high rates of runoff. The K values (the soil erodibility factor which represents both susceptibility of soil to erosion and the rate of runoff) for these soils tend to be greater than 0.4. Therefore, the primary management concern for soils in the analysis area is erosion. Approximately 30% of the soils in the analysis area have an erosion capability classification greater than 3.

Wetness (w): Wet soils typically have poor drainage. These soils often either reflect compacted soil conditions that restrict drainage, or they are hydric soils resulting from a high or perched water table that can then be classified as wetland. Wet soils are a concern in that they are also easily damaged may be difficult to repair. Approximately 60% of the soils in the analysis area have a wet capability classification of 3 or greater. Many of these soils are associated with wetlands and are considered hydric soils.

Shallow (s): Shallow soils have limitations from the limited rooting depth they provide plants. None of the soils in the analysis area have a shallow classification of 3 or greater.

As discussed in Section 3.3 Vegetation, two algific talus slope sites have been recorded within the resource evaluation area within the Refuge. The Mississippi River floodplain is present where the two algific talus slope recorded sites are said to occur. At both locations, the relatively level floodplain of the Mississippi River consists of an emergent wetland dominated by reed canary grass with scattered black willow and eastern cottonwood trees. These areas are affected by the Mississippi River water level and are seasonally flooded (RUS 2018).

See Section 3.2 for more information about geology and soils that may be present within the C-HC Project, both within and outside the Refuge.

3.14.1.1.2 VEGETATION

Much of the resource evaluation area within the Refuge consists of non-forested wetlands, with some patches of forested wetlands. In 2010, the Refuge was designated as a Wetland of International Importance in accordance with the 1971 Ramsar Convention, which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources (Ramsar Sites Information Service 2010). Vegetation within the resource evaluation area within the Refuge consists of reed canary grass, swamp milkweed, beggartick (*Bidens laevis*), barnyard grass (*Echinochloa crus-galli*), smartweeds (*Polygonaceae spp.),* and dense thickets of willows and cottonwoods, as well as a variety of other tree species.

The USFWS has aggressively pursued reforestation of much of the Turkey River floodplain, including where proposed Segment B-IA1 or B-IA2 would cross the Refuge (see Figure 3.14-1). Reforestation efforts have involved planting of a variety of bottomland hardwood species, including swamp white oak (*Quercus bicolor*), hackberry (*Celtis occidentalis*), black walnut (*Juglans nigra*), river birch (*Betula nigra*), and disease-resistant American elm (*Ulmus americana*). Currently, the vegetation in this area could best be characterized as young forest, as most of the trees present are less than 15 years old. Natural succession of forest species such as willows and dogwoods is also occurring in the Turkey River floodplain. Reforestation efforts, working in concert with natural forest regeneration and succession, would result in much of the Turkey River floodplains' growing into bottomland forest within 100 years (Yager 2018a).

See Section 3.3 for more information about vegetation that may be present within the analysis area both within and outside the Refuge.

3.14.1.1.3 WILDLIFE

The Refuge is home to unique habitat types that support a variety of wildlife species, including many of those described above. There are 51 mammal species known to occupy the Refuge, including many described in Section 3.4. Mammal species that are more common within the Refuge than the rest of the analysis are species typically dependent on wetland and open water habitat such as: muskrat, mink, beaver, and river otters (USFWS 2006a).

Owing to its location in the heart of the Mississippi Flyway, many species of bird migrate through or occupy habitat within the Refuge. This includes species dependent on wetland and open water habitat such as the wood duck, mallard, blue-winged teal, American wigeon, gadwall, northern pintail, green-winged teal, canvasback, lesser scaup, common goldeneye, ringed-necked duck, bufflehead, ruddy duck, merganser, belted kingfisher, Canada goose, and Tundra swan (USFWS 2006a).

Wetland and open water dependent colonial nesters common to the Refuge include black tern, great blue herons, double-crested cormorants, great egrets, and green herons (USFWS 2006a).

More than 160 species of songbird have been documented within the Refuge. Species that rely on forested areas and grasslands that are commonly found nesting within the Refuge include the American robin, downy woodpecker, great-crested flycatcher, prothonotary warbler, tree swallow, yellow-headed blackbird, northern cardinal, and the brown creeper (USFWS 2006a). Neo-tropical migrants are of particular interest to the Refuge, as many of these birds rely upon the ribbon of unbroken forest that stretches from north to south for approximately 260 miles. The USFWS has identified and is implementing reforestation efforts on the floodplain of the Turkey River to reduce fragmentation of the forest community, thus improving conditions for migrating songbirds. Young forests, such as the one being regenerated on the Turkey River floodplain, are a missing habitat type throughout much of the Driftless Area and provide critical habitat for a variety of bird and wildlife species that favor this habitat type (Yager 2018a).

The Refuge also supports nesting pairs of red-shouldered hawks (common to forested areas) and osprey (who nest near and hunt in the Mississippi River and other large bodies of water), among other raptors that migrate through (USFWS 2006a). More than 300 bald eagle nests have been recorded within the

Refuge. Two eagle nests have been identified between the two proposed Mississippi River crossings; however, neither of the nests has been active in recent years.

Eleven species of turtle occupy the Refuge, using habitats that range from quiet backwaters (e.g., Blanding's, painted, snapping, and common map turtles) to the faster flowing waters of the larger channels (e.g., smooth and spiny softshells, Ouachita and false map turtles). There are nine species of frog and one toad species known from the Refuge. Bullfrogs, chorus frogs, and spring peepers are commonly found in and near wetland and open water habitat (USFWS 2006a).

One-hundred nineteen fish species are known to use the Refuge. These include common sport fish such as walleye, sauger, white bass, large and smallmouth bass, channel catfish, northern pike, bluegill, and crappies, as well as non-sport fish such as sturgeon and paddlefish. There are 39 species of mussel considered present within the Refuge, with pink papershell and giant floater commonly observed species (USFWS 2006a).

See Section 3.4 for more information about wildlife, including special status species, that may be present within the C-HC Project both within and outside the Refuge.

3.14.1.1.4 WATER RESOURCES

Within the resource evaluation area, the Refuge is drained by a dendritic pattern of first- and second-order intermittent streams that flow into the third-order permanent streams including Bluebell Creek. These streams both drain into the Turkey River. The Turkey River flows eastward into the Mississippi River, which flows northwest-to-southeast in this area. The confluence of Turkey River and Mississippi River is approximately 0.5 mile just west of the closest alternative identified for C-HC Project to cross the Mississippi River. This area also includes a series of shallow swales that extend southeast from the alluvial fan and appear to be old Mississippi River channels (or overflow channels) that have become partially silted-in (Kullen 2017, 2018).

3.14.1.1.5 CULTURAL RESOURCES

No previously recorded archaeological sites are reported on Refuge lands in the vicinity of the C-HC Project (Kullen 2017, 2018). The cultural resources survey completed July 24–26 and August 28–September 1, 2017, and in July through August 2018, surveyed the proposed locations of the transmission line structures along the two alternate transmission line routes. Shovel tests and combination shovel test/hand auger cores were excavated. No evidence for archaeological sites or for buried topsoil horizons that might represent potential former living surfaces were encountered during the survey (Kullen 2017, 2018).

See Section 3.9 for more information about cultural and historic resources that may be present within the C-HC Project outside the Refuge.

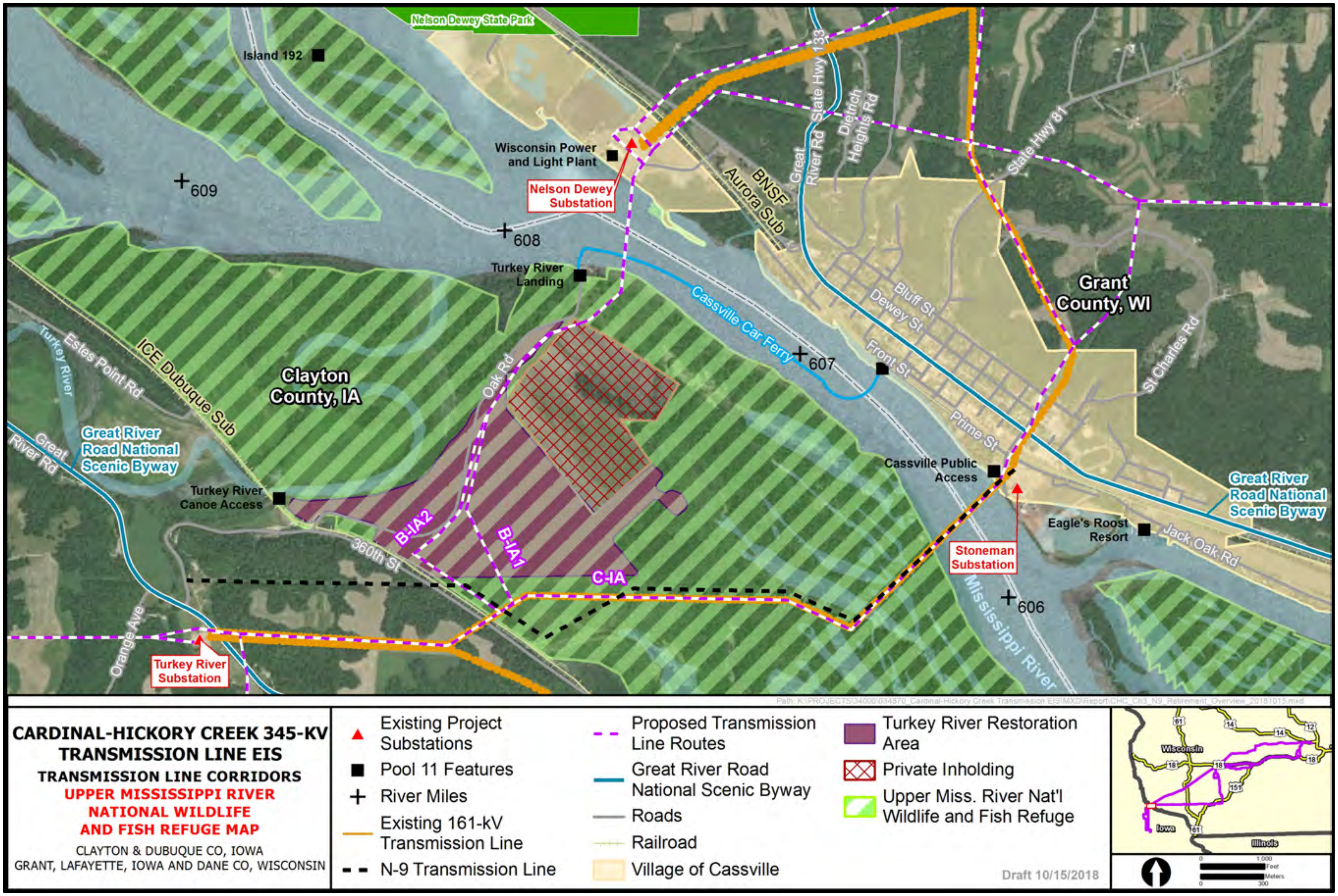

Figure 3.14-1. C-HC Project vicinity with the Upper Mississippi River National Wildlife and Fish Refuge.

3.14.1.1.6 LAND USE

Land use in the Refuge resource evaluation area has been primarily agricultural for the last 170 years. Since the Refuge was established, much of the land has gone out of cultivation. While vegetation is actively managed in some parts of the Refuge, including the Turkey River bottoms, in the resource evaluation area, the vegetation communities represent those species that have grown in long fallow farm fields. Early successional forest species, including cottonwood and willow, are present, in addition to tree species that have been planted by the USFWS, such as swamp white oak, hackberry, black walnut, river birch, and disease-resistant American elm. There is a private inholding within this portion of the Refuge, which is used for agricultural production when conditions allow. The inholding is in the floodplains of both the Mississippi River and Turkey River and is subject to flooding on a regular basis (Yager 2018b).

There are human disturbances within this portion of the Refuge as well as directly across the Mississippi River near Cassville, Wisconsin. Oak Road is the unpaved access road within the Refuge used to connect Iowa County road C9Y (the Great River Road) with the Cassville Car Ferry landing on the Iowa bank of the Mississippi River. The Cassville Car Ferry operates seasonally with daily service between Memorial Day and Labor Day and limited weekend service in May, September, and October (Cassville Tourism 2016).

Directly across the river from the Turkey River landing is the Nelson Dewey Substation, which sits adjacent to the demolished Nelson Dewey generation facility.

There is also an existing electric transmission line that crosses the Refuge and Mississippi River to connect with the Stoneman Substation, which is immediately adjacent to the unused Stoneman generation facility in Cassville. Woody vegetation has been suppressed within the existing transmission line ROW, and a barely visible dirt track runs between the support structures.

Recreational uses within the Refuge include hunting, fishing, wildlife observation and photography, interpretation and environmental education, recreational boating, camping, and other shoreline uses. The Cassville car ferry landing is also used as a river access point, named the Turkey River landing. Other nearby river access points include Cassville Public Access launch and the Wisconsin Power and Light launch on the Wisconsin side of the Mississippi River. The public park in Cassville also serves as a Refuge overlook. Commercial navigation passes through the Refuge.

See Section 3.10 for more information about land uses that may be present within the C-HC Project both within and outside the Refuge.

3.14.1.1.7 VISUAL QUALITY AND AESTHETICS

The viewshed within the Refuge from the position of a human observer standing in the Refuge, looking west to Wisconsin, can be characterized as having native vegetation in the foreground and middle ground, with some human disturbances, such as Oak Road and the existing transmission line in the middle ground, and the Village of Cassville and the demolished Nelson Dewey generation plant site in the background. Due to the sensitivity of the Refuge's viewshed, RUS and USFWS completed extensive visual resource analysis from multiple observation points within and outside the Refuge. Section 3.11 provides the detailed discussion of the visual resource analysis conducted for the Refuge.

3.14.2 *Environmental Consequences*

This section describes impacts to resources within the Refuge associated with construction, operation, and maintenance of the C-HC Project. Impacts to the Refuge are presented for geology and soils, vegetation, wildlife, water resources, cultural resources, land use, and visual quality and aesthetics. These resource topics are also discussed in standalone sections of Chapter 3, as follows:

- Geology and soils: Section 3.2
- Vegetation: Section 3.3
- Wildlife: Section 3.4
- Water resources: Section 3.5
- Cultural resources: Section 3.9
- Land use: Section 3.10
- Visual quality and aesthetics: Section 3.11

3.14.2.1 DATA SOURCES, METHODS, AND ANALYSIS ASSUMPTIONS

Table 3.14-1 summarizes the impact indicators that were considered when analyzing potential impacts to resources within the Refuge.

Table 3.14-1. Impact Indicators for Refuge Resources

Resource	Impact Indicator

Geology and Soils	• Acres of surface disturbance
	  o Temporary – construction activities
	  o Permanent – structure locations
	• Acres of disturbance to sensitive soils
	• Acres of disturbance to steep slopes

Vegetation	• Acres, both permanent and temporary, of disturbance resulting from construction and maintenance activities
Wildlife, Including Special Status Species	• Acres of habitat to be modified/removed by construction and maintenance activities • For non-listed species, a qualitative description of potential direct and indirect impacts to individuals
Water Resources	• Number of potential jurisdictional waterways to be crossed by the C-HC Project. Provides a measure of potential direct and indirect impact to surface waters. • Acres of disturbance within potential jurisdictional drainages • Potential changes in surface water contaminants of concern, including increases in sediment from erosion, compared with applicable state surface water standards and concentrations of groundwater contaminants of concern compared to applicable state groundwater standards. • Potential impacts to floodplains measured as expected changes in surface flow capacities, velocities, and stages due to temporary or permanent disturbances; and expected changes in downstream channel morphology.
Cultural and Historic Resources	• Number of NRHP-eligible cultural resources/historic properties (historic and prehistoric) to be directly or indirectly affected and acres to be disturbed at each historic property. • Qualitative descriptions of changes in skylines or other visual settings in relation to cultural sites.
Land Use	• Acres of disturbance, by land cover class

Resource	Impact Indicator
Geology and Soils	• Acres of surface disturbance o Temporary – construction activities o Permanent – structure locations • Acres of disturbance to sensitive soils • Acres of disturbance to steep slopes
Vegetation	• Acres, both permanent and temporary, of disturbance resulting from construction and maintenance activities
Wildlife, Including Special Status Species	• Acres of habitat to be modified/removed by construction and maintenance activities • For non-listed species, a qualitative description of potential direct and indirect impacts to individuals
Water Resources	• Number of potential jurisdictional waterways to be crossed by the C-HC Project. Provides a measure of potential direct and indirect impact to surface waters. • Acres of disturbance within potential jurisdictional drainages • Potential changes in surface water contaminants of concern, including increases in sediment from erosion, compared with applicable state surface water standards and concentrations of groundwater contaminants of concern compared to applicable state groundwater standards. • Potential impacts to floodplains measured as expected changes in surface flow capacities, velocities, and stages due to temporary or permanent disturbances; and expected changes in downstream channel morphology.
Cultural and Historic Resources	• Number of NRHP-eligible cultural resources/historic properties (historic and prehistoric) to be directly or indirectly affected and acres to be disturbed at each historic property. • Qualitative descriptions of changes in skylines or other visual settings in relation to cultural sites.
Visual Resources	• Visual simulations from KOPs within and looking into the Refuge

The following field investigations have occurred in the Refuge for the C-HC Project and are used to inform impact analysis presented below:

- The Utilities completed wetland delineations from May through July 2017, and in July through August 2018, using methods outlined in the U.S. Army Corps of Engineers Wetland Delineation Manual (USACE 1987) and the Midwest Region and Northcentral and Northeast Region Supplements (USACE 2010, 2012).

- An archaeological survey of the portion of the action alternatives within the Upper Mississippi River National Wildlife and Fish Refuge was conducted by Burns and McDonnell (Kullen 2017, 2018). The cultural resources survey completed July 24–26 and August 28–September 1, 2017, and in July through August 2018. No evidence for archaeological sites or for buried topsoil horizons that might represent potential former living surfaces were encountered during the survey (Kullen 2017, 2018).

- The Utilities collected photographs from several locations within the Refuge and in Cassville, Wisconsin looking across the Mississippi River into the Refuge. These photographs were used to create the photo simulations presented in Section 3.11 and summarized below.

The same methods for calculating and assessing impacts to resources across the C-HC Project area were used to assess impacts to resources within the Refuge. For a detailed description of methods and assumptions for the resources analyzed within the Refuge, refer to those corresponding sections of Chapter 3.

The following sections provide an effects evaluation by alternative based on the above impact indicators. An overall classification (minor, moderate, major) of impacts is assigned to each alternative. Definitions of the impact threshold for each classification are provided in Table 3.14-2 below.

Table 3.14-2. Impact Thresholds and Descriptions for Resources within the Refuge

	Minor Impact	Moderate Impact	Major Impact
Geology and Soils	Disturbances to geology or soils from construction and operation would be detectable but localized and discountable. Erosion and/or compaction would occur from construction and operation in localized areas and be quickly repaired.	Disturbances would occur over a relatively wide area from construction and operation of the C-HC Project or with sufficient impairment in localized areas that could result in wider areas if not repaired. Impacts to geology or soils would be readily apparent and result in short-term changes to the soil character or local geologic characteristics. Erosion and compaction impacts would occur over a wide area.	Disturbances would occur over a large area from construction and operation of the C-HC Project. Impacts to geology or soils would be readily apparent and would result in short- and long-term changes to the characteristics of the geology or soils over a large area, both in and out of the project boundaries or within limited areas of sensitive environments that would affect vegetation, wildlife, and geological processes. Erosion and compaction would occur over a large area.
Vegetation, Including Wetlands and Special Status Plants	Impacts on native vegetation would be detectable but discountable and would not alter natural conditions measurably. Infrequent disturbances to individual plants could be expected, but without affecting local or range-wide population stability. Infrequent or insignificant one-time disturbances to local populations could occur, but sufficient habitat would remain functional at both the local and regional scales to maintain the viability of the species. Opportunities for the increased spread of noxious weeds would be detectable but discountable. There would be some minor potential for an increased spread of noxious weeds.	Impacts on native vegetation would be detectable and/or measurable. Occasional disturbances to individual plants could be expected. These disturbances could affect local populations negatively but would not be expected to affect regional population stability. Some impacts might occur in key habitats, but sufficient local habitat would remain functional to maintain the viability of the species both locally and throughout its range. Opportunities for increased spread of noxious weeds would be detectable and/or measurable. There would be some moderate potential for the increased spread of noxious weeds.	Impacts on native vegetation would be measurable and extensive. Frequent disturbances of individual plants would be expected, with negative impacts to both local and regional population levels. These disturbances could negatively affect local populations and could affect range-wide population stability. Some impacts might occur in key habitats, and habitat impacts could negatively affect the viability of the species both locally and throughout its range. Opportunities for the increased spread of noxious weeds would be measurable and extensive. There would be a major potential for the increased spread of noxious weeds.
Wildlife, Including Special Status Species	Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, but discountable and would not measurably alter natural conditions. Infrequent responses to disturbances by some individuals could be expected, but without interference to feeding, breeding, sheltering, or other factors affecting population levels. Small changes to local population numbers, population structure, and other demographic factors could occur. Sufficient habitat would remain functional at both the local and range-wide scales to maintain the viability of the species.	Impacts on native species, their habitats, or the natural processes sustaining them would be detectable and/or measurable. Occasional responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, resting, migrating, or other factors affecting local population levels. Sufficient population numbers or habitat would retain function to maintain the viability of the species both locally and throughout its range.	Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and would be extensive. Frequent responses to disturbances by some individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a decrease in both local and range-wide population levels and habitat type. Impacts would occur during critical periods of reproduction and would result in mortality of individuals or loss of habitat that might affect the viability of a species. Local population numbers, population structure, and other demographic factors might experience large changes or declines.
Water Resources	The effect on surface waters would be measurable or perceptible, but small and localized. The effect would not alter the physical or chemical characteristics of the surface water or aquatic influence zone resource.	The effect on surface waters would be measurable or perceptible and could alter the physical or chemical characteristics of the surface water resources in a localized area, but not to large areas. The functions typically provided by the surface water or aquatic influence zone would not be substantially altered.	The impact would cause a measurable effect on surface waters and would modify physical or chemical characteristics of the groundwater or surface waters. The impacts would be substantial and highly noticeable. The character of the surface water or aquatic influence zone would be changed so that the functions typically provided by the surface water or aquatic influence zone would be substantially altered.

	Minor Impact	Moderate Impact	Major Impact
Cultural and Historical Resources	Impacts would occur, but cultural resources would retain existing characteristics that make them eligible for the NRHP.	Impacts and alterations would occur, but overall, cultural resources would partially retain characteristics that make them eligible for the NRHP or impacts would alter the characteristics that make them eligible for the NRHP.	Impacts would occur, that overall, would substantially alter or destroy characteristics of cultural resources that make them eligible for the NRHP.
Land Use, Including Agriculture and Recreation	Other than at the footprint of project features (e.g., transmission structures, substations, access roads), previous land uses would continue without interruption. Existing land uses such as agriculture, grazing, and special use areas might experience temporary construction-related disturbances and intermittent, infrequent interruptions from operation and maintenance. There would be no conflicts with local zoning. For recreation, the same site capacity and visitor experience would remain unchanged after construction.	Previous land uses (e.g., agriculture, grazing, and special use areas) would be diminished or required to change on a portion of the project area, to be compatible with the C-HC Project. Only a few parcels within the project area would require zoning changes to be consistent with local plans. Some parcels within the project area (e.g., transmission ROW, substation, access roads) might require a change in land ownership through purchases or condemnation. For recreation, the visitor experience would be slightly changed but would still be available.	More than 25% of the project area (e.g., transmission ROW, substations, access roads) would require a change in land ownership through purchases or condemnation. All land use (e.g., agriculture, grazing, and special use areas) on these parcels would be discontinued. Most parcels of land within the project area would require zoning changes to be consistent with local plans. For recreation, visitors would be displaced to facilities at other regional or local locations and the visitor experience would no longer be available at this location.
Visual Quality and Aesthetics	Proposed changes could attract attention but would not dominate the view or detract from current user activities.	Proposed changes would attract attention and contribute to the landscape, but would not dominate the landscape. User activities would remain unaffected.	Changes to the characteristic landscape would be considered significant when those changes dominate the landscape and detract from current user activities.

3.14.2.2 NO ACTION

Under the No Action Alternative, the proposed Project would not be built. Therefore, the existing transmission line ROW within the Refuge would remain. No new impacts to resources within the Refuge would occur. The USFWS would continue to pursue reforestation on the Turkey River floodplain through a combination of forest planting and natural forest succession.

3.14.2.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

3.14.2.3.1 GEOLOGY AND SOILS

Clearing of vegetation as well as grading would disturb topsoil, which would result in newly exposed, disturbed soils that could be subject to accelerated soil erosion by wind and water. Access roads and use of heavy equipment in the ROW would cause soil compaction. Impacts to soils could range from short-term to long-term depending on the amount of ground disturbance at a particular location. Some areas may be able to revegetate quickly, and impacts to soils would be short-term. In areas with more intense equipment use and construction activities, soil compaction and erosion could have longer impacts. Any soil removal associated with the development of the structure foundations would be permanent.

Use of construction equipment in wet soils could result in greater compaction and rutting, affecting the wetland hydrology and connection to groundwater as well as affecting wetland plant growth. Compaction to soil impairs the ability for water to infiltrate and percolate into the soil while also reducing the ability for plant roots to grow. Impacts to wet soils would likely be localized to the relatively small areas in which they occur. The use of timber matting and temporary bridges over wet areas and streams would help minimize impacts to wet soils.

The potential for erosion is likely with disturbance of any soil in the analysis area, including resulting from other soil sensitivities such as wet soils. Erosion potential is less in well-vegetated areas, but in cultivated soils and on slopes, the potential for erosion is greatly increased. Erosion, if and where it occurs, also may migrate beyond the area of immediate impact and could impair wide areas, damaging not only soils beyond the analysis area, but other environmental resources. The Utilities would develop an erosion control plan that provides detailed information and response actions that would be necessary to prevent and minimize erosion within the C-HC Project area.

Indirect impacts to soils would include loss of soil structure and stability, loss of plant productivity or health due to reduction in nutrient availability, a reduction in oxygen in the soil reducing plant function, and increased stormwater runoff emanating from compacted soils. The potential for soil erosion increases not only in the affected area, but erosion could increase in area as rills and gullies are formed and stormwater runoff is channelized across broad areas of land. Expansive erosion will substantially reduce soil productivity and could result in extensive repairs necessary to restore soil condition for agricultural production and native habitat. Erosion will also ultimately impact water quality in streams with increased sediment loads.

The potential direct impacts to geology from construction include drilling, blasting, excavation, equipment movement/hauling, and other ground-disturbing activities during construction. Under all action alternatives, geologic resources would be impacted by the displacement of soil and rock during construction of structure foundations.

Borings for transmission line structure foundations would displace soil and rock. Some excavated soil and rock would be used for backfilling around structure foundations with excess material removed from the site to locations directed by landowner or disposed of at another location. The use of heavy duty vehicles and earth moving equipment required for structure foundations and structure placement would result in short-term moderate impacts on local surface geology (soils) as a result of compaction, rutting, and the potential for localized rill erosion near unimproved roadbeds and on sensitive landscapes.

3.14.2.3.2 VEGETATION

The primary direct and indirect impacts to vegetation during construction and operation and maintenance of the proposed Project associated with all action alternatives would be associated with:

- removal and/or crushing of natural, native species–dominated vegetation communities or associations;
- increased non-native, invasive plants;
- decreased plant productivity as a result of fugitive dust; and
- plant community fragmentation.

All action alternatives would involve the removal of vegetation during construction activities resulting in the direct loss of plant communities. Forest and shrub vegetation would be cleared within the ROW and in areas where access roads are required. Permanent impacts on vegetation would result from the conversion of forested cover to non-forest cover within the ROW, as well as from the loss of vegetation resulting from permanent conversion of undeveloped areas to develop areas around the transmission line structures. Any permanent impacts on vegetation through loss and/or conversion of vegetation communities would be mitigated through acquisition and restoration of similar habitats in locations acceptable to the Refuge.

Vegetation removal could affect vegetation communities by changing community structure and composition and altering soil moisture or nutrient regimes. The degree of impact depends on the type and amount of vegetation affected, and, for short-term impacts, the rate at which vegetation would regenerate following construction. These direct and indirect effects would reduce or change the functional qualities of vegetation, including as wildlife habitat.

Temporary impacts on vegetation would include the removal of non-forested vegetation that would be restored upon completion of construction. The degree of these impacts depends on the type and amount of vegetation affected, and the rate at which vegetation would regenerate following construction. Fugitive dust resulting from construction and maintenance traffic has the potential to affect photosynthetic rates and decrease plant productivity.

Potential impacts to wetlands from the C-HC Project would include fill activities from transmission line structure construction, tree clearing within the ROW, and construction of access roads and staging areas. Wetland fill activities due to the placement of transmission line structures within wetlands, and associated grading and construction activities, are considered permanent impacts resulting in wetland loss.

Forested wetlands crossed by the alternatives would require trees to be removed during construction and maintained in a non-forested state for the life of the C-HC Project. Tree clearing within forested wetlands would generally not be considered a wetland fill activity; however, conversion of a forested wetland to a non-forested wetland type (shrub/scrub or emergent) would be considered a permanent wetland impact as the wetland type and wetland function would be permanently altered.

Wetland impacts may result from temporary wetland crossings for construction equipment and/or materials along the proposed ROW and adjacent areas. Timber mats and other impact minimization techniques and BMPs would be used to prevent soil compaction and earth disturbance at temporary crossings. Wetlands temporarily impacted by construction access, staging areas, and access roads would be restored to original contours and reseeded with a site-appropriate mix of native wetland species.

Wetland areas both within the ROW and adjacent areas may be indirectly impacted by project construction, operation, and maintenance activities. These 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. Precautions would be implemented during construction and reclamation to prevent the introduction and spread of noxious weeds, such as revegetation of disturbed areas using certified seed and mulch that contains no viable noxious weed seeds, as well as the use of standard BMPs during construction and revegetation practices within disturbed areas as discussed in Section 3.1, Table 3.1-4.

Operation and maintenance activities are expected to result in moderate impacts to vegetation resources, primarily through the process of maintaining converted vegetation communities, as described above. These long-term impacts would be most evident in forested areas where the tranmsision line ROW would be maintained as a grassland vegetative community. Minimal vegetation management activities would be required to maintain the operating transmission line. Operation and maintenance activities would include vegetation trimming within the ROW, aerial inspections, ground inspections, and repairs. Vegetation trimming would result in the removal of limited, target vegetation, including non-native species. Aerial inspections would not affect vegetation. Ground inspections, where vehicles are confined to existing roadways, are unlikely to have any additional direct or indirect impacts on vegetation. Repairs to the transmission structures and conductors could have minor direct and indirect impacts on vegetation resources within areas disturbed by this activity. Impacts would be reduced by implementing BMPs.

Potential impacts to wetlands are assumed to be minimized by a number of environmental commitments as previously discussed in Section 3.1, Table 3.1-4. Any unavoidable impacts to wetlands, whether temporary or permanent, will be discussed with the USACE and USFWS prior to construction to determine the permitting requirements, mitigation, and conditions necessary for construction activities involving wetland impacts.

3.14.2.3.3 WILDLIFE

Potential construction-related impacts from the C-HC Project common to all wildlife groups would 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 construction-related impacts would be moderate and short-term.

Impacts associated with clearing the ROW would include habitat loss, fragmentation, and degradation; and changes to species movement. Fragmentation could result in a shift in species composition, especially in continuous blocks forest habitat, where forest-obligate species are likely to occur. Habitat generalists use a range of habitat types and therefore would be less impacted by habitat fragmentation. In contrast, species that have poor dispersal abilities that are area-sensitive, or that are forest-interior species can be intolerant of disturbance associated with clearing the ROW in forested areas. The shift in species composition can be a concern where rare, unique, or specialized species exist because they are more likely to be adversely impacted from fragmentation (Brittingham 2018). Although some wildlife species would be temporarily displaced during construction of the transmission line, permanent displacement of these species is not anticipated, except potentially in cleared forest areas that provide habitat for forest obligate species and in areas of permanent conversion to utility ROW. Forest habitat would be available in other areas near or adjacent to the ROW, with adjacent woodland areas still available along the route for refuge during construction and as habitat during project operation.

The presence of transmission structures would provide perches as well as nesting habitat for some species. This would allow some species to use areas that would otherwise be unsuitable. The increased amount of edge habitat created by the proposed C-HC Project would allow for an increase in species that use edge habitats. This would change the species composition of the ROW area and impact species that use larger blocks of habitat, as they would be subject to increased predation. Other species that use edge habitats or have more general habitat requirements would benefit from the increased amount of edge habitat.

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 would cease with the completion of construction activities.

Two inactive bald eagle nests occur within the Refuge between the two proposed Mississippi River crossings for the C-HC Project. Adverse impacts to nesting eagles are not anticipated because the nests have not been used for the past several years. If eagles were to begin using either of these nests, impacts would be avoided by following the USFWS restrictions on when construction activities are allowed. Construction on the Refuge would only be permitted outside the nesting season (typically January 15 to June 15) or outside a 660-foot exclusion zone to avoid disturbance to nesting adults, chicks, and fledglings. Eagle nest surveys would be conducted prior to construction activities, and the Utilities would coordinate with the USFWS to minimize the impacts to nearby nesting eagles.

The design of the C-HC Project within the Refuge is intended to reduce the likelihood of avian collisions using low-profile, horizonal-symmetrical H-frame structures where the 345-kV and 161-kV transmission lines would be placed on the same set of structures (Figure 2.4-5 and Figure 2.4-6). A horizontal transmission line configuration is believed to be more beneficial to avian species, as the configuration reduces the height of the collision zone, compared with a vertical configuration (Figure 3.14-2) (APLIC 2012:71). Furthermore, by collocating the transmission lines on one set of structures, the wires on the transmission structures would be confined to a smaller area, which increases the visibility of the transmission lines and allows birds to make one ascent and descent to cross the lines (Figure 3.14-3; APLIC 2012:70). APLIC also recommends siting new transmission lines below the existing tree line so that birds are forced to gain enough altitude to clear the more-visible tree line and thereby avoid the transmission line (APLIC 2012:59). The C-HC Project would use low-profile structures that are 75 feet tall within the Refuge, which is below the estimated height of the tree line in this area. As a result of these three practices—1) using a horizontal configuration of wires, 2) collocating two transmission lines on one set of structures, and 3) constructing low-profile structures, the number of avian collisions with the C-HC Project is expected to be reduced within the Refuge under all action alternatives.

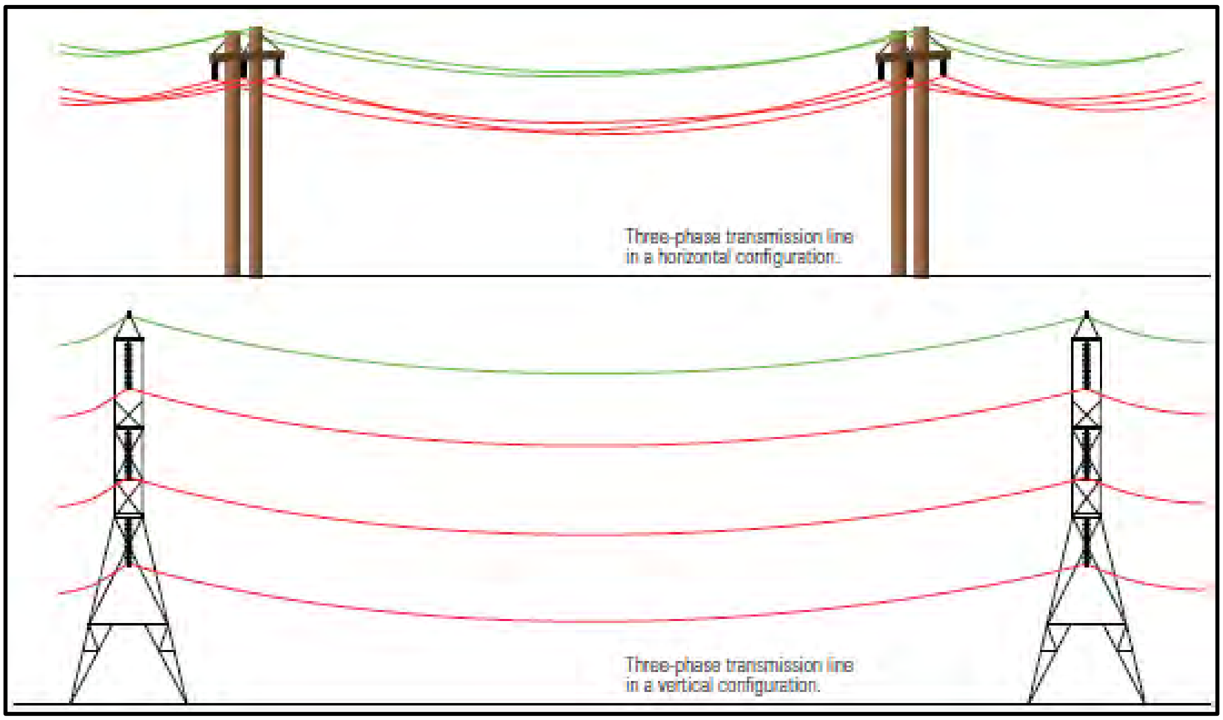

Figure 3.14-2. Horizontal and vertical configuration, modified from *Reducing Avian Collisions with Power Lines: The State of the Art in 2012* (APLIC 2012:71).

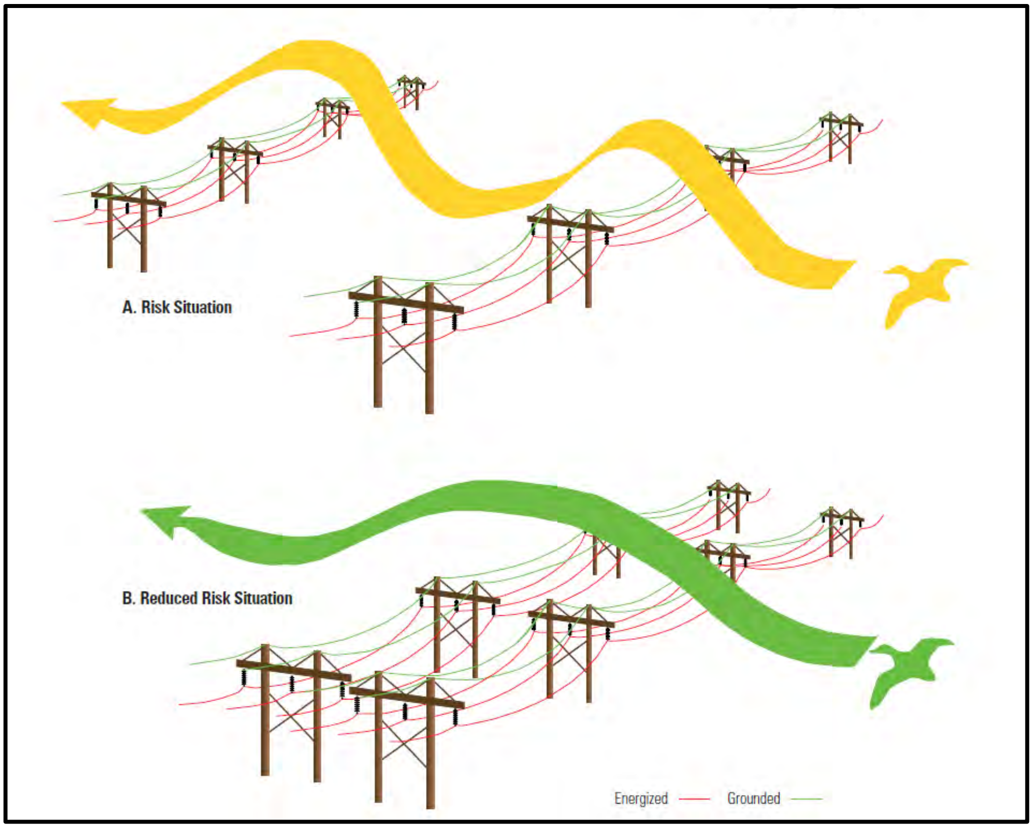

Figure 3.14-3. Reducing collisions by clustering lines in one ROW, modified from *Reducing Avian Collisions with Power Lines: The State of the Art in 2012* (APLIC 2012:70).

Potential impacts from maintenance activities would be similar in nature to those previously discussed above for construction activities. However, the scope of maintenance impacts would be lower in magnitude than those for construction as there would be less equipment and fewer people working. Maintenance impacts would be temporary and would occur sporadically over the life of the C-HC Project. After construction, a mid-year cycle application of herbicide would be conducted in 2 to 3 years. Thereafter, the vegetation management cycle would occur every 5 years.

3.14.2.3.4 WATER RESOURCES

All action alternatives would cross the Mississippi River and the associated floodplain that occurs within the Refuge. Transmission line structures would be placed outside the Mississippi River OHWM, but within the floodway. The support structures for the transmission line would be small when compared to the Mississippi River floodway dimensions, as would be the grading required at the base of the structures. Neither the structures nor the grading at the base would be significant obstructions to the flood flows in the Mississippi River floodway. “No rise” conditions would likely be met for the proposed project, regardless of proposed Mississippi River crossing location. Modeling would be performed to demonstrate “no rise” conditions are met.

The Mississippi River is a Meandered Sovereign River and a Sovereign Lands Construction Permit would be required for proposed construction activities that may impact the Mississippi River (IAC 571 Chapter 13). Taller (approximately 196 feet), tubular steel, H-frame support structures may be required at the channel crossings, so the transmission line can span the channel and still provide adequate clearance for river-going vessels. At either crossing location, the transmission line would need to have a free span of approximately 1,600 feet in order to span the channel. With the support structures outside the channel and the transmission line elevated according to U.S. Coast Guard standards, the impacts to the Mississippi River would be temporary and minor.

The most common contaminant from construction activity is the movement of sediment by stormwater into nearby surface waters, due to ground disturbance. The C-HC Project includes minimization measures and BMPs that are intended to stabilize disturbed ground, control erosion from disturbed areas, and prevent sediment from entering surface waters. The SWPPP(s) required to be prepared for the construction activities would identify the specific structural control measures and BMPs to be implemented. When implemented properly, as required under Section 402 of the CWA, 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. Minor adverse impacts from sedimentation is expected to be short-term for all alternatives.

3.14.2.3.5 CULTURAL RESOURCES

No cultural resources have been identified within the analysis area; therefore, no impacts to cultural resources within the Refuge are expected to occur under any of the six action alternatives.

3.14.2.3.6 LAND USE, INCLUDING AGRICULTURE AND RECREATION

Construction activities would temporarily impact both land cover and recreational users by limiting access to a small portion of the Refuge and the Mississippi River, including public access points to the river, generating noise associated with construction equipment, changing the land use of the ROW area, and altering the visual environment. Most of these adverse impacts would last the duration of construction. Recreation activities are expected to return to preconstruction levels after construction ends. The C-HC Project would not exclude existing land uses or recreation activities currently enjoyed within the Refuge.

3.14.2.3.7 VISUAL QUALITY AND AESTHETICS

All action alternatives would result in short-term and long-term adverse impacts to visual quality and aesthetics within the Refuge. Construction of the C-HC Project would introduce elements to the landscape that would not be typical of Refuge activities. The presence of construction vehicles, equipment, and ground disturbance would disrupt the viewshed in an otherwise vegetated and undeveloped area. Once constructed, the C-HC Project would require maintained vegetation within the 260-foot-wide ROW. The edge of the ROW would introduce lines on the landscape that are inconsistent with other nearby vegetated areas of the Refuge. To help convey the types of impacts to scenic resources within the Refuge, visual simulations are presented for each action alternative in Section 3.11. Refer to Figure 3.11-14 through Figure 3.11-21, and Figure 3.11-24 through Figure 3.11-25 for representations of how the alternatives would modify the existing viewshed within the Refuge.

3.14.2.4 ALTERNATIVE 1

Under Alternative 1, the C-HC Project would cross the Refuge via a new ROW, directly across the Mississippi River from the Nelson Dewey Substation. Either Segment B-IA1 or B-IA2 could be used to cross the Refuge under Alternative 1. Low-profile H-frame structures with a height of 75 feet would be used to cross the Refuge. Taller (approximately 196 feet), tubular steel, H-frame support structures would be placed near the Mississippi River crossing, so the transmission line can span the channel and still provide adequate clearance for river-going vessels. Due to the low-profile structures, the ROW would be

260 feet wide. Under Alternative 1, the existing transmission line ROW in the Refuge, which crosses the Mississippi River at the Stoneman Substation, would be decommissioned and revegetated.

3.14.2.4.1 GEOLOGY AND SOILS

Under Alternative 1, the adverse impacts to sensitive soils within the Refuge would be moderate and long term if not immediately repaired. With repair, adverse impacts would be moderate, short term, and generally limited to the construction limits. Table 3.14-3 summarizes the acres of impact to sensitive soils within the Refuge under Alternative 1, for both Segment B-IA1 and Segment B-IA2.

Table 3.14-3. Alternative 1 Temporary Sensitive Soil Impacts within the Refuge

	Segment B-IA1 Within ROW (acres)	Segment B-IA1 Outside ROW within 300-foot Corridor (acres)	Segment B-IA2 Within ROW (acres)	Segment B-IA2 Outside ROW within 300-foot Corridor (acres)
Refuge Analysis Area	39	6	44	6
Sensitive Soil Type				
Severe Erosion Potential	0	0	0	0
Shallow Soils	0	0	0	0
Wet Soils	39	6	43	6
Steep Slopes	0	0	0	0

3.14.2.4.2 VEGETATION, INCLUDING WETLANDS AND SPECIAL STATUS PLANTS

Alternative 1 would result in the temporary or permanent removal, degradation, or alteration of vegetation within the Refuge as shown in Table 3.14-4. The primary land cover class within the Refuge along Alternative 1 is wetland. This vegetation class would be directly impacted by construction and maintenance of the C-HC Project within the ROW. Within these acres, effects described Impacts Common to All Action Alternatives would be expected to occur.

Alternative 1 would cross a total of 12 identified wetlands within the Refuge along Segment B-IA1, including 38 acres of wetland within the ROW, and approximately 6 acres of wetland outside the ROW but within the analysis area (see Table 3.14-4). A total of approximately <0.1 acre of wetland would be permanently impacted within the Refuge due to tree clearing, with an additional <0.1 acre of wetland permanently impacted by fill activities associated with transmission line structures. Temporary impacts to wetlands within the Refuge are estimated to be 38 acres under Segment B-IA1. Indirect impacts to wetlands within the Refuge are estimated to be 6 acres under Segment B-IA1.

Alternative 1 would cross a total of 15 identified wetlands within the Refuge along Segment B-IA2, including 41 acres of wetland within the ROW, and <1 acre of wetland outside the ROW but within the analysis area (see Table 3.14-4). A total of approximately 1 acre of wetland would be permanently impacted within the Refuge due to tree clearing, with an additional <0.1 acre of wetland permanently impacted by fill activities associated with transmission line structures. Temporary impacts to wetlands within the Refuge are estimated to be 40 acres under Segment B-IA2. Indirect impacts to wetlands within the Refuge are estimated to be <1 acre under Segment B-IA2.

Table 3.14-4. Alternative 1 Refuge Wetland Impacts

Permanent Impacts	B-IA1 Wetland Acres	B-IA2 Wetland Acres
Forested Wetlands Cleared Within ROW	<0.1	1
Wetland Filled due to Placement of Structures	<0.1	<0.1
Total Permanent Impacts	**0.1**	**1**
Temporary or Indirect Impacts	**Wetland Acres**	**Wetland Acres**
Non-Forested Wetlands Within ROW (Temporary)	38	40
Wetlands Outside ROW, Within Analysis Area (Indirect)	6	<1

Impacts to wetlands would be considered moderate under either Segment B-IA1 or B-IA2. The alteration or removal of vegetation would be measurable and would affect individual plants and local populations. Fragmentation of the young forest community would adversely alter the functions of vegetation. Effects would not be expected to affect regional populations, as they would be limited to discrete footprints within the Refuge.

It is important to note that both Segment B-IA1 and Segment B-IA2 would cross the Turkey River restoration area (see Figure 3.14-1). Segment B-IA1 would cross approximately 23 acres of the restoration area in a diagonal pattern, resulting in habitat fragmentation of the restoration area. Segment B-IA2 would cross approximately 27 acres of the restoration area while following along the edges of the restoration area, reducing the amount of fragmentation within the restoration area. Currently, the vegetation in this area could best be characterized as young forest, as most of the trees present are less than 15 years old. The USFWS intends to manage this restoration area so that natural forest regeneration and succession results in much of the Turkey River floodplains' growing into bottomland forest within 100 years. Due to this management objective, it is estimated that Segment B-IA1 would result in future fragmentation of 23 acres of mature forested wetland in a diagonal pattern across the Turkey River restoration area. It is estimated that Segment B-IA2 would result in future fragmentation impacts of 27 acres of mature forested wetland along the edges of the Turkey River restoration area.

Beneficial impacts to vegetation would occur within the Refuge under Alternative 1 because the existing 161-kV transmission line ROW (approximately 14 acres) would be retired, and the Utilities would restore the abandoned ROW with native vegetation in accordance with USACE and USFWS requirements. Revegetation of the existing utility ROW would result in long-term beneficial impacts to the forested wetland community, as the area would return to surrounding vegetative conditions over the next 25 to 50 years.

No special status plants have been identified within proposed ROW through the Refuge for Alternative 1.

3.14.2.4.3 WILDLIFE, INCLUDING SPECIAL STATUS SPECIES

There are 38 acres of wetland and 1 acre of open water habitat within the proposed permanent ROW of Segment B-IA1, and 40 acres of wetland and 4 acres of open water habitat within the proposed permanent ROW of Segment B-IA2. Non-forested wetland habitat would experience temporary disturbance during construction, though these impacts would be minimized through the measures described in Section 3.1, Table 3.1-4. Permanent impacts to non-forested wetlands would also occur under Alternative 1, where transmission line structures are placed. As discussed above under Vegetation, both Segment B-IA1 and Segment B-IA2 would cross the Turkey River restoration area (see Figure 3.14-1), resulting in 23 acres and 27 acres, respectively, of habitat fragmentation within an area managed for mature bottomland forest within 100 years. Due to this management objective, it is estimated that Segment B-IA1 would result in future fragmentation of 23 acres of mature forested wetland in a diagonal pattern across the Turkey River restoration area. It is estimated that Segment B-IA2 would result in future fragmentation impacts of 27 acres of mature forested wetland along the edges of the Turkey River restoration area. Habitat fragmentation would adversely impact forest interior species that need large contiguous tracts of forest to complete their life cycles.

Construction of Segment B-IA1 would result in 1.2 miles of new transmission line through the Refuge, and construction of Segment B-IA2 would result in 1.4 miles of new transmission line through the Refuge. Both segments could pose a new collision risk to raptors and other large birds, although low-profile structures are intended to minimize the risk of bird collisions in the Refuge. Other environmental commitments to avoid or minimize impacts to wildlife within the Refuge are listed in Table 3.1-4.

Two inactive bald eagle nests are known to occur within close proximity of Alternative 1, the closest of which is approximately 45 feet from Segments B-IA1 and B-IA2. The second inactive next is approximately 985 feet from Segments B-IA1 and B-IA2. No adverse impacts to nesting bald eagles are expected since these nests have been inactive for the past several years. If eagles were to begin using these nests, Refuge-imposed restrictions on construction would be required. Those restrictions would minimize impacts on nesting eagles through a 660-foot exclusion zone requirement around the nests and limiting construction within the Refuge to periods outside the eagle nesting season (typically January 15 to June 15).

Beneficial impacts to wildlife would occur within the Refuge under Alternative 1 because the existing 161-kV transmission line ROW (approximately 14 acres) would be retired, and the Utilities would restore the abandoned ROW with native vegetation in accordance with USACE and USFWS requirements. Revegetation of the existing utility ROW would result in long-term beneficial impacts to the forest-dependent wildlife species, as the area would return to forested conditions over the next 25 to 50 years.

3.14.2.4.4 LAND USE, INCLUDING AGRICULTURE AND RECREATION

Temporary moderate impacts would occur to land use within the Refuge during construction. Approximately 39 acres of new ROW for Segment B-IA1 and 44 acres of new ROW for Segment B-IA2 would be constructed through the Refuge under Alternative 1. Alternative 1 would adversely impact recreational users, especially car ferry customers, during construction by limiting access to a portion of the Refuge and the Mississippi River, introducing noise from construction equipment and contractors, changing the land use of the ROW area, and altering the visual environment from an undeveloped landscape to a developed landscape. Most of these adverse impacts would last the duration of construction. Recreation activities are expected to return to preconstruction levels after construction ends. Permanent moderate impacts would occur in the Refuge from the C-HC Project as the character of the area near Oak Road would be changed and user experience would be impacted.

Beneficial impacts would also occur to the Refuge under Alternative 1. The existing transmission line ROW near the Mississippi River at the Stoneman Substation would be removed and reclaimed. Decommissioning and removing the existing utility line would limit users access and recreational opportunities to this area during reclamation activities. Reclamation of this area to pre-transmission line conditions would enhance user experiences in this area by providing an undeveloped landscape over the long term.

There are no Refuge lands under agricultural production within the analysis area; therefore, impacts to Refuge agricultural programs would not occur under Alternative 1. One private inholding within the Refuge continues to be actively farmed; however, the inholding would not be impacted by either Segment B-IA1 or Segment B-IA2.

3.14.2.4.5 VISUAL QUALITY AND AESTHETICS

Detailed analysis and visual simulations for the Refuge are presented in Section 3.11, and the following paragraphs summarize the analysis in that section.

Under Alternative 1 (for both Segment B-IA1 and Segment B-IA2), long-term, major adverse impacts to scenic resources within the Refuge would occur from the C-HC Project. Viewers traveling along Oak Road would see new transmission line structures and conductors in the middle-ground, and these changes to the characteristic landscape would dominate the landscape and detract from current user activities. At the Mississippi River, where the C-HC Project would cross the Refuge and connect to the Nelson Dewey Substation, the C-HC Project would result in additional visual impacts to visitors, fishermen, and wildlife photographers as well as car ferry users in this area, particularly on the south side of the river. Due to the amount of development already occurring within this viewshed, the visual resource impacts to the Refuge from the C-HC Project would be long term and moderate. Proposed changes would attract attention, but would not dominate the landscape. User activities would remain unaffected.

Under Alternative 1, the Utilities would remove the existing transmission lines that cross the Mississippi River at the Stoneman Substation because the ROW would be shifted north on the river to the Mississippi River crossing at the Nelson Dewey Substation. The existing ROW would no longer be used as a utility ROW, and the Utilities would restore the abandoned ROW with native vegetation in accordance with USACE and USFWS requirements. The revegetation of the existing ROW would be a beneficial long-term visual impact to the Refuge as well as the observers looking into the Refuge from Cassville, Wisconsin.

3.14.2.5 ALTERNATIVE 2

Under Alternative 2, the C-HC Project would cross the Refuge within the existing transmission ROW, which is 150 feet wide and approximately 14 acres across the Refuge. As with Alternative 1, low-profile H-frame structures with a height of 75 feet would be used to cross the Refuge. Taller (approximately 196 feet), tubular steel, H-frame support structures would be placed near the Mississippi River crossing, so the transmission line can span the channel and still provide adequate clearance for river-going vessels. Due to the low-profile structures, the existing ROW would be widened to 260 feet.

3.14.2.5.1 GEOLOGY AND SOILS

Under Alternative 2, the adverse impacts to sensitive soils within the Refuge would be moderate and long-term if not immediately repaired. With repair, adverse impacts would be moderate, short term, and generally limited to the impact area. Table 3.14-5 summarizes the acres of impact to sensitive soils within the Refuge under Alternative 2.

Table 3.14-5. Alternative 2 Temporary Sensitive Soil Impacts within the Refuge

	Within ROW (acres)	Outside ROW within 300-foot Corridor (acres)
Total Area	46	7
Sensitive Soil Type		
Severe Erosion Potential	0	0
Shallow Soils	0	0
Wet Soils	44	6
Steep Slopes	0	0

3.14.2.5.2 VEGETATION, INCLUDING WETLANDS AND SPECIAL STATUS PLANTS

Alternative 2 would result in the temporary or permanent removal, degradation, or alteration of vegetation within the Refuge, as shown in Table 3.14-6. The primary land cover class within the Refuge along Alternative 2 is wetland, and approximately 14 acres have been maintained as a utility ROW for several decades. The vegetation communities within the existing ROW would continue to be managed as non-forested wetlands through maintenance activities. Approximately 33 acres of additional wetland (both forested and non-forested) would be crossed by the C-HC Project, which would have a wider 260-foot-wide ROW to accommodate the low-profile structures in the Refuge. Within these acres, effects described under Impacts Common to All Action Alternatives would be expected to occur.

Alternative 2 would cross a total of 20 identified wetlands within the Refuge along Segment C-IA, including 46 acres of wetland within the ROW, and <1 acre of wetland outside the ROW but within the analysis area (see Table 3.14-6). A total of approximately 12 acres of wetland would be permanently impacted within the Refuge due to tree clearing, with an additional <0.1 acre of wetland permanently impacted by fill activities associated with transmission line structures. Temporary impacts to wetlands within the Refuge are estimated to be 35 acres. Indirect impacts to wetlands within the Refuge are estimated to be <1 acre.

Table 3.14-6. Alternative 2 Refuge Wetland Impacts

Permanent Impacts	**Wetland Acres**
Forested Wetlands Cleared Within ROW	12
Wetland Filled Due to Placement of Structures	<0.1
Total Permanent Impacts	**12**
Temporary or Indirect Impacts	**Wetland Acres**
Non-Forested Wetlands Within ROW (Temporary)	35
Wetlands Outside ROW, Within Analysis Area (Indirect)	<1

Impacts to wetlands would be considered moderate. The alteration or removal of vegetation would be measurable and would affect individual plants and local populations. Fragmentation of the mature forest community would continue along the utility ROW and expanded from the existing 150-foot-wide ROW corridor to 260-foot-wide corridor. Effects would not be expected to affect regional populations, as they would be limited to discrete footprints within the Refuge.

No special status plants have been identified within proposed ROW through the Refuge for Alternative 2.

3.14.2.5.3 WILDLIFE, INCLUDING SPECIAL STATUS SPECIES

There are 46 acres of wetland habitat within the proposed permanent ROW of Alternative 2, along Segment C-IA. The current transmission line ROW is approximately 14 acres within the Refuge. Therefore, Segment C-IA would expand the amount of transmission line ROW by approximately 33 acres through the Refuge. Non-forested wetland habitat would experience temporary disturbance during construction, though these impacts would be minimized through the measures described in Section 3.1, Table 3.1-4. The permanent conversion of approximately 12 acres of forested wetland habitat would occur under Alternative 2, which would result in an adverse impact to wildlife that depend on forested habitat. Under Alternative 2, habitat fragmentation of the forested wetland surrounding Segment C-IA would continue for the life of the C-HC Project, thereby resulting in long-term adverse effects on forest-obligate species. Fragmentation would alter the functions of this habitat type in providing migratory habitat for neo-tropical bird species as well as nesting habitat for a variety of resident bird species.

Construction of Alternative 2 would result in approximately 1.5 miles of transmission line through the Refuge, within an existing transmission line corridor. The additional conductors could pose a new collision risk to raptors and other large birds, although low profile structures are intended to minimize the risk of bird collisions in the Refuge. Other wildlife impact minimization measures applicable to the Refuge are listed in Table 3.1-4.

Two inactive bald eagle nests are known to occur within close proximity of Alternative 2, the closest of which is approximately 4,450 feet from Segment C-IA. The second inactive next is approximately 4,940 feet from Segment C-IA. Adverse impacts to nesting bald eagles are not expected to occur under Alternative 2 due to the distance between the nests and the C-HC Project.

3.14.2.5.4 LAND USE, INCLUDING AGRICULTURE AND RECREATION

Temporary minor impacts would occur to land use within the Refuge during construction. Approximately 46 acres of ROW would be constructed through the Refuge under Alternative 2, following the existing transmission line ROW. Construction activities would temporarily impact both land cover and recreational users by limiting access to a small portion of the Refuge and the Mississippi River, generating noise associated with construction equipment, changing the land use of the ROW area, and altering the visual environment. Most of these adverse impacts would last the duration of construction. Recreation activities are expected to return to preconstruction levels after construction ends and land use with the transmission line ROW would not change since Alternative 2 follows an existing transmission line ROW. No permanent impacts would occur as the new power line would occur in an existing power line ROW.

There are no Refuge lands under agricultural production within the analysis area; therefore, impacts to Refuge-managed agricultural practices would not occur under Alternative 2.

3.14.2.5.5 VISUAL QUALITY AND AESTHETICS

Detailed analysis and visual simulations for the Refuge are presented in Section 3.11, and the following paragraph summarizes the analysis in that section.

Under Alternative 2, the existing transmission line that crosses the river at the Stoneman Substation would be replaced with a low-profile H-frame structure resulting in a minor impact to viewers and recreational users at this location from the C-HC Project. Minor changes in the existing transmission ROW due to vegetation maintenance and the low-profile structures could attract attention but would not dominate the view or detract from current user activities.

3.14.2.6 ALTERNATIVE 3

Under Alternative 3, impacts to resources within the Refuge would be the same as Alternative 2.

3.14.2.7 ALTERNATIVE 4

Under Alternative 4, impacts to resources within the Refuge would be the same as Alternative 2.

3.14.2.8 ALTERNATIVE 5

Under Alternative 5, impacts to resources within the Refuge would be the same as Alternative 1.

3.14.2.9 ALTERNATIVE 6

Under Alternative 6, impacts to resources within the Refuge would be the same as Alternative 1.

3.14.3 *Summary of Impacts*

Table 3.14-7 summarizes the impacts to sensitive soils, vegetation, wetlands, and their associated habitats within the Refuge from the action alternatives. Because Alternatives 1, 5, and 6 would cross the Refuge in the same location (either Segment B-IA1 or B-IA2), along the new ROW near the Nelson Dewey Substation, their impacts are the same. Alternatives 2, 3, and 4 would cross the Refuge in the same location (Segment C-IA), along the existing transmission line ROW, and would have the same impacts.

Table 3.14-7. Impact Summary Table

	ROW within Refuge (acres)	Temporary Impacts to Sensitive Soils within ROW (acres)	Permanent Forest Removal within ROW (acres)*	Temporary Wetland Impacts within ROW (acres)	Permanent Wetland Impacts within ROW (acres)	Permanent ROW in restoration area (acres)	Associated Action Alternative
Segment B-IA1	39	39	0	38	0.1	23	1, 5, 6
Segment B-IA2	44	44	1	40	1	27	1, 5, 6
C-IA	46	44	0	35	12	0	2, 3, 4

* Permanent impacts to forested wetlands are defined based on the existing vegetation conditions within the proposed ROW.

Under Alternatives 1, 5, and 6, Segment B-IA1 and Segment B-IA2 would result in future fragmentation of 23 acres and 27 acres, respectively, of mature forested wetland within the Turkey River restoration area. In addition, under Alternatives 1, 5, and 6, approximately 14 acres of the existing 161-kV transmission line ROW would be revegetated, resulting in a long-term beneficial impact to Refuge lands.

Under Alternatives 2, 3, and 4, the C-HC Project would expand the amount of transmission line ROW by approximately 33 acres through the Refuge.

3.14.3.1.1 CULTURAL AND HISTORIC RESOURCES

No cultural resources have been identified within the analysis area; therefore, no impacts to cultural resources within the Refuge are expected to occur under any of the six action alternatives.

3.14.3.1.2 LAND USE, INCLUDING AGRICULTURE AND RECREATION

All action alternatives would result in short-term adverse impacts to land use and recreation during construction. Under Alternatives 1, 5, and 6, long-term moderate impacts would occur in the Refuge from the C-HC Project as the character of the Refuge near Oak Road would be changed, and user experience would be impacted. Beneficial impacts would occur under these alternatives as a result of removing and revegetation the existing transmission line ROW through the Refuge. Reclamation of this area to pre-transmission line conditions would enhance user experiences in this area by providing an undeveloped landscape over the long-term.

Under Alternatives 2, 3, and 4, long-term minor impacts would occur in the Refuge because the C-HC Project would be located along an existing transmission line ROW.

3.14.3.1.3 VISUAL QUALITY AND AESTHETICS

Under Alternatives 1, 5, and 6, major adverse impacts to scenic resources within the Refuge would occur from the C-HC Project at the Mississippi River crossing and along Oak Road. Beneficial impacts to viewers would occur from the Stoneman river crossing at the Cassville public landing KOP due to the removal of the existing transmission line and revegetation of the ROW.

Under Alternatives 2, 3, and 4, minor impacts to scenic resources within the Refuge would occur from the C-HC Project.

3.14.3.2 ADDITIONAL ENVIRONMENTAL COMMITMENTS

At this time, no additional environmental commitments for the Refuge have been identified beyond what is provided in Section 3.1, Table 3.1-4. Ongoing coordination with USFWS and USACE would result in the identification of additional mitigation measures, including measures to offset the loss of floodplain forest acreage and functionality, which would result under all action alternatives. Issuance of a ROW permit and/or easement to cross the Refuge would require complete mitigation of any unavoidable impacts. Acceptable mitigation in an approved location and manner would need to be included with any request for use of federal lands.