3.0 Overview of Project and Alternative Routes and Sites

ITC Midwest LLC (ITCM) is proposing to build an approximately 73 mile long, 345 kilovolt (kV) transmission line in southern Minnesota. This section describes ITCM's proposed project including routes, connector segments and associated facilities. This section also describes route alternatives and route variations beyond those proposed by ITCM that could be used for the project. The engineering and design for the project, including the possibility of undergrounding a portion of the line, and construction of the project are also discussed here.

3.1 Proposed Project

ITCM is proposing to build an approximately 73 mile long, 345 kV transmission line in southern Minnesota through the counties of Jackson, Martin and Faribault. The project would start at the existing Lakefield Junction substation near Lakefield, Minnesota, run eastward to a new Huntley substation near Winnebago, Minnesota, and then southward to the Iowa border (Map 3-1). Though the transmission line would continue on into Iowa, the portion of the line in Iowa is not evaluated in this EIS because the Commission's jurisdiction ends at the border. The project also includes expansion of the Lakefield Junction substation, construction of a new Huntley substation and the relocation of several segments of existing 161 kV and 69 kV transmission lines such that they would connect into the new Huntley substation.

3.2 Project Proposer and Project Need

ITCM is a subsidiary of ITC Holdings Corp., an independent electric transmission company based in Michigan. ITCM operates approximately 6,600 circuit miles of transmission lines in Iowa, Minnesota, Illinois and Missouri. ITCM is a member of the Midcontinent Independent System Operator (MISO) – the non-profit, regional transmission operator in the mid-continental United States and Canada. ITCM does not serve retails loads; it is an electric transmission company. ITCM does, however, supply electrical power to local utilities that, in turn, serve retail customers.

ITCM indicates in its certificate of need (CN) application that its project is needed to enhance regional electrical reliability, to increase transmission capacity to support additional generation, and to reduce congestion on the electrical grid. Additional discussion of the need for the project is provided in Section 4.0 of this EIS and in ITCM's CN application.

3.3 Applicant's Proposed Transmission Line Routes

ITCM has proposed two possible routes for its project, designated as routes A and B, as shown on Map 3-1. Each of the two routes is about 73 miles long and is divided into two primary segments: 1) the segment between the existing Lakefield Junction substation and the new Huntley substation; and 2) the segment between the new Huntley substation and the Iowa border.

In this EIS, the Lakefield to Huntley segment is referred to as the "LH" segment and the Huntley to Iowa border segment is referred to as the "HI" segment. Thus, for example, route A between the Lakefield Junction substation and the Huntley substation is referred to as route A-LH.

Note that route alternatives differ from system alternatives. Routes and route alternatives refer to possible locations for the high voltage transmission line (HVTL). System alternatives (Section 4.0) refer to higher-level considerations about the system itself – for example, whether the HVTL should be of a different size or whether an upgrade of existing facilities could meet the need for the project.

3.3.1 Route A

For the majority of its length, route A would be co-located with an existing 161 kV transmission line (the Lakefield to Border 161 kV line). There are four areas where the route deviates from following the existing 161 kV line: (1) near the Jackson Municipal Airport; (2) near Fox Lake; (3) near Lake Charlotte; and (4) near the Huntley substation (Map 3-1).

3.3.2 Route B

Route B would follow existing field, fence and property lines, with some paralleling of roadways. If route B is permitted by the Commission, the existing Lakefield to Border 161 kV line would remain in service. The 161 kV line would likely need to be rebuilt within the next 10-20 years, but any rebuilding would be a separate project, requiring separate approvals.

3.3.3 Connector Segments

ITCM has identified connector route segments, between routes A and B, to provide options for the Commission to permit a hybrid route for the project – for example, using route A for part of the project

and route B for another part. These segments are in addition to those areas where routes A and B share a common segment or cross. These connector segments are shown on Map 3-1 and include: the Jackson Municipal Airport connectors (JMAW and JMAE) and the Fox Lake West (FLW) connector along route A-LH; and the Pilot Grove Lake Waterfowl Production Area (WPA) connectors (PGLN and PGLS) along route A1-HI.

3.3.4 Double-Circuit Structures

The project would be built with 345 kV/161 kV double-circuit capable structures. That is, the structures would be able to carry the 345 kV transmission line on one side of the pole and a 161 kV transmission line on the other side.

Where the 345 kV line is co-located with an existing 161 kV line such as on route A, the existing 161 kV line would be placed on a single pole with the new 345 kV line. In these situations, the new single poles would replace existing H-frame structures that now support the 161 kV line. Typical double-circuit 345/161 kV single pole structures that could be used for this project are illustrated in Appendix C.

In instances where there is no existing 161 kV line (e.g., route B), the structures would be capable of carrying such a line at some future date. However, if ITCM or some other utility wanted to construct a 161 kV line on theses poles, they would require separate approval(s) from the Commission.

3.4 Associated Facilities

ITCM's project includes expanding the existing Lakefield Junction substation, removing the existing Winnebago Junction substation, constructing a new Huntley substation and reconfiguring four 161 kV lines and three 69 kV lines such that they would connect to the new Huntley substation. The locations of these associated facilities are shown on Map 3-2 for route A and Map 3-3 for route B.

3.4.1 Lakefield Junction Substation

ITCM has proposed to expand the existing Lakefield Junction substation site by moving the eastern substation fence approximately 160 feet eastward, to accommodate interconnection of the new 345 kV line. The expansion would require acquisition of approximately three acres of land, with the fenced area of the substation expanding by about 2.2 acres. The expansion would accommodate equipment to connect the new 345 kV line. No new transformers would be added to the substation as part of the project.

3.4.2 Winnebago Junction Substation

ITCM's project removes the existing Winnebago Junction substation and replaces it with the new Huntley substation, located approximately one mile to the south. All equipment, foundations and fencing would be removed at the Winnebago Junction site. An existing 161 kV line and one 69 kV line would still cross the property on their way to the new Huntley substation. The substation site would be re-vegetated and allowed to return to natural conditions.

3.4.3 Huntley Substation

The proposed Huntley substation would include all necessary breakers, switches, transformers and associated structures to accommodate the new 345 kV line and all 161 kV and 69 kV connections which currently occur at the Winnebago Junction substation. In addition, the substation site would include space for possible future electrical connections.

To accommodate the fenced area, setbacks, line clearances and grading requirements, ITCM estimates that the minimum area necessary for the Huntley substation is 32 acres. ITCM proposed a fenced area of nine acres for the substation in its route permit application; however, it has since identified a need for reactors at the substation, which would require an additional three acres, for a total of 12 acres (650 feet by 800 feet). A 200-foot buffer along the front and either side would allow for setbacks and line clearances. A 250-foot buffer along the rear property line would allow for grading, line clearances and rear setback requirements. With these buffers, the overall property dimensions would be approximately 1,050 feet by 1,350 feet, or 32 acres.

ITCM has purchased 40 acres of land for the Huntley substation, in anticipation that the Commission will permit the site as proposed in the route permit application. The Commission, however, could select a different site for the substation, and ITCM's purchase of land plays no role in this EIS in the evaluation of sites for the substation.

All lines which currently connect at the Winnebago Junction substation would be rerouted to the new Huntley substation, including four 161 kV lines and three 69 kV lines. In reconfiguring these lines, ITCM

proposes to primarily use single pole structures and use existing, but expanded, ROWs to the extent feasible. Depending on which route is selected for the project, the configurations of these 161 kV and 69 kV lines would be different, as shown on Map 3-2 and Map 3-3. In these maps and throughout this EIS, these reconfigured lines are referred to as associated facilities.

For the associated facilities, ITCM has proposed co-locating and double-circuiting two 161 kV lines with two 69 kV lines. The other 69 kV line would not be co-located or double-circuited. Of the remaining two 161 kV lines, one would be co-located and double-circuited with the new 345 kV line for all or a portion of the relocation and the other would not be co-located or double-circuited. Portions of ROWs for existing 161 kV and 69 kV lines would no longer be needed after the project is complete and would be abandoned. See Section 3.8.7 for a discussion of abandonment and decommissioning.

3.5 Route Width, Right-of-Way and Anticipated Alignment

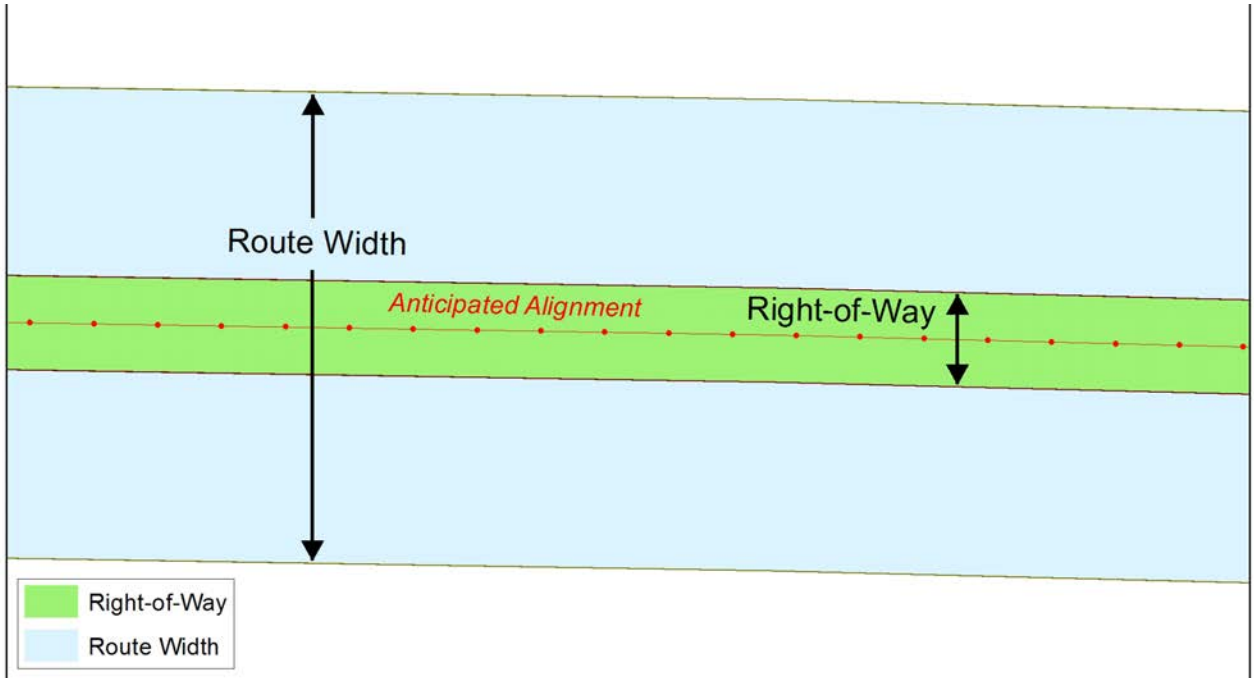
When it issues a route permit, the Commission approves a route, a route width and an anticipated alignment within that route width (Figure 3-1). In general, the transmission line must be constructed within the Commission's designated route. The route width is typically larger than the actual right-of-way (ROW) needed for the transmission line. This additional width provides flexibility in constructing the line, yet is not of such an extent that the placement of the line is undetermined. The route width allows permittees to work with landowners to address their concerns and to address engineering issues that may arise after a permit is issued. The route width, in combination with the anticipated alignment, is intended to balance flexibility and predictability.

The ROW is that specific area required for the safe construction and operation of the transmission line. The ROW must be within the designated route and is the area for which the permittee obtains rights from private landowners to construct and operate the line.

Once a route permit is issued by the Commission, a permittee would conduct detailed survey and engineering work, including, for example, soil borings. Additionally, the permittee would contact landowners to gather information about their property and their concerns and discuss how best the ROW for the project might proceed across the property. Use of a ROW for a transmission line across private property is typically obtained by an easement agreement between the permittee and landowners.

The Commission may include conditions in a route permit (Appendix B). These conditions could address the route width, right-of-way width or anticipated alignment in a specific area of the project, for example, requiring the alignment for a specific

Figure 3-1 Route Width, Right-of-Way and Anticipated Alignment Schematic



portion of the route to be north, rather than south, of a road or requiring that the route width be narrower in a certain area.

After working with landowners and completing detailed engineering work, the permittee would establish the final alignment for the project and pole placements. These plans (known as "plan and profiles") must be provided to the Commission so that the Commission can confirm that the permittee's plans are consistent with the route permit and all permit conditions prior to construction of the project.

3.5.1 Route Width

In its route permit application, ITCM requested a 1,000-foot route width for the 345 kV portion of the project, with a larger route width in two areas:

1. In the area along Interstate 90 (I-90) near the city of Sherburn and the intersection of I-90 and State Highway 4, ITCM requested a route width of 1,800 feet to accommodate routing consistent with MnDOT requirements.

2. In Pilot Grove Township near the Iowa border, ITCM requested a route width of 1.25 miles to provide flexibility in coordinating the route in Minnesota with that portion of the project to be approved by the Iowa Utilities Board and constructed in Iowa.

For the new 161 kV portions of the project, ITCM requested a 500-foot route width.

3.5.2 Right-of-Way

The new 345 kV structures would require a 200-foot ROW, 100 feet on either side of the transmission line. A ROW of at least 150 feet in width would be required for new 161 kV transmission line structures. In addition, a ROW up to 250 feet may be required between the Winnebago Junction and Huntley substation sites to allow construction of up to five circuits on three parallel, overlapping, ROWs as part of reconfiguring the lines between the two substations.

As is discussed further in Section 6.0, route alternatives evaluated in this EIS – alternatives beyond those proposed by ITCM – may have route widths and ROW widths that are different than those requested by ITCM in its applications. Additionally, as noted above, the Commission may, based on the record developed during the route permit proceedings, designate a route width or ROW width that is different than requested by ITCM.

3.6 Route Alternatives and Route Variations

In its route permit application, ITCM proposed routes A and B and several connector segments as possible ways to route the transmission line from the Lakefield Junction substation to the Huntley substation and then south to the Iowa border. Based on comments received during the scoping process and on the EIS scoping decision, this EIS evaluates route alternatives and route variations beyond those proposed by ITCM. Any of these alternatives or variations could, individually or in combination with ITCM's proposed routes, be selected by the Commission as the route for the project.

For purposes of this EIS, a route alternative is a relatively longer section of route that is capable of connecting the Lakefield Junction substation with the Huntley substation. These alternatives utilize, to varying extents, Interstate 90 and thus are labeled as "I90 alternatives." Some of these alternatives have an associated alternative site for the Huntley substation. In this EIS, a route variation is a relatively shorter section of route that is a variation on route A or B and is designed to mitigate a specific local impact.

A summary of these route alternatives and route variations is provided in Table 3-1. This table includes the naming convention used in this EIS as well as the corresponding nomenclature used in the scoping decision. Each of the alternatives and variations is briefly described here and is evaluated and discussed in detail in Section 6.0.

The route alternatives and route variations studied in this EIS were developed from the various route segments suggested during the scoping process. These segments were generally designated in the scoping decision with an initial for the county in which they occurred and an identifying number (Table 3-1). Some of these segments were relatively long; others were relatively short and focused on mitigating a specific impact at a specific location.

This EIS discusses and evaluates those routing options, consistent with the scoping decision, that affect the intended mitigation of the proposed route segments and have relatively fewer impacts with respect to the routing factors of Minnesota Rule 7850.4100. This EIS does not discuss all possible routing options. There may be routing options,

Table 3-1 Summary of Route Alternatives and Route Variations

EIS Nomenclature	Scoping Nomenclature	Length (mi)
Routes and Route Alternatives		
Lakefield to Huntley Segment		
A-LH	A	57.6
B-LH	B	55.5
I90-1	A + I-90 + I-90(M5) + I-90(M6) + M12 + A	57.0
I90-2	A + I-90(M5) + I-90(M6) + M12 + A	55.6
I90-3	A + I-90 + Huntley Substation Option 3	58.3
I90-4	A + I-90 + Huntley Substation Option 4	58.4
I90-5 Option 1	A + I-90 + Huntley Substation Option 1	54.9
I90-5 Option 2	A + I-90 + Huntley Substation Option 2	54.9
Huntley to Iowa Border Segment		
A1-HI	A	15.6
B1-HI	B	17.6
A2-HI(1)	A(1)	12.1
B2-HI(1)	B(1)	13.4
Route Variations		
Jackson Airport Variations		
JA-1	A + JMAW + B + JMAE	9.6
JA-2	A + J3 + J4 + A	8.2
JA-3	A + J4 + A	8.2
Fox Lake Variations		
FL-1	A + M4 + M3 + A	12.6
FL-2	A + M7 + A	12.9
FL-3	A + M5 + A	12.9
FL-4	A + M5 + B + M2	13.2
FL-5	M1 + B + M3 + A	13.8
FL-6	A + FLW + B + M3 + A	13.0
Lake Charlotte Variations		
LC-1	A + M11	5.1
LC-2	A + M13	5.3
LC-3	A + M8 + B + A	5.9
LC-4	A + M10	4.4
LC-5	M9	5.3
Center Creek WMA Variations		
CC-1	M17	0.8
Huntley Substation to Iowa Border Variations		
HI-1	F1	1.2
HI-2	F2	0.4
HI-3	F3	0.8
HI-4	PGLN + B + PGLS	2.5
HI-5	F4	3.0

(1) These HI route alternatives would be only used if the alternative southern Huntley Substation site along I-90 is selected.

consistent with the scoping decision that, for the reader, would appear to have fewer impacts or a different balance of impacts relative to the routing factors of Minnesota Rule 7850.4100, and would be more reasonable or prudent routes for the project. To address this possibility, this EIS is issued in draft form so that it may benefit from public comment.

3.6.1 Lakefield to Huntley – Route Alternatives

During the scoping process, several commenters suggested using I-90 as a routing option for the project. This EIS evaluates five route alternatives, I90-1 through I90-5, for the Lakefield to Huntley segment of the project (Map 3-4). Of these alternatives, route alternative I90-5 (with Options 1 and 2) includes moving the Huntley substation site to an alternative southern location at the intersection of routes A and B and I-90, in Section 2 of Jo Daviess Township, Faribault County. All of the I90 alternatives, except for I90-2, would be double-circuited with the existing 161 kV line along I-90 west of the city of Sherburn. In this area, the lines would be routed and double-circuited such that there are not transmission lines on both side of I-90. Route alternative I90-2 follows route A until just west of the city of Sherburn.

All of the alternatives require reconfiguring existing 161 kV and 69 kV lines to facilitate connections at the Huntley substation. The reconfiguration of these lines for route alternatives I90-1 and I90-2 is the same as route A, which is shown on Map 3-2. The reconfiguration of lines for route alternative I90-3 is the same as route B, which is shown on Map 3-3. The reconfigured lines for route alternative I90-4 are shown on Map 3-5.

The other two route alternatives along I-90 (I90-5 Option 1 and I90-5 Option 2) end at the alternative southern Huntley substation site and, therefore, require different reconfigurations of the existing 161 kV and 69 kV lines. The reconfiguration of these lines for route alternative I90-5 Option 1 is shown on Map 3-6 and the reconfigured lines for route alternative I90-5 Option 2 are shown on Map 3-7.

Route alternatives I90-1 and I90-2, in addition to being analyzed as routes for the 345 kV line, are also analyzed as routes that could remove the existing 161 kV line from Fox Lake and Lake Charlotte by double-circuiting it with the 345 kV line along I-90. To accomplish this removal from both lakes, route alternatives I90-1 and I90-2 would require a small segment of new 161 kV line to run southward from the Fox Lake substation until intersecting the new 345 kV line, where it would be picked up and double-circuited (Map 3-8). The 345/161 kV double-circuit line would follow route alternatives I90-1 or I90-2 east along I-90 and then north along Highway 15, until the point where Highway 15 intersects route B. At route B, the 161 kV line would jog slightly west and then northward along 210th Ave. to the Rutland substation. The 345 kV line would proceed for a short length as a single circuit until rejoining route A and the 161 kV line from the Rutland substation (Map 3-8).

3.6.2 Lakefield to Huntley – Route Variations

ITCM proposed routes A and B as well as connectors at the Jackson Municipal Airport and on the west side of Fox Lake to connect the Lakefield Junction substation to the new Huntley substation. Based on public comment during the scoping process, several route variations were identified that may improve on ITCM's proposed routes and may mitigate potential impacts of the project. The locations of these route variation areas are shown on Map 3-9. The route variations evaluated in this EIS for the Lakefield to Huntley segment of the project are discussed below.

Jackson Municipal Airport

Three route variations (JA-1 through JA-3) are evaluated to avoid potential impacts to the Jackson Municipal Airport and to mitigate other potential impacts. These route variations are shown on Map 3-10. All of these variations bump north to avoid impacting the airport and all cross the Des Moines River. For route variations JA-2 and JA-3, the existing 161 kV line would be removed and double-circuited with the new 345 kV line. For route variation JA-1, the 161 kV line would remain in place, and the new 345 kV line would proceed independently along JA-1.

Fox Lake

Six variations (FL-1 through FL-6) are evaluated to possibly better navigate the Fox Lake area and mitigate potential impacts. The route variations are shown on Map 3-11. FL-5 and FL-6 proceed around the western end of Fox Lake before proceeding along the existing Lakefield to Border 161 kV line and back to route A. FL–2, FL-3 and FL-4 proceed along the southern edge of Fox Lake and then around its eastern end before rejoining route A. FL-1 crosses Fox Lake, double-circuiting with the existing 161 kV line that crosses the lake.

Variations FL-3 and FL-4, in addition to being analyzed as routes for the 345 kV line, are also analyzed as routes which remove the existing 161 kV line from Fox Lake and double-circuit it with the 345 kV line (Map 3-12). To remove the existing 161 kV from the Fox Lake, the line would need to come out of the Fox Lake substation and proceed southward toward I-90 on a short stretch of new 161 kV line until it connected with route variations FL-3 and FL-4. From there the line would be double-circuited with the 345 kV line on route variation FL-3 or FL-4 until reconnecting with route A northeast of Fox Lake.

Lake Charlotte

Five route variations (LC-1 through LC-5) are evaluated to possibly better navigate the Lake Charlotte area and mitigate potential impacts. These route variations are shown on Map 3-13. LC-1, LC-2 and LC-5 proceed around the southern end of Lake Charlotte along 160th St. before turning north and rejoining route A. LC-3 also proceeds around the southern end of Lake Charlotte but does so further south, near Kiester Lake. LC-3 then proceeds north along Highway 15 before rejoining route A. LC-4 crosses Lake Charlotte, paralleling or double-circuiting the existing 161 kV line that crosses the lake.

Four variations (LC-1, LC-2, LC-3 and LC-5), in addition to being analyzed as routes for the 345 kV line, are also analyzed as routes which remove the 161 kV line from Lake Charlotte and double-circuit it with the new 345 kV line. The various options for removing the existing 161 kV line from the lake and double-circuiting with the 345 kV line are shown on Map 3-14. For all of these options, the 161 kV line would leave the double-circuiting and proceed north along 210th Ave. to the Rutland substation. The 345 kV line would proceed for a brief length as a single circuit until it returns to route A and is double-circuited with the 161 kV line once again (Map 3-14).

Center Creek WMA

A route variation (CC-1) along route B is evaluated to avoid lands recently added to the Center Creek Wildlife Management Area. This route variation is shown on Map 3-15.

3.6.3 Huntley to Iowa Border

ITCM proposed routes A and B and connectors at the Pilot Grove Lake WPA for the project to connect to the Huntley substation and proceed south to the Iowa border (Map 3-1). Two route alternatives and five route variations are evaluated in this EIS for the Huntley to Iowa border segment of the project. Route alternatives A2-HI and B2-HI are shortened versions of routes A and B that would be used only if an alternative southern location for the Huntley substation were selected by the Commission.

The route variation in the northern portion of route A1-HI (route variation HI-1) avoids crossing the Blue Earth River and is shown on Map 3-16. If route variation HI-1 were selected as the route for the project, the existing 161 kV line be removed from the Blue Earth River and double-circuited with the 345 kV line. The other four route variations (HI-2, HI-3, HI-4 and HI-5) in the southern portion of route A1-HI avoid impacts to residences, a waterfowl production area and other features. These route variations are shown on Map 3-17. If route variations HI-4 or HI-5 were selected as the route for the project, the existing 161 kV line would be removed and double-circuited with the 345 kV line.

3.7 Engineering and Design

ITCM's project is a HVTL that requires extensive engineering and design to perform properly and safely. This section discusses the structures and conductors that will be used for the project. Additionally, this section discusses the possibility of undergrounding a portion of the line and the potential impacts of doing so.

3.7.1 Transmission Lines

HVTL circuits generally consist of three phases, each at the end of a separate insulator and physically supported by structures. A phase consists of one or more conductors (single, double or bundled). A typical conductor is a cable consisting of aluminum wires stranded around a core of steel wires. There may also be shield wires strung above the phases to prevent damage from potential lightning strikes. The shield wire could also include a fiber optic cable that allows substation protection equipment to communicate with other terminals on the line.

Figure 3-2 shows the major components of a typical double-circuit HVTL structure. There are three conductors per circuit because power plants generate electricity such that each of the three conductors operates at a different phase.

Figure 3-2 Typical Double-Circuit HVTL

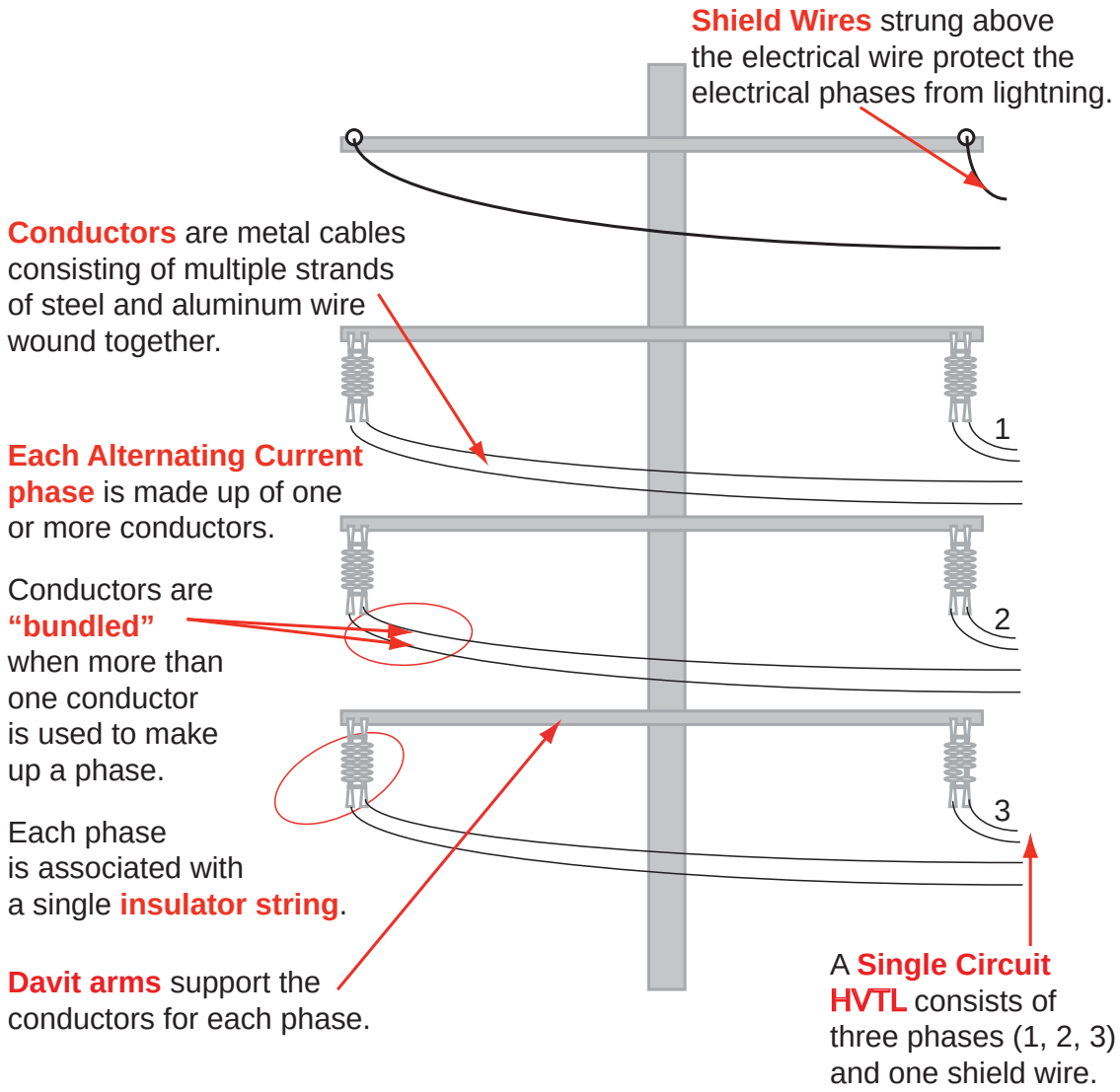


Figure **depicts a Double Circuit HVTL** consisting of six phases, and two shield wires.

Transmission lines are usually either single-circuit, (carrying one three-phase conductor set), or double-circuit (carrying two three-phase conductor sets, totaling six conductors). The various structure configurations proposed for this project are described in the following sections.

345 kV Transmission Line

The project would use single pole, weathering or galvanized steel structures built to 345 kV/161 kV double-circuit standards. A single pole structure is typically installed on a concrete foundation. The 345 kV transmission line poles would range from 130 to 190 feet in height, with a span between structures in the range of 700 to 1,000 feet. The project could require the use of specialty structures to mitigate specific impacts of the project or to ensure structural design criteria are met (e.g., low-profile structures, lake crossing structures). Schematics of typical 345 kV/161 kV double-circuit capable structures that could be used for the project are provided in Appendix C. Davit arms extend approximately 23 feet on either side of the pole. Table 3-2 provides a summary of the design features of these structures.

Route A anticipates co-locating the 345 kV line with the existing Lakefield to Border 161 kV line for approximately 75 percent of its length. If route B is selected – a route which is not co-located with existing transmission lines – the 345 kV/161 kV double-circuit capable structures would allow for future expansion of the transmission system. Only the 345 kV arms, however, would be

Table 3-2 345 kV Structure Design Summary

Design Configuration	Initial Operation	Structure Type	Structure Material	Right-of-Way Width (feet)	Structure Height	Structure Base Diameter (feet)	Foundation Diameter (feet)	Span Between Structures (feet)
345 kV/161kV	345 kV/161 kV	Single Pole Davit Arm	Steel	200	130-190	Tangent: 5 Angle: 9	Tangent: 8 Angle: 12	700-1000
		2 Pole	Steel	200	130-190	Deadend: 9	Deadend: 12	700-1000
		Single Pole Davit Arm Low Profile	Steel	200	100-160	Tangent: 5 Angle: 9	Tangent: 8 Angle: 12	500-1000
		3 Pole Low Profile	Steel	200	100-160	Deadend: 9	Deadend: 12	500-1000
345 kV/161 kV	345 kV/69 kV	Single Pole Davit Arm	Steel	200	130-190	Tangent: 5 Angle: 9	Tangent: 8 Angle: 9	700-1000
		2 Pole	Steel	200	130-190	Deadend: 9	Deadend: 12	700-1000
345 kV/161 kV	345 kV/none	Single Pole Davit Arm	Steel	200	130-190	Tangent: 5 Angle: 9	Tangent: 8 Angle: 9	700-1000
		2 Pole	Steel	200	130-190	Deadend: 9	Deadend: 12	700-1000
		Single Pole Davit Arm Low Profile	Steel	200	100-160	Tangent: 5 Angle: 9	Tangent: 8 Angle: 12	500-1000
		3 Pole Low Profile	Steel	200	100-160	Deadend: 9	Deadend: 12	500-1000

installed as part of the project. The 161 kV arms, insulators and conductors would be added in the future as conditions warrant. For route B, the existing Lakefield to Border 161 kV transmission line would remain in its current location except for approximately 1.5 miles in Verona Township, Faribault County that would have to be relocated to connect to the new Huntley substation.

161 kV Transmission Lines

The 161 kV transmission lines that currently terminate at the existing Winnebago Junction substation would be reconfigured to terminate at the new Huntley substation as part of the project.

For these existing 161 kV lines, single pole, single circuit and 161 kV/161 kV single pole, double-circuit structures would be used. These structures would be constructed of galvanized or weathering steel. The transmission line poles would range from 130 to 190 feet in height, with span between structures in the range of 600 to 800 feet. Where double-circuit structures are used, one of the circuits may initially be operated at 69 kV; however, the structures would be built to 161 kV/161 kV double-circuit standards. Schematics of typical 161 kV structures that could be used for the project are provided in Appendix C. Table 3-3 provides a summary of the design features of these structures.

As with the 345 kV structures, other specialty 161 kV structures could be required for the project to mitigate specific impacts or ensure structural integrity.

3.7.2 Undergrounding

During the scoping process, commenters suggested burying portions of the proposed transmission line to avoid adversely affecting residents in the project area. Undergrounding of transmission lines can be a feasible option, especially for lower voltage transmission lines. However, at higher voltages, undergrounding becomes progressively more complex. It is common today to see lower voltage distribution lines that connect to homes and businesses buried directly in the ground using fairly non-invasive construction methods. In these cases, undergrounding offers aesthetic and environmental benefits while posing relatively few construction, maintenance and operational challenges.

At transmission line voltages typically of 115 kV and higher, undergrounding is an exception; it is a mitigation strategy that is used only when aboveground placement of a transmission line is not feasible or not allowed by law. In general, underground lines are more reliable. Overhead transmission lines fail, on average, once every 17.8 years, underground transmission lines fail once every 50.5 years (Reference 2). However, underground lines are significantly more costly to construct, more costly to repair, and when a failure does occur they require significantly more time to repair.

Construction

Installation of an underground transmission line typically requires construction of a duct and vault system – the ducts provide a means to safely place the conductors underground; the vaults provide access points for workers to install the conductors, and to inspect and repair them. Vaults would be spaced periodically along the route and would be relatively larger than the ducts to allow for working space.

In general, there are three major types of underground transmission facilities: high and low pressure oil-filled systems; solid dielectric systems; and compressed gas insulated systems. These systems could require the installation of additional underground conductors to meet the equivalent capacity requirements of an overhead line. Depending on the type of undergrounding system used, cooling equipment could be required at underground transmission line substations.

Constructing the duct and vault system for the underground transmission line would result in greater temporary construction impacts than the proposed overhead line. Construction requires trenching and digging along the entirety of the route, as opposed to an overhead line, which requires digging only at structure locations. Burying transmission lines rather than placing them overhead increases noise, dust and traffic disruption during construction. Considerable clearing and grading would need to occur, and dust and noise from construction would last three to six times as long as that for an overhead line.

Underground construction typically takes two to three days for each 200-foot section of trench, with approximately 500 to 700 feet of trench open at one time. Steel plates are typically placed over open sections of trench when crews are not at that location. Access to homes (driveways, yards, parking) may be limited for several days or weeks

Table 3-3 161 kV Structure Design Summary

Design Configuration	Initial Operation	Structure Type	Structure Material	Right-of-Way Width (feet)	Structure Height	Structure Base Diameter (feet)	Foundation Diameter (feet)	Span Between Structures (feet)
161 kV/161 kV	161 kV/161 kV	Single Pole Braced Post	Steel	150	80-120	Tangent: 3.5 Angle: 7	Tangent: NA Angle: 10	600-800
		Single Pole Davit Arm	Steel	150	80-120	Deadend: 7	Deadend: 10	600-800
161 kV/161 kV	161 kV/69 kV	Single Pole Braced Post	Steel	150	80-120	Tangent: 3.5 Angle: 7	Tangent: NA Angle: 10	600-800
		Single Pole Davit Arm	Steel	150	80-120	Deadend: 7	Deadend: 10	600-800
161 kV	69 kV	Single Pole Braced Post	Steel	150	70-110	Tangent: 3 Angle: 5	Tangent: NA Angle: 8	600-800(1)
		Single Pole Davit Arm	Steel	150	80-120	Deadend: 7	Deadend: 10	600-800(1)

(1) Spans will be 250-300 feet where proposed to be co-located with distribution lines along 170th Street

during construction, and local traffic would likely be rerouted to other streets or redirected by a traffic monitor. Underground conductors of the size appropriate for this project are generally limited to 1,000-foot segments, due to the state of the technology, materials and shipping weight and size restrictions.

Electromagnetic Fields

The calculated EMF profiles for underground transmission lines generally show a higher EMF level directly above the line, when compared to an overhead line, but the fields decrease faster with distance compared to levels under overhead lines.

Electric fields created by transmission lines can be blocked by different objects such as trees, structures, cars and soil; therefore, electric fields may be significantly diminished by undergrounding transmission lines. Magnetic fields, however, are difficult to block and would continue to pass through the ground. Regardless of overhead or underground construction, magnetic and electric field intensities decrease with distance from the line.

Cost

The estimated cost of constructing an underground transmission line ranges from 4 to 14 times more expensive than overhead lines of the same voltage and distance (Reference 2). These additional costs are due to extra time and materials and specialized labor needed for underground lines. An underground transmission line must also be routed to avoid other underground installations such as water, gas and sewer lines. Unstable slopes, hazardous material sites, wetlands and bedrock must be avoided. Going under a road, highway or river requires expensive construction techniques such as directional boring. These factors as well add to the cost differential.

Maintenance

Although underground transmission lines rarely fail, a major disadvantage of underground transmission lines is the difficulty of finding and repairing failures. While overhead failures can usually be found visually, it can be difficult to locate a failure on an underground line. While overhead failures can usually be repaired in hours, repairs on an underground system can be more complex. Underground cable failures must first be located and excavated. These excavated repairs can take weeks or months, depending on the extent of damage and the availability of replacement materials. The average time to resolve a failure on an overhead transmission line is nine hours. The average time to resolve a failure on an underground transmission line is three weeks (Reference 2). Thus, underground lines pose a risk of long term outages and the costs of repairing an underground transmission line can be significantly higher than that of repairing an overhead transmission line.

3.7.3 Lake Crossings

Fox Lake and Charlotte Lake are located near ITCM's proposed routes and are crossed by the existing Lakefield to Border 161 kV line. This EIS analyzes route variations that cross Fox Lake (FL-1) and Lake Charlotte (LC-4). Crossings of these lakes, either parallel to the 345 kV line or double-circuited with the 345 kV line, would require specialty structures. Schematics of specialty structures that could be used for these lake crossings are provided in Appendix C. Photo-simulations of these crossings are provided in Appendix D.

3.8 Construction and Maintenance Procedures

Construction of the project would not begin until all necessary federal, state and local approvals have been obtained, easements have been acquired for the ROWs, and final plans and profiles have been approved by the Commission. The precise timing and order of ROW clearing and construction along the line would depend on permit conditions, system loading issues, when existing transmission lines can be taken out of service for construction to proceed, and available workforce.

3.8.1 Right-of-Way Acquisition

One of the first steps in the construction process is to acquire an easement from each of the landowners along the transmission line route. Prior to contacting these landowners, ITCM would conduct a title search to identify all persons and entities that have a recorded interest in the affected real estate. Once ownership has been determined, a ROW agent would contact each landowner. The ROW agent would discuss with the landowner where the structure(s) would be located on the property, as well as the boundaries of the easement.

The ROW agent would collect area land value data to determine the amount of just compensation to be paid for the rights to build, operate and maintain the transmission facilities in the easement. Using

this information, the ROW agent prepares the necessary documents to acquire the easement and makes an offer to the landowner.

If a negotiated settlement cannot be reached with a landowner, ITCM would acquire an easement through exercise of the power of eminent domain pursuant to Minnesota Statutes, Chapter 117. The process of exercising the power of eminent domain is called condemnation.

If the land is condemned, ITCM would provide the landowner with a copy of each appraisal it has obtained for the property interests to be acquired. To initiate the condemnation process, ITCM would file a petition in the district court in the county where the property is located. If the court approves the petition, the court appoints a three-person condemnation commission. Once appointed, the commissioners schedule a viewing of each parcel identified in the petition.

Next, the commissioners schedule a valuation hearing, where the utility and landowner present testimony and evidence about the just compensation for acquiring the easement. The commission then makes an award of just compensation and files it with the court. The utility and the landowner are both bound by the award. Each may appeal the award to the district court. At any point in this process, the case can be dismissed if the parties reach a settlement.

There may be instances where landowners elect to exercise their rights under Minnesota Statutes, section 216E.12, subdivision 4, which would require ITCM to purchase their property, rather than acquiring only an easement for the transmission facilities. This statute, sometimes referred to as the "Buy-the-Farm" statute, applies only to transmission facilities that are 200 kV or more; thus, this statute would apply to parcels crossed by the 345 kV transmission line but not to parcels crossed by the 161 kV transmission line.

Once ROW is acquired and prior to construction, the ROW agent would contact each owner to discuss the construction schedule and requirements. To ensure safe construction, special consideration may be needed for fences, crops or livestock. Fences or livestock, for example, might need to be moved, or temporary or permanent gates might need to be installed. In each case, the ROW agent would coordinate with the landowner, who would be compensated for project-related construction damages.

3.8.2 Right-of-Way Access

Wherever feasible, ITCM indicates that it would traverse the ROW acquired for the project to access construction areas, which would minimize impacts to landowners and adjacent properties. In some situations, however, private field roads, trails or fields must be used to gain access to areas for construction. Where no current access is available or existing access is inadequate to cross roadway ditches or other features, new access roads could be constructed. Permission from landowners would be obtained prior to using any of these areas to access the ROW for construction.

ITCM notes that it would also upgrade existing roads or construct new roads, where necessary. If new roads must be constructed, in addition to obtaining permission from landowners, ITCM would need to obtain necessary permissions from the local road authority. During construction activities, ITCM indicates that it would work with appropriate road authorities to ensure proper maintenance of roadways traversed by construction vehicles.

3.8.3 Equipment and Staging Areas

ITCM anticipates that construction of the project would require the use of many different types of construction equipment, including cranes, backhoes, track-mounted drill rigs, dump trucks, front-end loaders, concrete trucks and various trailers or other hauling equipment. Excavation equipment is often set on wheel or track-driven vehicles. ITCM indicates that wherever possible, construction crews would use equipment that minimizes land impacts.

Staging areas would be required for the project. Staging areas would be identified after a route is selected and are typically set up at intervals of approximately 25 miles along the route. These staging areas would be used as receiving locations for the delivery and storage of construction materials and equipment for the project. For staging areas outside the transmission line ROW or not located on property owned by ITCM, rights to use these areas would be obtained individually from affected landowners.

3.8.4 Construction Process

Construction would progress generally as follows: survey marking of the ROW; ROW clearing and preparation; grading or filling, where necessary; installation of concrete foundations; installation of poles with insulators and hardware attached;

conductor stringing; and installation of any markers required by state or federal permits on conductors or shield wires.

Concrete foundations would require the drilling of a hole approximately eight to ten feet in diameter. Angle, dead-end and specialty structures could require foundations up to 12 feet in diameter. Foundation depths would depend on structure type and soil conditions, but would typically be 25 feet or more. Further details regarding the applicant's construction procedures are provided in Section 3.3.2 of the route permit application.

At substations, after all property has been acquired, survey marking and clearing preparation would begin. Once substation grading has been completed, concrete foundations would be placed throughout the substation for pad-mounted substation equipment. Substation perimeter fencing would then be installed. All substation equipment would be contained within the fenced area.

Construction of the substation control house, which encloses protective relaying and control equipment, would also occur at this time. Erection of steel structures would occur after foundations have properly cured. Large high voltage equipment, such as circuit breakers and transformers, are installed following completion of the steel structures.

3.8.5 Restoration Procedures

Although crews would attempt to minimize ground disturbance wherever possible, some areas would be disturbed during the normal course of work. ITCM indicates that once construction is completed, disturbed areas would be restored to their original condition to the maximum extent feasible. Temporary restoration before the completion of construction in some areas along the ROW or at substation sites may be required in accordance with Minnesota Pollution Control Agency (MPCA) construction permit requirements.

Construction activities on agricultural land would be conducted in accordance with an Agricultural Impact Mitigation Plan (AIMP) approved by the Minnesota Department of Agriculture. An example AIMP is provided in Appendix E. After construction activities have been completed, and in accordance with the AIMP, ITCM would contact the property owner to discuss any damage to crops, fences or drain tile, and repair any identified damages or reimburse the landowner for the damages.

It is anticipated that ground-level vegetation disturbed or removed from the ROW during construction would naturally reestablish to pre-construction conditions. In areas where soil compaction or other construction-related disturbances impair reestablishment, ITCM indicates that it would reseed these areas with seed that is free from noxious weeds. Vegetation that is consistent with substation site operation outside the fenced area would be allowed to reestablish naturally at substation sites.

Various best management practices would be used to control erosion and sedimentation. These practices are noted in the Commission's generic route permit template (Appendix B). Such practices may also be required by MPCA construction permits. Some commonly used methods to control soil erosion during construction include erosion control blankets, silt fences and straw bales.

ITCM also indicates that it would ensure that township, city and county roads used for access during construction would be returned to either the condition they were in, or better. ITCM indicates that it would meet with township road supervisors, city road personnel or county highway departments to address any issues that arise during construction with roadways to ensure the roads are adequately restored, if necessary, after construction is complete.

3.8.6 Maintenance Procedures

ITCM estimates the service life of its transmission lines to be approximately 55-60 years. Practically speaking, however, high voltage transmission lines are seldom retired. This infrastructure has very few mechanical elements and is designed and constructed to withstand weather extremes typical for the region. Transmission lines rarely fail, except occasionally in extreme weather.

Protective relaying equipment would automatically take the project's transmission facilities out of service when a fault is sensed on the system. These interruptions are usually only momentary. Outages necessary for scheduled maintenance are also infrequent. Because of these general operational characteristics, the average annual availability of transmission infrastructure exceeds 99 percent.

Inspections are typically conducted semi-annually by helicopter with a forester, vegetation planner and line inspector; annually by ground with a forester; and once every four years by ground with a line inspector. These inspections examine the general

condition of the lines, structures and ROW, and look for encroachments on the ROW.

A certain amount of maintenance is required at substations to ensure proper operation within NESC and NERC standards. Various equipment, including transformers, circuit breakers, batteries and protective relays, must be periodically serviced according to the manufacturers' guidelines.

3.8.7 Abandonment and Decommissioning

It is possible, depending on the route selected by the Commission, that segments of existing 161 kV transmission line would be abandoned as part of the project. Additionally, it's possible that at some time in the future the project may no longer be needed to transmit electricity and would be decommissioned. For both scenarios – abandonment and decommissioning – existing facilities to be retired from service would be removed. For transmission line structures that do not have footings, ITCM indicates that it would, if possible, extract the pole from the ground. If a pole cannot be extracted by pulling, ITCM would excavate to uncover approximately 60 percent of the buried pole and would try again to extract it. If the pole cannot be removed in its entirety, the pole would either be cut off at the excavated depth (approximately five feet) or pushed over if the pole cannot be cut. The excavated area would be backfilled to match existing grade.

For transmission line structures that have concrete footings, ITCM indicates that it would excavate to five feet below grade, remove the concrete, cut off any exposed reinforcing steel and anchor bolts and remove support anchors. Before removing the anchors, ITCM would work with landowners to identify any tile lines near the anchor points. After removal of the footings and anchors, the excavated area would be backfilled to match existing grade and the land restored to previous conditions.

ITCM indicates that it would take extra measures as necessary to ensure that farming operations can resume on tillable land affected by the abandonment of transmission structures.

3.9 Project Costs

The total cost for the project is estimated to be between $194 million and $206 million (plus or minus 30 percent), depending on the route selected. A breakdown of costs for the project is provided in Table 3-4.

3.10 Project Schedule

It is anticipated that the Commission will make decisions on ITCM's CN and route permit applications in the third quarter of 2014. ITCM plans to complete all permitting, in Minnesota and Iowa, by the end of the third quarter of 2015 (including all federal and state agency permits, environmental permits and local permits in both states; see Section 2.3). ROW clearing would begin in fourth quarter of 2015, followed by initiation of construction in first quarter of 2016. ITCM plans to have the project in service by the second quarter of 2017.

Table 3-4 Estimated Project Costs

Project Facility	Estimated Costs ($ millions)	
	Route A	Route B
345 kV Transmission Line	164	152
Lakefield Junction Substation	6	6
Huntley Substation	33	33
Associated Facilities	3	3
Total	206	194

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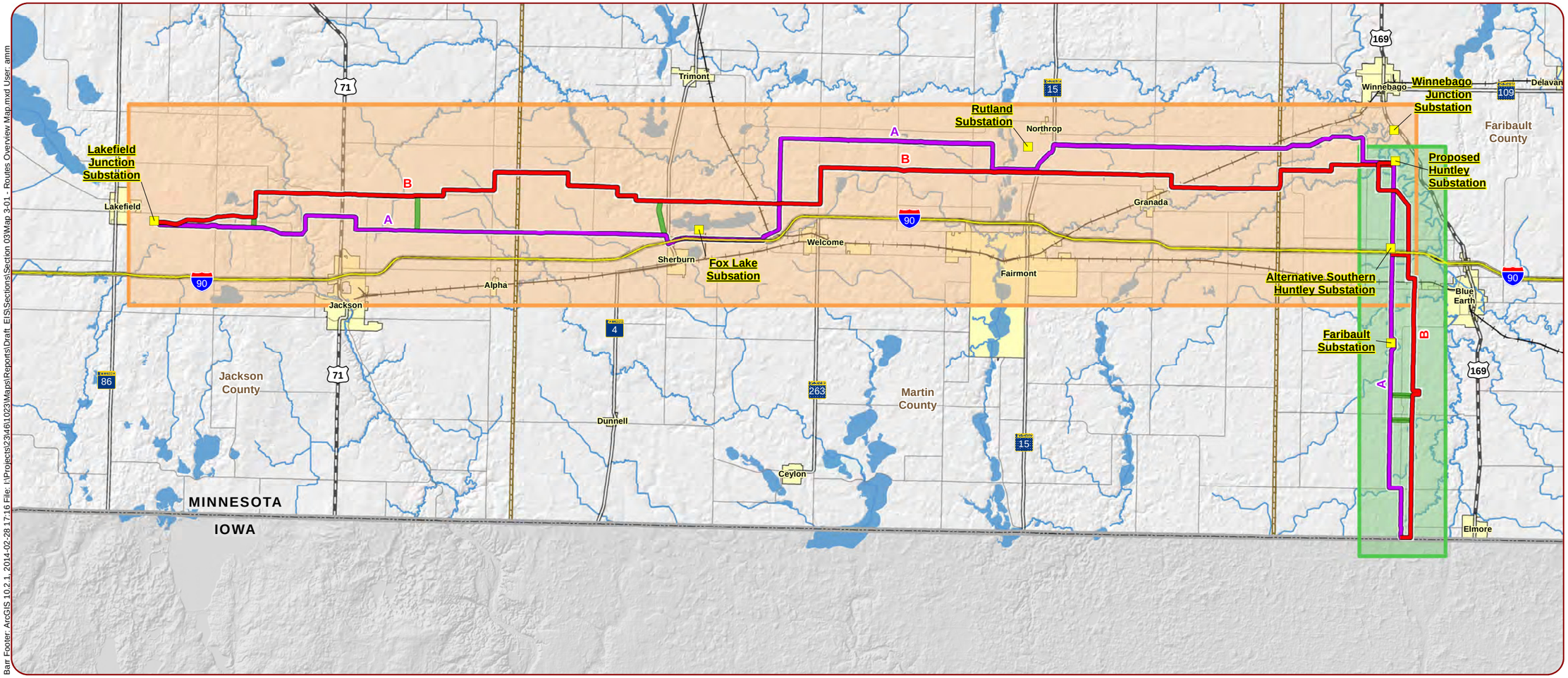


Barr Footer: ArcGIS 10.2.1, 2014-02-28 17:16 File: I:\Projects\23\46\1023\Maps\Reports\Draft_EIS\Sections\Section 03\Map 3-01 - Routes Overview Map.mxd User: amm

0 1 2 4 6 Miles

0 2.5 5 10 Kilometers

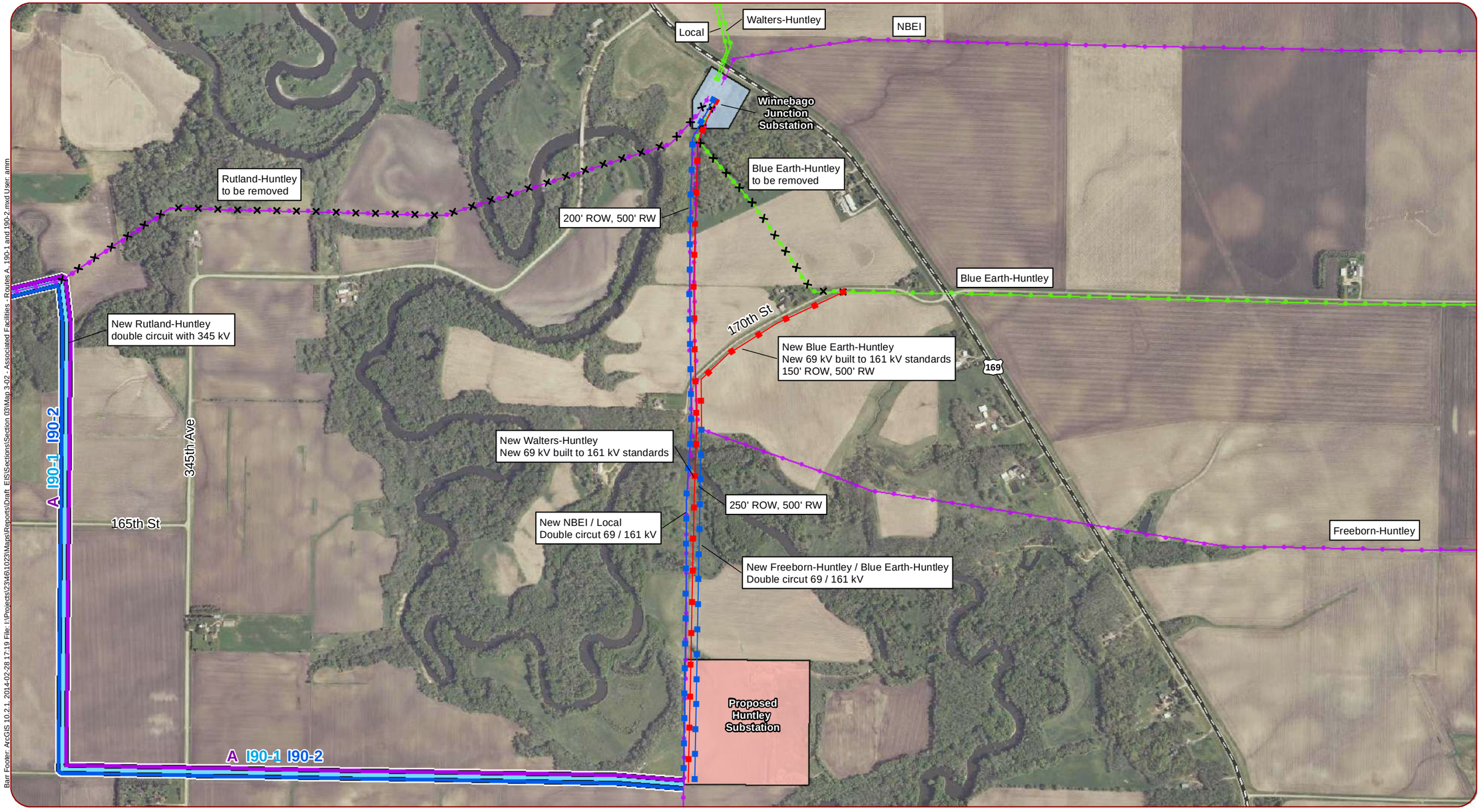
Routes
- A
- B

- Connector Segment
- Project Substation
- Segment 1: Lakefield to Huntley
- Segment 2: Huntley to Iowa border

- Municipal Boundary
- County Boundary
- State Boundary

Map 3-1

Routes Overview Map
Minnesota-Iowa 345 kV Transmission Project
ITC Midwest LLC



Barr Footer: ArcGIS 10.2.1, 2014-02-28 17:19 File: I:\Projects\23\46\1023\Maps\Reports\Draft_EIS\Sections\Section 03\Map 3-02 - Associated Facilities - Routes A, I90-1 and I90-2.mxd User: amm

0 500 1,000 2,000 Feet

0 200 400 800 Meters

Route

A

Route Alternatives

I90-1

I90-2

Proposed Huntley Substation

Winnebago Junction Substation

Existing 69 kV Line

Existing 161 kV Line

New Double Circuit 69/161kV

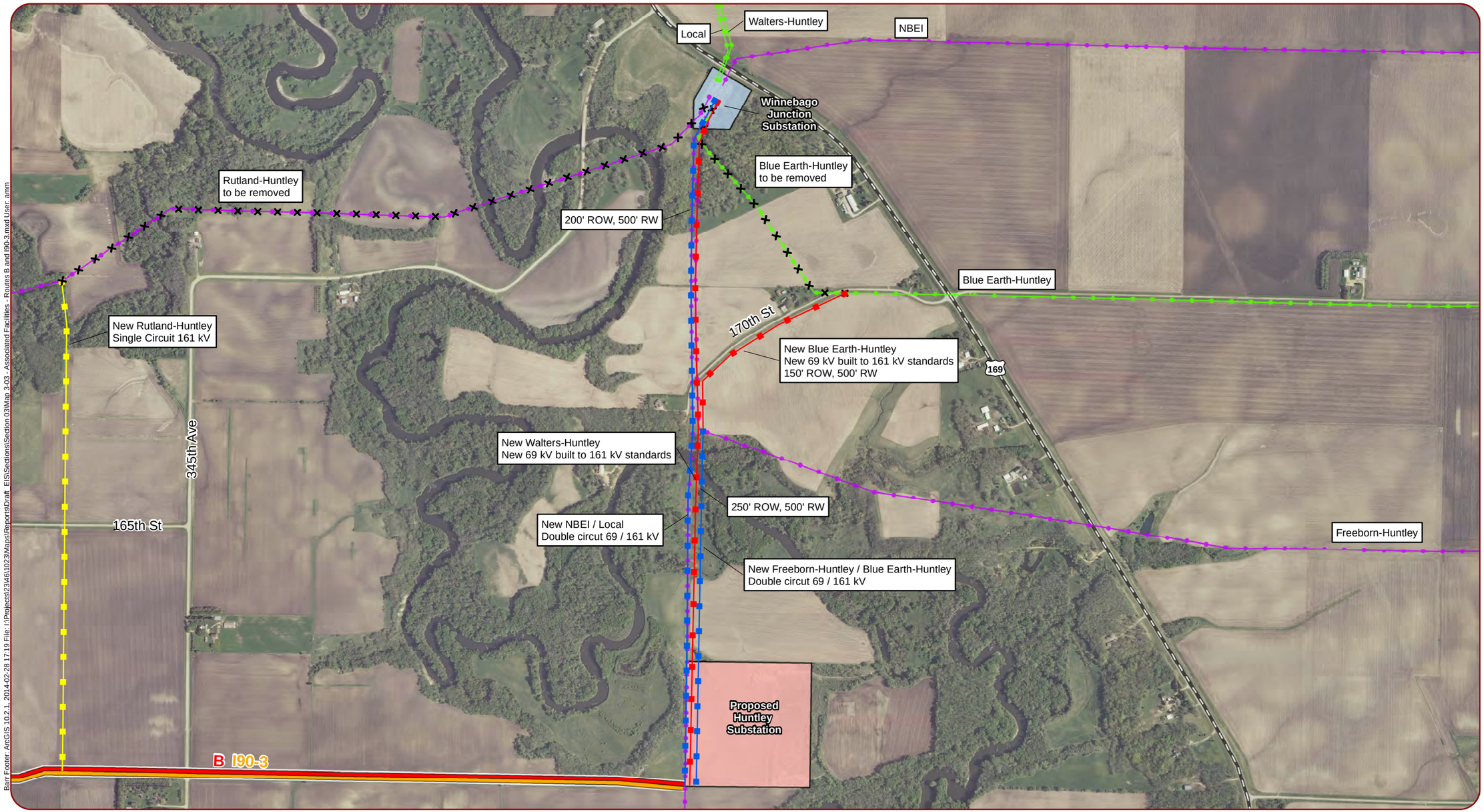
New 69kV Built to 161kv Standards

Existing 69kV or 161kV Line To be Removed

Note:
Anticipated alignments are shown offset for display purposes only. Please refer to more detailed figures for precise alignment placement.

Map 3-2

Associated Facilites - Routes A, I90-1 and I90-2
Minnesota-Iowa 345 kV Transmission Project
ITC Midwest LLC



Barr Footer: ArcGIS 10.2.1, 2014-02-28 17:19 File: I:\Projects\23\46\1023\Maps\Reports\Draft_EIS\Sections\Section 03\Map 3-03 - Associated Facilities - Routes B and I90-3.mxd User: amm

0 500 1,000 2,000 Feet

0 200 400 800 Meters

Route

B

Route Alternative

I90-3

Proposed Huntley Substation

Winnebago Junction Substation

Existing 69 kV Line

Existing 161 kV Line

New 161kV Single Circuit

New Double Circuit 69/161kV

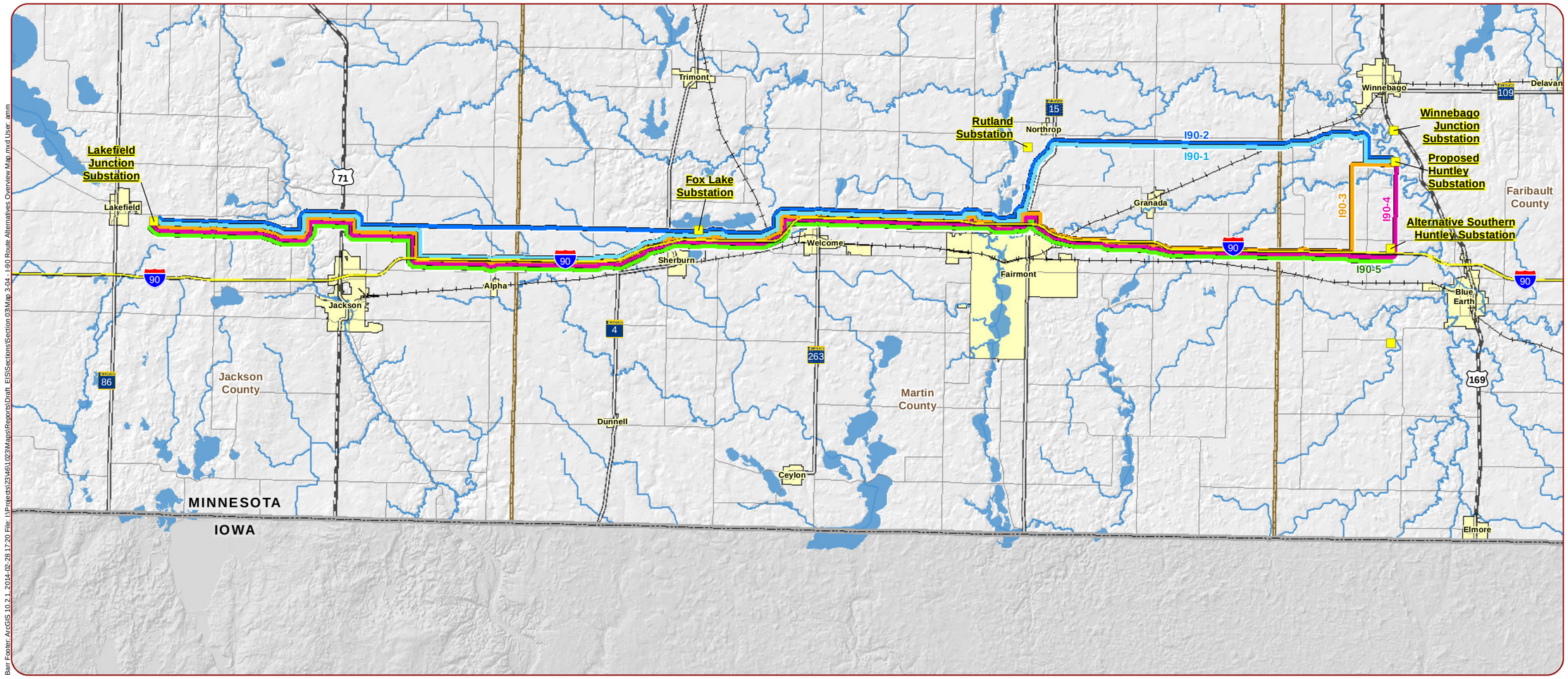
New 69kV Built to 161kv Standards

Existing 69kV or 161kV Line To be Removed

Note:
Anticipated alignments are shown offset for display purposes only. Please refer to more detailed figures for precise alignment placement.

Map 3-3

Associated Facilites - Routes B and I90-3
Minnesota-Iowa 345 kV
Transmission Project
ITC Midwest LLC



0 1 2 4 6 Miles

0 2.5 5 10 Kilometers

Route Alternatives
- I90-1
- I90-2
- I90-3
- I90-4
- I90-5

- Project Substation
- Municipal Boundary
- County Boundary
- State Boundary

Note:
Anticipated alignments are shown offset for display purposes only.
Please refer to more detailed figures for precise alignment placement.

Map 3-4

I90 Route Alternatives Overview Map
Minnesota-Iowa 345 kV
Transmission Project
ITC Midwest LLC