PHASE I ARCHAEOLOGICAL SURVEY FOR THE ELM CREEK II WIND PROJECT IN JACKSON AND MARTIN COUNTIES, MINNESOTA

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OSA License No. 09-030
Elm Creek Wind II, LLC (ECWII), a wholly owned subsidiary of Iberdrola Renewables, Inc., is proposing to construct a utility-scale wind farm, the Elm Creek II Wind Project, in Jackson and Martin counties, Minnesota. HDR Engineering, Inc. (HDR) subcontracted with Florin Cultural Resource Services, LLC (FCRS) to complete a Phase I archaeological survey of the proposed wind turbine locations, meteorological stations, access roads, laydown areas, operations and maintenance areas, and the underground and overhead electric collection system for the Elm Creek II Wind Project. ECWII committed to this work in response to the requirements of the Minnesota Public Utility Commission’s Site Permit for the Elm Creek II Wind Large Wind Energy Conversion System in Jackson and Martin counties (PUC Docket No. IP6728/WS-09-553) and also under the requirements of the Minnesota Historic Sites Act and the Minnesota Field Archaeology Act. This project does not involve federal funding or permitting and is not subject to federal historic preservation regulations.

The Elm Creek II Wind Project is in Archaeological Region 2s: Prairie Lake South in southwestern Minnesota. The project area includes: T104N R33W Sections 19, 20, 29, 32; T103N R34W Sections 1, 2, 11-13, 23-28, 33-36; T103N R33W Sections 5-7, 18-20, 30; and T102N R34W Sections 1-4 and 9 (Figure 1).

Fieldwork was conducted between November 12, 2009, and December 4, 2009. Frank Florin was the principal investigator for F CRS. The Phase I archaeological investigation included a literature search, pedestrian survey, and shovel testing. Pedestrian survey was conducted for approximately 850 acres, and twelve shovel tests were dug in three areas. No archaeological sites were identified during the Phase I archaeological survey.

The Elm Creek II Wind Project includes 77 wind turbine pads, three meteorological towers, two laydown areas, two operations and maintenance laydown areas, an operations and maintenance substation, and approximately 51.8 miles of associated infrastructure that includes access roads and an underground and overhead electric collection system.

Phase I archaeological survey was completed for 61 wind turbine pads, two meteorological towers, two laydown areas, one operations and maintenance laydown area, an operations and maintenance substation, approximately 26.3 miles of associated access roads and underground electric collection system, and 6.3 miles of overhead electrical collection system.

All of the land surveyed was in agricultural fields, except for a few small areas of fallow fields and woodlots. The landscape is characterized by rolling glacial till plains and hilly moraines of the Des Moines lobe. The project crosses Elm Creek and the South Fork of Elm Creek.

Sixteen turbine pads, approximately 14.6 miles of access road and underground electrical collection system, approximately 4.6 miles of overhead electrical collection system, one meteorological tower pad, and an operations and maintenance laydown area could not be surveyed because of a lack of surface visibility or lack of landowner consent prior to when surveys ended for the 2009/2010 winter season. FCRS recommends that survey be conducted for those portions of the project that have not been surveyed and for any project design changes that are outside of the original survey corridors.

It is the opinion of FCRS that no archaeological sites eligible for or listed on the NRHP will be affected in the portions of the project area that have been surveyed to date.
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1. PROJECT DESCRIPTION

1.1 Overview

Elm Creek Wind II, LLC (ECWII), a wholly owned subsidiary of Iberdrola Renewables, Inc., is proposing to construct a utility-scale wind farm, the Elm Creek II Wind Project, in Jackson and Martin counties, Minnesota (Figures 1 to 12). HDR Engineering, Inc. (HDR) subcontracted with Florin Cultural Resource Services, LLC (FCRS) to complete a Phase I archaeological survey of the proposed wind turbine locations, meteorological stations, access roads, laydown areas, operations and maintenance areas, and underground and overhead electric collection system for the Elm Creek II Wind Project. ECWII committed to this work in response to the requirements of the Minnesota Public Utility Commission’s Site Permit for the Elm Creek II Wind Energy Conversion System in Jackson and Martin counties (PUC Docket No. IP6728/WS-09-553) and also under the requirements of the Minnesota Historic Sites Act and the Minnesota Field Archaeology Act. This project does not involve federal funding or permitting and is not subject to federal historic preservation regulations.

1.2 Project Description and Area of Potential Effect

The Elm Creek II Wind Project includes 77 wind turbine pads, three meteorological towers, two laydown areas, two operations and maintenance laydown areas, an operations and maintenance substation, and approximately 51.8 miles of associated infrastructure that includes access roads and an underground and overhead electric collection system.

Fieldwork was conducted between November 12, 2009, and December 4, 2009. Frank Florin was the principal investigator for FCRS. The Phase I archaeological investigation included a literature search, pedestrian survey, and shovel testing.

Phase I archaeological survey was completed for 61 wind turbine pads, two meteorological towers, two laydown areas, one operations and maintenance laydown area, an operations and maintenance substation, approximately 26.3 miles of associated access roads and underground electric collection system, and 6.3 miles of overhead electrical collection system. Approximately 850 acres were surveyed for archaeological resources, and twelve shovel tests were dug in three areas adjacent to Elm Creek. The survey results are summarized in Section 7.

Sixteen turbine pads, approximately 14.6 miles of access road and underground electrical collection system, approximately 4.6 miles of overhead electrical collection system, one meteorological tower pad, and an operations and maintenance laydown area could not be surveyed because of a lack of surface visibility or lack of landowner consent prior to when surveys ended for the 2009/2010 winter season. These areas are summarized in Section 7.4. FCRS recommends that survey be conducted for those portions of the project that have not been surveyed and any project design changes that are outside of the original survey corridors.

The project area is in Archaeological Region 2s: Prairie Lake South in southwestern Minnesota. The landscape consists of the rolling glacial till plains and hilly moraines of the Des Moines lobe. All of the land surveyed was in agricultural fields, except for a few small areas of fallow fields and woodlots. The project area includes: T104N R33W Sections 19, 20, 29, 32; T103N R34W Sections 1, 2, 11-13, 23-28, 33-36; T103N R33W Sections 18-20, 30; and T102N R34W Sections 1-4 and 9.

The archaeological survey area is bounded by 220th Street on the north, 30th Avenue on the east, 110th Street on the south, and 10th Avenue on the west. The land in the project area is privately
owned except for the road rights-of-way (ROW). A permit to conduct archaeological investigations was obtained from the Minnesota Office of State Archaeologist prior to commencing fieldwork (Appendix A).

Survey limits for the project features were as follows:

- Access roads and underground electric - survey corridors were 60 meters wide
- Overhead electric transmission lines - survey corridors were 30 meters wide
- Turbine and meteorological tower pads - survey areas were 91 by 91 meters
- Laydown areas and operations and maintenance substation – various acreage

The vertical extent of project impacts below the ground surface is as follows: 3.0 meters for the turbine tower foundations; 1.2 meters for the underground electric cabling; 2.0 meters for the overhead electric structures and meteorological tower pads; and less than 1.0 meter for the access roads, laydown areas, and operations and maintenance substation.

The survey limits and subsurface depths of impact specified above constitute the area of potential effect (APE) for the archaeological survey. The Phase I archaeological survey included a literature search, pedestrian survey, and shovel tests. No archaeological sites were identified.
Figure 1

Project Location

Archaeology Survey

Elm Creek II Wind Project

Jackson and Martin Counties, MN
Figure 1

Archaeology Survey
Elm Creek II Wind Project
Jackson and Martin Counties, MN
Figure 5
T103N, R33W, S5, 6
T104N, R33W, S32
Archaeology Survey
Elm Creek II Wind Project
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Elm Creek II Wind Project
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2. Research Design

2.1 Objectives

There are several objectives of the Phase I archaeological investigation: 1) to aid project sponsors in complying with the Minnesota Historic Sites Act and the Minnesota Field Archaeology Act; 2) to identify archaeological sites and assess their potential eligibility for listing on the National Register of Historic Places (NRHP); 3) to aid in project planning; and 4) to produce a report documenting the archaeological investigations.

2.2 Aspects of the Research Design

The report documents the results of research and fieldwork for the Elm Creek II Wind Project. The archaeological research design was developed to meet project objectives, and it adhered to the research and field method guidelines established by the Minnesota State Historic Preservation Office (MnSHPO). These methods, which included a literature search, fieldwork, analysis of data, and production of a technical report, are summarized below and discussed in greater detail in the following sections.

The literature search provided information on previous investigations, previously recorded sites, potential cultural resources depicted on historical maps, and the environmental setting. The results of the literature search are presented in Section 4.

Archaeological fieldwork included pedestrian survey and shovel tests. The pedestrian survey was used to identify artifacts or archaeological remains that were present on the ground surface. Shovel tests were used to identify artifacts that were present below the ground surface and to characterize soils at the survey areas. A more detailed discussion of the field methods is presented in Section 3.1 and the survey results are summarized in Section 7.

3. Field Methods

3.1 Archaeological Field Methods

The fieldwork for the Phase I archaeological survey adhered to MnSHPO guidelines for archaeological fieldwork. Background research was conducted prior to fieldwork to identify potential historic sites and determine if any previously recorded sites exist in the project area. Proposed turbine locations were staked by ECWII. The turbine locations, access roads, and electric collector alignments were mapped in a Geographical Information System (GIS) database. The proposed turbine locations and infrastructure alignments were uploaded to a Trimble Global Positioning System (GPS) with sub-meter accuracy, which provided the field crew with accurate locations for project alignments during survey.

3.1.1 Survey Design

The survey design was based on 1) the Mn/Model results for the Minnesota River Prairie subsection; 2) the location of previously recorded sites near the project area; and 3) intuitive field judgment. The Mn/Model indicates that areas of moderate and high archaeological site potential in the region are located primarily near major rivers and larger lakes (Hudak et al. 2002, Chapter 8.20 and Figures 8.20.3 and 8.20.8; see Section 4.4 of this report). However, site potential is unknown for many areas of the subsection, including most of the project area, because of the lack of surveys. Most of the project area is located on uplands more than a mile from permanent water
sources. These areas have a low site potential based on the survey results for similar landscapes in other portions of the Minnesota River Prairie subsection and previous surveys for wind farm projects near the project area. Portions of the project area that the Mn/Model map depicts as having medium and suspected medium site potential include the land adjacent to Elm Creek and the South Fork of Elm Creek.

The archaeological survey was conducted for the entire project APE. All of the project area that was surveyed had adequate to good surface visibility (above 25 percent), except for a few small woodlots and fallow areas. Shovel testing was conducted in fallow or wooded areas on the floodplains and on a topographic high area overlooking Elm Creek, as these areas were deemed to have moderate to high site potential.

Shovel testing was not conducted in two small woodlots planted as windbreaks that were more than one mile from permanent water, as these were located in areas of low archaeological site potential, and no sites were identified in the surveys conducted in the adjacent agricultural fields.

3.1.2 Survey Parameters

Access Roads and Underground Electric
The survey corridor for the access roads and underground electric routes was 60 meters wide. The surveys for these project features were conducted in three transects, with one transect along the proposed centerline and two transects spaced 15 meters on each side of the centerline.

Overhead Electric Transmission Lines
The survey corridor for the overhead electric transmission lines primarily followed existing roadways and was 30 meters wide. The centerline for the overhead electric transmission lines, where the support poles will be placed, is typically a few meters outside of the road ROW on private land. The typical survey consisted of a single transect that was walked along the centerline in agricultural fields. The transect focused on areas with good surface visibility along the edge of the road ROW.

Turbine Pads and Meteorological Tower Pads
The survey areas for the turbine pads and meteorological towers were 91 by 91 meters, centered on the pad/tower location. Survey was conducted in six 15-meter-interval transects that were centered within the 91 by 91 meter survey area.

Laydown Areas and Operations and Maintenance Substation
The operations and maintenance substation was 2.2 acres and each laydown area was 7.9 acres. Survey of these areas was conducted at 15-meter intervals.

3.1.3 Pedestrian Survey

Pedestrian survey was conducted at 15-meter-interval transects within the survey area. The pedestrian survey was a practical and efficient method for identifying archaeological resources because most of the project area was in row crops (corn and soybeans) or tilled fields with adequate to good surface visibility (25 to 80 percent), and the soils formed in glacial-age deposits, indicating that artifacts should be exposed on the surface by plowing. In recently deep-tilled areas the artifact visibility was significantly lower than the surface visibility because of the lack of weathering and wash on the newly exposed soil. Areas listed as “deep tilled” in the survey results section have an actual artifact visibility of 25 to 30 percent even through the surface visibility was generally around 70 to 80 percent.
The goal of the pedestrian survey was to 1) identify and record cultural resources that could be observed on the ground surface; and 2) identify areas for subsurface testing based on landscape morphology and field conditions.

### 3.1.4 Shovel Testing

Shovel testing was used to identify artifacts that were present below the ground surface and to characterize soils at survey areas. All soil removed from shovel tests was screened through one-quarter-inch mesh. The field crew returned all excavated soil to each test upon completion. Shovel test locations were recorded with a GPS unit and also marked on field sketch maps. Shovel tests were 35 to 40 centimeters in diameter.

Shovel tests were typically dug at 15-meter intervals. The tests extended 80 centimeters below surface (cmbs) or at least 20 centimeters into the B horizon. The plow zone was screened separately from the underlying soils whenever possible. Shovel testing was conducted in three areas (Section 7.5).

### 3.1.5 GPS Data Collection

The locations of shovel tests were recorded with a GPS unit, which provided sub-meter accuracy. The data were digitally plotted on the U.S. Geological Survey (USGS) 7.5-foot quadrangle maps.

### 3.1.6 Field Documentation

A record of daily activity was maintained in a daily journal, and relevant survey information was recorded on project maps. HDR provided maps with the project alignments plotted on aerial photos and USGS 7.5-foot quadrangle maps. Photographs were taken at various locations within the project area. A record of the photographs was maintained in a project photo log.

Soil profiles were drawn for representative shovel tests within each test area. Soil colors, textures, horizons, and disturbances were recorded on the profile. Soil colors were described using the Munsell system, and the soils were moistened prior to determining color.

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### 4. Literature Search

#### 4.1 Archival and Background Research

HDR conducted archival research for the project in February 2009. The research included a review of site inventory files, USGS 7.5-foot quadrangle maps, and survey reports at MnSHPO offices. Historical maps were also reviewed at the Minnesota Historical Society Library. MnSHPO staff conducted a search of the site file database and provided a list of recorded sites within a mile of the project area. FCRS also reviewed various written sources and maps to provide background data on the local history, previous investigations, potential cultural resources within the survey area, relevant historic contexts, regional cultural history, and the environment.

#### 4.2 Previous Archaeological Surveys and Sites

There have been two intensive surveys for other wind projects conducted in the immediate vicinity of the current project area. FCRS conducted a Phase I survey for the Elm Creek I Wind Project in 2007, which borders the current Elm Creek II Wind Project on the west and north (Florin and Lindbeck 2008). The survey included 85 wind turbine pads, two meteorological
towers, two SODAR (SOnic Detection and Ranging) stations, and approximately 47 miles of associated access roads and electric collection system layouts. Approximately 844 acres were surveyed. Four precontact archaeological sites were identified during the 2007 survey. One of these sites, 21JK34, is located 0.75 mile west of the current project area in T103N R34W, Section 10. The site is a lithic scatter that was recommended not eligible for listing on the NRHP.

In 2004, HDR conducted a Phase I archaeological survey and Phase I/II architectural history survey for the Trimont Wind Project in Jackson and Martin counties (Pratt et al. 2004). The project included 67 wind turbine pads and associated project infrastructure. Survey methods consisted of pedestrian survey, as the area was in agricultural fields with adequate surface visibility. No archaeological sites were identified. The Trimont Wind Project overlapped the northern portion of the current project area.

In 2000, a Phase I archaeological survey was conducted for the reconstruction of County State Aid Highway (CSAH) 44 in northwestern Martin County adjacent to the Elm Creek II Wind Project (Harrison 2000). The survey along CSAH 44 began at the boundary of Sections 30 and 31 T104N R33W and extended seven miles east to the town of Trimont. Field methods for the CSAH 44 project consisted of a surface survey. Three precontact lithic scatters were identified near Cedar Lake, which is approximately five miles east of the current project area.

An archaeological site lead (21MRq) has been reported within one mile of the project area. Site lead 21MRq is the reported location of a historical trading post in T104N, R33W, SW¼ Section 32. This location places the possible site less than one-half mile north of turbine pads 81 and 82 and less than one-half mile east of an overhead transmission route that was not surveyed due to a lack of landowner consent. The MnSHPO files contain no additional information on this site.

T.H. Lewis conducted the first formal cultural resources investigation in Jackson and Martin counties for the Northwestern Archaeological Survey (NWAS) in 1889. A few earthworks were recorded during the survey, but none near the project area. N.H. Winchell subsequently compiled and published the original survey notes and maps from the NWAS survey (Winchell 1911).

4.3 Historical Map Review

The Public Land Survey (PLS) maps from 1858 and 1859 were examined to aid in identifying potential historic period sites within the project area. These maps were available online at the Minnesota Historical Society website at http://www.mnhs.org/collections/digitalmaps/index.htm. The maps illustrate historic-period land use and environmental conditions such as the locations of streams, lakes, and wetlands in the mid-1800s. A few small, wet prairie areas that no longer exist are depicted on the PLS maps near the project area. The small lake north of Turbine 43 on the USGS 7.5-foot quadrangle map in T103N R34W Section 28 is not depicted on the PLS map, indicating that it may be a man-made feature.

The PLS maps from 1858 and 1859 depict a single potential cultural resource in the project area: a road from Mankato to Springfield that traverses the project area in a southwesterly to northeasterly orientation. The road is shown in the following portions of the project area: T103N R34W, NW¼ Section 33, SE¼ Section 28, NW¼ Section 27, SE¼ Section 11, NW¼ Section 12, and SE¼ Section 1; T103N R33W, Section 6 and NW¼ Section 5; and T104N R33W, S½ Section 32. The locations where the road intersects the project area are all currently or formerly cultivated fields. No evidence of the road was identified during the survey, and it is likely the portion of the road in the project area has been destroyed by cultivation over the last century.
4.4 Mn/Model Study of the Minnesota River Prairie Subsection

The Mn/Model is a statewide GIS-based predictive model for pre-1837 archaeological site locations. The Elm Creek II Wind Project area is located within the Mn/Model Minnesota River Prairie subsection, which is characterized by a landscape that is predominantly a gently rolling ground moraine with smaller areas of outwash and glacial lake deposits. The Minnesota and Blue Earth rivers are the primary drainages of the subsection. Presettlement vegetation of the Coteau Minnesota River Prairie subsection was prairie with wet prairie, marshes, and sloughs distributed throughout the subsection and river-bottom forest along streams.

The Mn/Model indicates that areas of moderate and high site potential in the region are located primarily near major rivers and larger lakes (Hudak et al. 2002, Chapter 8.20; Figures 8.20.3 and 8.20.8). The survey implementation model states that 53 percent of the land area in the subsection is inadequately surveyed, and thus the site potential is unknown for large areas of this subsection.

5. CULTURE HISTORY

The project area is located in southwestern Minnesota in MnSHPO Archaeological Region 2s: Prairie Lake South. The Prairie Lake Region encompasses northeastern South Dakota, north-central Iowa, and most of southern Minnesota, excluding the driftless area of the Inner Coteau Des Prairie. The following prehistoric and contact cultural history is derived from the Outline of Historic Contexts for the Prehistoric Period (Dobbs 1988) and Southwestern Minnesota Archaeology: 12,000 Years in the Prairie Lake Region (Anfinson 1997).

5.1 Early Prehistoric Period

The Early Prehistoric Period in the Prairie Lake Region spans from 10,000 to 3,000 B.C. This time period in the region is poorly documented because of the lack of extensive and systematic investigations in the area. Paleoindian and Archaic projectile points have been recovered primarily as surface finds in agricultural fields. Although these finds indicate that early peoples were present, not enough information is known to define specific regional cultural phases.

5.1.1 Paleoindian Tradition

The Paleoindian Tradition spans from 10,000 to 6,000 B.C. and is defined by fluted and Plano projectile points that were used for hunting and butchering game animals. Although direct evidence is lacking, it is likely that subsistence also included the gathering of wild plant resources. Paleoindians were highly mobile and traveled in small bands. A small number of Clovis and Folsom fluted points have been recovered from the surface of agricultural fields. No fluted points were reported from Jackson or Martin counties in a statewide survey of fluted points, but a small number have been reported from adjacent counties (Higginbottom 1996). A few Plano complex sites have been recorded in the Prairie Lake Region. The most significant site is the Browns Valley site (21TR5), which contained Browns Valley points and a 9,000-year-old human skeleton. Other Plano complex sites in the region include the Hildahl # 3 site (21YM35), the Goodrich site (21FA36), and the Pedersen site (21LN2). One Plano site was reported in Jackson County from the statewide survey of Plano points (Florin 1996). A small number of Plano spear points have been reported from adjacent counties.

This period was a time of rapid environmental change as the glaciers retreated from Minnesota and substantial vegetation changes occurred as a result of the ameliorating climate (Wright 1974). In western Minnesota, parkland/savanna replaced the tundra and spruce forest by 10,000 B.P.
Vegetation changes in conjunction with human predation were responsible for the extinction of megafauna that occurred during the late glacial period.

5.1.2 Prairie Archaic Tradition

The Prairie Archaic Tradition spans from 6,000 to 3,000 B.C. This tradition is generally characterized by the following: 1) a subsistence base that relied on a variety of game animals and wild plant food resources; 2) the absence of agriculture and ceramics; and 3) the absence of burial mounds. Archaic projectile points were side-notched, and ground stone tools such as adzes and mauls were developed. Bison hunting was the dominant form of subsistence, supplemented by hunting and gathering of other wild foods. The Granite Falls Bison site (21YM47) is the best documented Archaic site in the Prairie Lake Region. The site yielded the remains of bison that were killed and butchered on a terrace within the Minnesota River Valley.

The Archaic tradition in the Early Prehistoric period was a time during which early Native Americans adapted to the post-glacial environment of the region. This adaptation led to a more intensive use of local resources and a more varied subsistence base. There was also a trend toward regionalization that appears to be related to major biomes (e.g., prairie, deciduous forest, lake-forest, and boreal forest). The environment during this period consisted of ecosystems similar to those of modern times. Several important environmental changes occurred during the Archaic period as a result of the increased warming and decreased precipitation during the Altithermal from 6,000 to 3,000 B.C. These changes included shifts in major vegetation belts and changes in the hydrology of lakes, rivers, streams, and groundwater. During the Altithermal, the prairies expanded a considerable distance east of their historical extent. Geological processes resulting from these climatic changes have buried or eroded Archaic sites on certain landscapes.

5.2 Middle Prehistoric Period

The Middle Prehistoric Period in the Prairie Lake Region dates from 3,000 B.C. to A.D. 1200. This period includes the Mountain Lake, Fox Lake, and Lake Benton phases. Sites associated with the Middle Prehistoric Period are more numerous than those of preceding periods. The climate became cooler and moister during this period. Lake levels rose and supported a greater abundance of aquatic resources. Prairie vegetation and bison herds shifted westward. The environmental changes caused shifts in the human subsistence and settlement patterns in the region.

5.2.1 Mountain Lake Phase

The Mountain Lake Phase (3,000 to 200 B.C.) is the terminal Archaic phase for the Prairie Lake Region. This phase is characterized by the equal use of game animals, namely bison, and aquatic resources as forms of subsistence. No evidence of agriculture, ceramic manufacture, or mound burial is apparent during this phase. Additional traits associated with the Mountain Lake Phase include a more sedentary lifeway, settlement on islands and peninsulas, and the manufacture of lanceolate, stemmed, and side-notched projectile points. The lanceolate points are described as having straight to concave bases and contracting lower edges. These points resemble Plano types in general shape, but they lack the highly-patterned pressure flaking on Plano types and are smaller in size. The stemmed points have straight, contracting, or expanding stems and are similar to other stemmed types found across the Prairie Peninsula. The side-notched and stemmed types vary widely in shape. Mountain Lake Phase sites have been reported near the project area at the Mountain Lake site (21CO1) in southeastern Cottonwood County and the Fox Lake site (21MR2) sites in northwestern Martin County.
5.2.2 **Fox Lake Phase**

The Fox Lake Phase (200 B.C. to A.D. 700) is the initial Woodland phase for the Prairie Lake Region and is characterized by the beginning of ceramic manufacture and the introduction of the bow and arrow in the region. The introduction of ceramics and the change to side-notched, corner-notched, and triangular points are the primary characteristics that differentiate the Fox Lake Phase from the earlier Mountain Lake Phase. The Pedersen (21LN2), Fox Lake (21MR2), and Big Slough (21MU1) sites are examples of Fox Lake Phase sites in the region. There are several Fox Lake sites recorded in Jackson and Martin counties.

Fox Lake ceramic ware consists of moderate to small-sized conoidal to subconoidal vessels with walls that range from 6 to 12 millimeters thick with an average of 10 millimeters (Anfinson 1997). Temper varies from sand to sandy grit. Surface treatment consists of well defined exterior cordmarking that is usually vertically oriented but may be horizontal or oblique. Horizontally cordmarked vessels are often partially smoothed with some rims being completely smoothed. Lip shape is round or flat, and rims may be everted or slightly inverted. Exterior rim decoration is common and includes, in order of frequency, trailing, bossing, punctating, and dentate or cord-wrapped stick stamping. Interior and lip decoration is not common, but includes tool and cord-wrapped stick impressions. Five Fox Lake types have been defined in a recent study of the Fox Lake Phase (Anfinson 1997). General trends that occur through time during the Fox Lake Phase include slight thinning of vessel walls, increase in surface smoothing, increase in use of narrow-trailed lines, appearance of horizontal cordmarking, decrease in use of bosses, and appearance of cord-wrapped stick impressions below the lip on vessel exteriors.

Four types of projectile points are associated with the Fox Lake Phase, including stemmed, side-notched, corner-notched, and isosceles triangular. The stemmed types occur early in the phase and are replaced later by the notched and unnotched triangular types. Stemmed points are primarily the expanding stem type similar to the Steuben and Durst types and have more eastern affinities. The side-notched types are quite variable, resembling a variety of Plains types such as Avonlea, Besant, and Hanna, and Oxbow. The corner-notched types are similar to the Pelican Lake type from the Plains. Side-notched and corner-notched types from the east are conspicuously absent. The variety of point types may be the result of the change from using the atlatl to bow and arrow during this period.

5.2.3 **Lake Benton Phase**

The Lake Benton Phase (A.D. 700 to 1200) is the terminal Woodland phase for the Prairie Lake Region and is characterized by the widespread use of burial mounds, dramatic changes in ceramic technology, the use of the bow and arrow. Burial mounds are low, moderate-sized conical mounds that contained multiple secondary burials with few grave goods. Subsistence and settlement patterns show little change and are similar to the Fox Lake Phase. The Pedersen site (21LN2) is the type site for this phase. The Boy Scout Hill (21LN10), Gullickson (21YM2), and Big Sough (21MU1) sites are examples of Lake Benton Phase sites within the region. There are several Lake Benton sites recorded in Jackson and Martin counties.

Lake Benton ceramic ware consists of moderate-sized, subconoidal vessels with moderately thin walls that range from 4 to 8 millimeters thick with an average of 6 to 7 millimeters (Anfinson 1979, 1997). The sherds are grit-tempered. Surface treatment consists of exterior vertical cordmarking in the mid-body. Rims and upper shoulder are smoothed, with a small percentage of body sherds also being smoothed. Cord-wrapped stick impressions are common decorative elements on the rim and shoulder while bosses are rare and trailed lines do not occur. Dentates
and punctates are less common but are also used as decorative elements. Cordmarking is present on nearly half of the lips. Lip shape is round or flat, and rims are slightly outflaring to slightly inflaring and have a slight curve in profile. Four Lake Benton types have been defined in a study of the Lake Benton Phase (Anfinson 1997). General trends that occurred through time during the Lake Benton Phase include thinning of vessel walls, a more globular shape, a decrease in decoration on the exterior shoulder and rim, and an increase in decoration on the lip.

Projectile points include small, equilateral triangular and corner-notched types, but the most common type is the small, side-notched style with straight to slightly concave bases. These points are similar to the small side-notched points of the Plains (Kehoe 1966). Stemmed point types are not associated with Lake Benton Phase. The relatively small size of the projectile points reflects their use for the bow and arrow.

5.3 Late Prehistoric Period

The Late Prehistoric Period in the Prairie Lake Region dates from A.D. 900 to 1650. This period includes the Great Oasis, Cambria, Big Stone, and Blue Earth Phases. Distinctive cultural changes, population movements, and increased cultural interactions are evident during this period.

5.3.1 Great Oasis Phase

The Great Oasis Phase (A.D. 900 to 1200) is part of the Plains Village tradition. General attributes associated with this phase include: globular, grit tempered ceramic vessels with distinctive decorations; small, notched and triangular projectile points; a variety of ground stone tools, including celts, abraders, hammerstones, manos, and metates; a variety of bone and shell items such as awls, chisels, and beads; and the cultivation of maize. Settlement patterns are focused in areas along shallow lakes. The Great Oasis site (21MU2) is the primary Great Oasis phase site in Minnesota. There are no recorded Great Oasis sites in Jackson and Martin counties. The nearest Great Oasis sites occur to the northwest in Lincoln and Murray counties.

Great Oasis ceramics are globular, grit tempered, and have a smooth or cordmarked-smoothed surface. Decoration consists of bands of incised horizontal and oblique parallel lines along the rims, which are outflared and outcurved. The lips are thickened and beveled. Sherd thickness ranges from 4 to 6 millimeters.

5.3.2 Cambria Phase

The Cambria Phase (A.D. 1000 to 1200) contains Woodland, Middle Mississippian, and Plains Village characteristics. General technology associated with this phase includes: grit tempered, globular vessels with smooth surfaces that exhibit Woodland, Middle Mississippian, and Plains Village traits; small, side-notched and triangular projectile points; ground stone tools such as celts, abraders, and hammerstones; and bone and shell items such as scapula hoes, punches, and awls. Evidence suggests that this phase was linked to the trade network centered at Cahokia, near St. Louis, Missouri. Settlement patterns include village sites on terraces of the upper Minnesota River and smaller habitation areas by lakes or rivers. Subsistence was based on hunting, fishing, gathering wild plant and aquatic foods, and the cultivation of maize and sunflowers. The Cambria phase is defined from the type site (Cambria site - 21BE2), which is located along the Minnesota River in Blue Earth County near Mankato. There are no recorded Cambria sites in Jackson County and only one Cambria site is recorded in Martin County. Most Cambria sites occur north of the project area in Lincoln, Murray, Cottonwood, Blue Earth, and Brown counties.
5.3.3 Big Stone Phase

The Big Stone Phase (A.D. 1100 to 1300) is part of the Plains Village tradition and occurs mainly in the northwestern area of the Prairie Lake Region near Big Stone Lake and Lake Traverse. The main characteristic associated with this phase is the construction of small, fortified villages. The means of subsistence are not well known for this phase, but a bison scapula hoe recovered at the Browns Valley site (21TR5) suggests plant cultivation. Ceramics include Woodland and Plains Village types. Knife River Flint is the primary lithic material instead of the local cherts widely used in other cultural phases. Fortified sites tend to be located on high bluffs overlooking Big Stone and Traverse Lakes, while unfortified sites are on the lower terraces of these lakes. Some Big Stone Phase sites in Minnesota are the Tenney (21TR11) and Shady Dell (21TR6) sites. All of the recorded Big Stone Phase sites are located along the Minnesota and South Dakota border near the headwaters of the Minnesota River, a considerable distance northwest of the project area.

5.3.4 Blue Earth Phase

The Blue Earth Phase (A.D. 1000 to 1650) is an Oneota micro-tradition in the Prairie Lake Region. This phase is characterized by smooth surfaced, shell-tempered ceramics. Agriculture is evident from bison scapula hoes and plant remains of maize, sunflowers, and beans. There are only two Blue Earth sites recorded in Martin County, as most Blue Earth sites are located north and east of the project area.

5.4 Contact Period

Contact period information in the Prairie Lake Region is not well documented. The Native groups in the area at the time of French contact included the Dakota, Oto, Ioway, and possibly the Illinois.

5.5 Historic Period

The French, interested in exploration and fur trade activities during the 1660s, were the first Euro-Americans in the region (Blegen 1975). Fur trade activities in southwestern Minnesota are largely unknown. In 1762, the French ceded land west of the Mississippi River to Spain. The French ceded land east of the Mississippi to the British in 1763 under the Treaty of Paris. The British, ignoring Spain’s claim to lands west of the Mississippi River, entered the Prairie Lake Region and established posts along the Minnesota River to aid in their fur trade interests. British trade continued until shortly after the War of 1812, when the Americans deprived them of licenses to trade within the United States. American fur trade companies replaced the British until the fur trade declined in the mid 1800s. Early settlers entered the region by the mid 1800s after the Dakota ceded lands in the Treaties of Traverse de Sioux and Mendota. The construction of railroads increased the rate of settlement throughout the region in the mid to late 1800s. Agriculture was the dominant activity of the early settlers, and it continues to be the primary use of land in the area.
6. ENVIRONMENTAL BACKGROUND

6.1 Modern Environment

The project area consists of rural agricultural lands in row crops (corn and soybeans). The town of Alpha is approximately one mile south of the project area, and the town of Jackson is approximately four miles southwest.

6.2 Glacial History

The most recent glacial activity in the region occurred during the Late Wisconsinan at the end of the Pleistocene when much of the Upper Midwest was buried beneath glaciers. The Des Moines lobe covered much of western Minnesota and extended into northern Iowa (Clayton and Moran 1982; Gilbertson 1990). The Des Moines lobe receded and advanced several times between 13,000 and 9,700 years B.C. The final retreat of the ice lobe occurred by 9,700 B.C. The glacial deposits shaped the surficial features of the landscape that characterize the region today. Meltwater from the glaciers established the drainage system through which many of the modern-day streams in the region flow.

6.3 Physiography

The project area is located in Blue Earth Till Plain physiographic region, which is characterized by a generally featureless till plain within the interior portion of the Des Moines lobe (Wright 1972).

On the Geologic Map of Minnesota – Quaternary Geology (Hobbs and Goebel 1982), most of the survey area is mapped as ground moraine of the Altamont Moraine of the Des Moines lobe. The eastern portion of the project is mapped as stagnation moraine of the Altamont Moraine. The landscape in the project is characterized by rolling glacial till plains and hilly moraines of the Des Moines lobe.

6.4 Hydrology

Perennial streams in the project area include Elm Creek and the South Fork of Elm Creek. These are small, meandering streams that flow east into the Blue Earth River, which drains northward into the Minnesota River near Mankato. The Des Moines River watershed is several miles west of the project area. The Des Moines River watershed flows in a southeasterly route through Iowa to the Mississippi River. The project is mostly located on uplands away from permanent water sources. Seasonal run-off occurs through intermittent drainages in low-lying areas. Some of these low areas have been ditched to improve drainage.

6.5 Vegetation

Vegetation at the time of European settlement consisted of prairie throughout most of the project area with scattered areas of wet prairie (Marschner 1974). Gallery forests existed along waterways. Broad changes in the vegetation of the region have been recorded in pollen samples preserved in lake-bottom sediments. These pollen samples show that spruce parkland dominated the landscape during the retreat of the glaciers approximately 10,000 years B.C. (Baronsky et al. 1987). Spruce forest was replaced by deciduous forest around 9,000 B.C. Prairie swiftly replaced the deciduous forests by 7,000 years B.C. The continued warming and drying trend (Altithermal) from 6,000 to 3,000 B.C. enabled the prairie to expand eastward into central Minnesota. A shift to a wetter and cooler climate about 3,000 B.C. caused the prairie to retreat west to its current
position. The floral communities present at the time of European settlement became established at this time (Anfinson 1997).

6.6 Fauna

Based on early historical accounts, a wide variety of mammalian game species were present in the Prairie Lake Region, including bison, elk, deer, muskrat, rabbit, beaver, bear, and occasionally antelope (Anfinson 1997; Ernst and French 1977; Herrick 1892). The range and abundance of species has been altered by the loss of natural habitat and hunting so that some species are no longer present. Numerous lakes and rivers in the region attracted a variety of birds, including ducks, geese, cranes, and swans. Fish species included northern pike, gar, sucker, sunfish, perch, and buffalo fish. The wide variety of animal resources in the region would have provided a broad subsistence base for prehistoric inhabitants of the region.

6.7 Soils

Soils in the project area formed under tall grass prairie and wet prairie vegetation in glacial till, with the exception of small areas of soils that formed in alluvium (Genrich 1983; Matzdorf 1983). The glacial deposits that the soils formed in are approximately 12,000 years old, and deeply buried archaeological sites are not likely to be present in the upland portions of the project area based on the age of the soils. It is expected that archaeological materials on the uplands would be near the ground surface in the upper 0.5 meter of soil.

Stream terraces have the potential for deeply buried sites as sediments have accumulated on these landscapes during the Holocene. There is a moderate to high potential for archaeological sites on stream terraces. The upper part of the soil profile is likely made up of post-settlement alluvium that has been deposited as a result of the significant erosion caused by agriculture in the last century.

The soils in the project area are mostly mapped within the Canisteo-Glencoe-Nicollet soil association, which consists of well drained and poorly drained soils on nearly level terrain that formed on till plains and moraines. These soil descriptions are summarized below.

Canisteo Series

The Canisteo series consists of very deep, poorly, and very poorly drained soils that formed in calcareous loamy glacial till or in a mantle of loamy or silty sediments and underlying calcareous loamy glacial till. These soils are on glacial moraines.

**Ap** – 0 to 25 centimeters (0 to 10 inches); black (N 2/0) clay loam, very dark gray (N 3/0) dry; weak medium subangular blocky structure; friable; about 2 percent gravel; strongly effervescent; slightly alkaline; abrupt smooth boundary.

**A**– 25 to 46 centimeters (10 to 18 inches); very dark gray (N 3/0) clay loam, dark gray (N 4/0) dry; moderate very fine subangular blocky structure; friable; about 2 percent gravel; strongly effervescent; slightly alkaline; clear smooth boundary.

**Bkg1**– 46 to 61 centimeters (18 to 24 inches); olive gray (5Y 5/2) loam; weak medium subangular blocky structure; friable; few light gray (2.5Y 7/2) calcium carbonates on faces of peds; about 3 percent gravel; few fine prominent olive (5Y 5/6) Fe concentrations; strongly effervescent; moderately alkaline; clear smooth boundary.
**Bkg2** – 61 to 99 centimeters (24 to 39 inches); light olive gray (5Y 6/2) loam; weak medium subangular blocky structure; friable; few light gray (2.5Y 7/2) calcium carbonates on faces of peds; about 3 percent gravel; common fine prominent light olive brown (2.5Y 5/6) Fe concentrations; slightly effervescent; slightly alkaline; clear smooth boundary.

**Cg1** – 99 to 165 centimeters (39 to 65 inches); gray (5Y 6/1) loam; massive; friable; about 5 percent gravel; common medium prominent light olive brown (2.5Y 5/4) Fe concentrations; slightly effervescent; slightly alkaline; clear smooth boundary.

**Glencoe Series**

The Glencoe series consists of very deep, very poorly drained soils that formed in loamy sediments from till. These soils are in closed depressions on moraines. Slope ranges from 0 to 1 percent.

**Ap** – 0 to 23 cm; black (N 2/0) clay loam, black (N 2/0) dry; moderate fine subangular blocky structure; friable; about 1 percent gravel; neutral; abrupt smooth boundary.

**A** – 23 to 99 cm black (10YR2/1) clay loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; friable; about 1 percent gravel; neutral; gradual irregular boundary.

**Bg** – 99 to 127 cm; grayish brown (2.5Y 5/2) clay loam; weak fine medium subangular blocky structure; friable; common medium distinct light olive brown (2.5Y 5/6) iron concentrations; about 3 percent gravel; neutral; gradual irregular boundary.

**Cg1** – 127 to 173 cm grayish brown (2.5Y 5/2) loam; massive; friable; common medium distinct light olive brown (2.5Y 5/6) iron concentrations; about 4 percent gravel; slightly effervescent; slightly alkaline; gradual wavy boundary.

**Cg2** – 173 to 203 cm olive gray (5Y 5/2) loam; massive; friable; few masses of carbonates on faces of peds; common medium prominent strong brown (7.5YR 5/8) iron concentrations; about 4 percent gravel; strongly effervescent; slightly alkaline.

**Nicollet Series**

The Nicollet series consists of very deep, somewhat poorly drained soils that formed in calcareous loamy glacial till on till plains and moraines.

**Ap** – 0 to 25 cm (0 to 10 inches); black (10YR 2/1) clay loam; weak fine subangular blocky structure; friable; about 2 percent gravel; slightly acid; abrupt smooth boundary.

**A** – 25 to 43 cm (10 to 17 inches); very dark gray (10YR 3/1) clay loam; moderate fine subangular blocky structure; friable; about 5 percent gravel; common black (10YR 2/1) worm casts; slightly acid; gradual irregular boundary.

**Bw** – 43 to 53 cm (17 to 21 inches); dark grayish brown (10YR 4/2) clay loam; moderate fine subangular blocky structure; friable; common very dark gray (10YR 3/1) worm casts; about 5 percent gravel; moderately acid; clear smooth boundary.

**Bg1** – 53 to 74 cm (21 to 29 inches); dark grayish brown (2.5Y 4/2) clay loam; moderate fine prismatic structure parting to moderate fine subangular blocky; friable; few very dark gray
(10YR 3/1) worm casts; about 5 percent gravel; common fine distinct olive brown (2.5Y 4/4) Fe concentrations; moderately acid; abrupt wavy boundary.

**Bg2** – 74 to 84 cm (29 to 33 inches); dark grayish brown (2.5Y 4/2) clay loam; weak medium prismatic structure parting to moderate fine and medium subangular blocky; friable; few very dark gray (10YR 3/1) worm casts; about 5 percent gravel; few fine faint grayish brown (2.5Y 5/2) and a few fine distinct light olive brown (2.5Y 5/4) and prominent brown (7.5YR 5/4) Fe concentrations; slightly acid; abrupt wavy boundary.

**BCg** – 84 to 91 cm (33 to 36 inches); grayish brown (2.5Y 5/2) clay loam; weak fine and medium subangular blocky structure; friable; few very dark gray (10YR 3/1) worm casts; about 5 percent gravel; many fine distinct light olive brown (2.5Y 5/4) Fe concentrations; slightly effervescent in parts; slightly alkaline; abrupt wavy boundary.

**BCkg** – 91 to 152 cm (36 to 60 inches); grayish brown (2.5Y 5/2) loam; massive in place breaking to angular fragments with greater horizontal than vertical dimensions; friable; about 5 percent gravel; common lime masses; many fine distinct light olive brown (2.5Y 5/4) and few fine prominent yellowish brown (10YR 5/8) Fe concentrations; few black (N 2/0) concretions; strongly effervescent; slightly alkaline.

### 7. Phase I Work Summary

A review of site inventory files and relevant reports was conducted at MnSHPO in February 2009 by HDR. Fieldwork was conducted between November 12 and December 4, 2009. Frank Florin was the principal investigator and Michael Beck was the field supervisor. Frank Koep, Jeff Shapiro, Dave Maki, and James Lindbeck were the field archaeologists from FCRS. The survey methods were discussed in Section 3. The archaeological survey locations are presented in Figures 3 to 12.

Phase I archaeological survey was completed for 61 wind turbine pads, two meteorological towers, two laydown areas, one operations and maintenance laydown area, an operations and maintenance substation, approximately 26.3 miles of associated access roads and underground electric collection system, and 6.3 miles of overhead electrical collection system. Approximately 850 acres were surveyed for archaeological resources.

The archaeological survey results are summarized in Tables 7.1 through 7.3. Table 7.1 summarizes the turbine pad, access road, and underground collection system surveys; Table 7.2 summarizes the overhead transmission line surveys; and Table 7.3 includes laydown areas and the operations and maintenance substation.

#### 7.1 Turbine Pads, Access Roads, Meteorological Towers, and Underground Collection Routes

A summary of the locations, field conditions, and survey results for the turbine pads, access roads, meteorological towers, and underground collection routes is summarized in Table 7.1. Pedestrian survey was the primary method used because of adequate surface visibility in most areas. Shovel testing was conducted in three areas with low surface visibility that had moderate to high archaeological site potential. The shovel test areas are discussed in Section 7.5. No archaeological sites were identified in the survey areas.

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Location</th>
<th>Field Conditions &amp; Surface Visibility</th>
<th>Survey Type</th>
<th>Results and Comments</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pads 91 and 92; U/C; Access roads</td>
<td>T103N R34W Center and NE ¼ Section 2</td>
<td>Shallow till and cut soybeans 60-75%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>4</td>
</tr>
<tr>
<td>Pads 72 to 75 &amp; 78 to 80; U/C; Access roads</td>
<td>T103N R33W Section 6</td>
<td>Soybeans, deep till, standing corn 30-70%; fallow field 0%</td>
<td>Pedestrian survey, shovel testing</td>
<td>Shovel Test Area 1 adjacent to Elm Creek in NE¼; no sites identified</td>
<td>5</td>
</tr>
<tr>
<td>Pads 83 and 84; U/C; Access roads</td>
<td>T103N R33W SW ¼ Section 5</td>
<td>Cut soybeans 50-70%; fallow field 0%</td>
<td>Pedestrian survey, shovel testing</td>
<td>Shovel Test Area 2 ridge top above Elm Creek in SW¼; Shovel Test Area 3 at Elm Creek in NW¼; no sites identified</td>
<td>5</td>
</tr>
<tr>
<td>Pads 85 and 86; U/C; Access roads</td>
<td>T103N R34W NE and NW ¼ Section 11</td>
<td>Deep till and standing corn 50-70%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>6</td>
</tr>
<tr>
<td>Pads 60 and 61; U/C; Access roads</td>
<td>T103N R34W NW and SW ¼ Section 23</td>
<td>Cut and standing corn 50-70%; small woodlot 0%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>8</td>
</tr>
<tr>
<td>Pads 40 to 44; U/C; Access roads</td>
<td>T103N R34W S ½ Section 28</td>
<td>Deep till 60%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>8</td>
</tr>
<tr>
<td>Pads 32 and 45 to 48; U/C; Access roads</td>
<td>T103N R34W Center of Section 27</td>
<td>Cut corn 50%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>8</td>
</tr>
<tr>
<td>Pads 50 to 52; U/C; Access roads</td>
<td>T103N R34W Center and SE ¼ Section 26</td>
<td>Cut corn, soybeans, and deep till 30-70%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>8</td>
</tr>
<tr>
<td>Pads 53, 54, and 62; U/C; Access roads</td>
<td>T103N R34W N ½ Section 25</td>
<td>Standing corn and deep till 50-70%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>9</td>
</tr>
<tr>
<td>Pads 56 to 58; U/C; Access roads</td>
<td>T103N R33W SW ¼ Section 30</td>
<td>Cut corn, standing corn, and cut soybeans 40-70%; deep till 50%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>9</td>
</tr>
<tr>
<td>Pads 63 to 66; U/C; Access roads</td>
<td>T103N R33W Center Section 19</td>
<td>Soybeans, cut soybeans, deep till 40-70%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>9</td>
</tr>
<tr>
<td>Pads 68 to 71; U/C; Access roads</td>
<td>T103N R33W Center Section 20</td>
<td>Cut corn, standing corn, and shallow till 30-80%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>9</td>
</tr>
<tr>
<td>Pads 20 to 22; U/C; Access roads</td>
<td>T103N R34W SE ¼ Section 33</td>
<td>Soybeans 40%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>10</td>
</tr>
<tr>
<td>Pads 23 to 26; U/C; Access roads</td>
<td>T103N R34W S ½ Section 34</td>
<td>Deep till 50-70% and cut soybeans 20-30%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>10</td>
</tr>
<tr>
<td>Pad 34; U/C; Access roads</td>
<td>T103N R34W SE ¼ Section 35</td>
<td>Soybeans 30-40%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>10</td>
</tr>
<tr>
<td>Pad 8; U/C; Access roads</td>
<td>T102N R34W NE ¼ Section 3</td>
<td>Deep till 60-70%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>10</td>
</tr>
<tr>
<td>Pads 10 to 12; U/C; Access roads</td>
<td>T102N R34W</td>
<td>Soybeans 30-60%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>10</td>
</tr>
</tbody>
</table>
7.2 Overhead Transmission Routes

A summary of the locations, field conditions, and survey results for the overhead electric transmission lines is presented in Table 7.2. These lines are mostly located just beyond the road ROW, and the proposed centerline for the overhead electric transmission lines is typically a few meters outside of the road ROW in the agricultural fields. Pedestrian survey was used because of adequate surface visibility. No sites were identified in the areas surveyed for the overhead electric transmission lines.

Table 7.2. Survey Summary of Overhead Transmission Routes.

<table>
<thead>
<tr>
<th>Location</th>
<th>Field Conditions &amp; Surface Visibility</th>
<th>Survey Type</th>
<th>Results and Comments</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>T104N R33W, Western edge of Section 20</td>
<td>Cut corn and deep till 35-70%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>3</td>
</tr>
<tr>
<td>T104N R33W, Western edge of Section 29</td>
<td>Cut corn and cut soybeans 50-70%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>3</td>
</tr>
<tr>
<td>T103N R33W, Western edge of Section 5</td>
<td>Cut corn and cut soybeans 30-70%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>5</td>
</tr>
<tr>
<td>T103N R33W, Southern edge of Section 6</td>
<td>Deep till 80%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>5</td>
</tr>
<tr>
<td>T103N R33W, Northwestern edge of Section 7</td>
<td>Cut soybeans 70%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>7</td>
</tr>
<tr>
<td>T103N R33W, Western edge of Section 19</td>
<td>Deep till and soybeans 40-60%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>9</td>
</tr>
<tr>
<td>T103N R34W, Eastern edge of Section 25</td>
<td>Standing corn and deep till 50-70%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>9</td>
</tr>
</tbody>
</table>

1 Artifact visibility in “deep till” areas was 25-30%
Table 7.3. Survey Summary of Operations and Maintenance Substation and Laydown Areas.

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Location</th>
<th>Field Conditions &amp; Surface Visibility</th>
<th>Survey Type</th>
<th>Results and Comments</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations and Maintenance Substation</td>
<td>T104N R33W NE ¼ Section 19</td>
<td>Sparse grass 30-40%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>3</td>
</tr>
<tr>
<td>Operations and Maintenance Laydown Area</td>
<td>T103N R34W NE ¼ Section 34</td>
<td>Cut soybeans 30-50%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>10</td>
</tr>
<tr>
<td>Laydown Area</td>
<td>T103N R34W SE ¼ Section 35</td>
<td>Shallow till 70%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>10</td>
</tr>
<tr>
<td>Laydown Area</td>
<td>T103N R34W SW ¼ Section 36</td>
<td>Deep till 70%</td>
<td>Pedestrian survey</td>
<td>No sites identified</td>
<td>11</td>
</tr>
</tbody>
</table>

1 Artifact visibility in “deep till” areas was 25-30%

7.4 Unsurveyed Project Areas and Components

Sixteen turbine pads, approximately 14.6 miles of access road and underground electrical collection system, approximately 4.6 miles of overhead electrical collection system, one meteorological tower pad, and an operations and maintenance laydown area could not be surveyed because of a lack of surface visibility or lack of landowner consent prior to when surveys ended for the 2009/2010 winter season. FCRS recommends that survey be conducted for those portions of the project that have not been surveyed. Table 7.4 provides a summary of project areas that could not be surveyed. The results of these surveys will be provided in an addendum to this report.

Table 7.4. Summary of Unsurveyed Project Areas and Components.

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Location</th>
<th>Comments</th>
<th>Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overhead transmission route</td>
<td>T104N R33W NE ¼ Section 19</td>
<td>Insufficient surface visibility</td>
<td>3</td>
</tr>
<tr>
<td>Overhead transmission route</td>
<td>T104N R33W W ½ Section 32</td>
<td>No landowner permission</td>
<td>5</td>
</tr>
<tr>
<td>Turbine pads 76 and 77; access road; U/C</td>
<td>T103N R33W SW ¼ Section 6</td>
<td>Insufficient surface visibility</td>
<td>5</td>
</tr>
<tr>
<td>Turbine pads 81, 82, 93, and 94; access roads</td>
<td>T103N R33W N ½ Section 5</td>
<td>Insufficient surface visibility</td>
<td>5</td>
</tr>
<tr>
<td>Turbine pads 88 and 89; access road; U/C</td>
<td>T103N R34W NE ¼ Section 11</td>
<td>Insufficient surface visibility</td>
<td>6</td>
</tr>
<tr>
<td>Overhead transmission route</td>
<td>T103N R33W SW ¼ Section 7</td>
<td>No landowner permission</td>
<td>7</td>
</tr>
<tr>
<td>Overhead transmission route</td>
<td>T103N R33W W ½ Section 18</td>
<td>No landowner permission</td>
<td>7</td>
</tr>
<tr>
<td>U/C</td>
<td>T103N R34W W ½ Section 23</td>
<td>Insufficient surface visibility</td>
<td>8</td>
</tr>
<tr>
<td>U/C</td>
<td>T103N R34W W ½ &amp; SE ¼ Section 26</td>
<td>Insufficient surface visibility</td>
<td>8</td>
</tr>
<tr>
<td>U/C</td>
<td>T103N R34W S ½ Section 28</td>
<td>Insufficient surface visibility</td>
<td>8</td>
</tr>
<tr>
<td>U/C</td>
<td>T103N R33W S ½ Section 19</td>
<td>Insufficient surface visibility</td>
<td>9</td>
</tr>
<tr>
<td>Project Component</td>
<td>Location</td>
<td>Comments</td>
<td>Figure</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------</td>
<td>-----------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Turbine pads 18 and 19; Met tower 4; access road; U/C; laydown area</td>
<td>T103N R34W NE ¼ &amp; SW ¼ Section 33</td>
<td>Insufficient surface visibility</td>
<td>10</td>
</tr>
<tr>
<td>U/C</td>
<td>T103N R34W NE ¼ &amp; S ¼ Section 34</td>
<td>Insufficient surface visibility</td>
<td>10</td>
</tr>
<tr>
<td>Turbine pads 28 to 31 and 33; access roads; U/C</td>
<td>T103N R34W Section 35</td>
<td>Insufficient surface visibility</td>
<td>10</td>
</tr>
<tr>
<td>U/C</td>
<td>T102N R34W W ½ Section 2</td>
<td>Insufficient surface visibility</td>
<td>10</td>
</tr>
<tr>
<td>U/C</td>
<td>T102N R34W NW ¼ Section 4</td>
<td>Insufficient surface visibility</td>
<td>10</td>
</tr>
<tr>
<td>Overhead transmission route</td>
<td>T103N R34W Northern edge of Section 36</td>
<td>Insufficient surface visibility</td>
<td>11</td>
</tr>
<tr>
<td>Turbine pad 16; access road; U/C</td>
<td>T102N R34W N ½ Section 1</td>
<td>Insufficient surface visibility</td>
<td>11</td>
</tr>
</tbody>
</table>

1 “U/C” is “Underground Collection System”

7.5 Shovel Test Areas

A total of 12 shovel tests were placed at three locations in the project area that had low surface visibility and moderate to high archaeological site potential. Shovel Test Area 1 was located along the access road and underground collection between 20th Avenue and Turbine 75 (Figure 5). The test area was approximately 40 meters west of Elm Creek in the NE ¼ of Section 6, T103N R33W. Five shovel tests (Shovel Tests 1-5) were placed on a small terrace overlooking the creek just west of 10th Avenue. The vegetation in the shovel test area was tall grass, and there was no surface visibility. Soils in two shovel tests were disturbed, and the ground surface across most of the test area was rutted and pitted. It is possible that portions of the test area had been used as borrow for road construction. The undisturbed shovel tests contained a clay-loam plow zone overlying clay loam and gravels. No artifacts were recovered. A representative profile from the test area is presented in Table 7.5.

Table 7.5. Representative Soil Profile from Shovel Test Area 1.

<table>
<thead>
<tr>
<th>Depth Below Surface (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-20</td>
<td>Very dark brown (10YR 2/2) clay loam; Ap horizon</td>
</tr>
<tr>
<td>20-40</td>
<td>Dark yellowish brown (10YR 4/4) clay loam; &lt; 5% gravels; B1 horizon</td>
</tr>
<tr>
<td>40-75</td>
<td>Dark yellowish brown (10YR 4/4) clay loam with mottles of gleyed clay; &gt; 5% gravels coated with calcium carbonate; B2 horizon</td>
</tr>
</tbody>
</table>

Shovel Test Area 2 was located the east edge of the Turbine 84 survey area in the SW ¼ of Section 5, T103N R33W (Figure 5). The test area is in a fallow field on top of a knoll that overlooks Elm Creek to the east. Lake Watkins is in clear view approximately one-half mile to the southeast. Three shovel tests (Shovel Tests 6-8) were placed in the test area, which had no surface visibility. All the tests contained clay loam soils with an Ap horizon. No artifacts were recovered. A representative soil profile is presented in Table 7.6.
Table 7.6. Representative Soil Profile from Shovel Test Area 2.

<table>
<thead>
<tr>
<th>Depth Below Surface (cm)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-20</td>
<td>Very dark brown (10YR 2/2) clay loam; &lt; 5% gravels; Ap horizon</td>
</tr>
<tr>
<td>20-40</td>
<td>Light olive brown (2.5Y 5/4) sandy clay with coarse sand; mottles of very dark brown (10YR 2/2) clay loam; B1 horizon</td>
</tr>
<tr>
<td>40-70</td>
<td>Light olive brown (2.5Y 5/4) sandy clay with coarse sand; &gt; 5% gravels coated with calcium carbonate; B2 horizon</td>
</tr>
</tbody>
</table>

Shovel Test Area 3 was located along the overhead transmission line on the north and south sides of Elm Creek in the NW ¼ of Section 5, T103N R33W (Figure 5). Four shovel tests (Shovel Tests 9-12) were placed near the creek on the east side of the 10th Avenue ROW. Two of the tests were placed on the south side of the creek and two were on the north side. Shovel Test 9, which was closest to the creek on the south side, contained very dark gray (10YR 3/1) silty loam soils to 80 cmbs. This area appears to have a thick layer of slopewash from the hill to the south. Shovel Test 10, which was farther to the south on the top of a low hill, contained mixed fill, presumably from road construction. The test area on the north side of Elm Creek was wooded in mature trees with leaves and grasses obscuring the ground surface. Shovel Test 11, which was closest to the creek, contained interbedded coarse sands to 80 cmbs. The soils were predominantly dark grayish brown (10YR3/2) with lighter lenses. The sandy texture suggests the soils are high-velocity deposits along the stream bank. Shovel Test 12 was north of Shovel Test 11 and contained a shallow horizon of very dark grayish brown (10YR3/2) sandy loam over interbedded sands to a depth of 70 cmbs. No artifacts were recovered in Test Area 3.

**8. SUMMARY AND RECOMMENDATIONS**

Phase I archaeological survey was completed for 61 wind turbine pads, two meteorological towers, two laydown areas, one operations and maintenance laydown area, an operations and maintenance substation, approximately 26.3 miles of associated access roads and underground electric collection system, and 6.3 miles of overhead electrical collection system. Approximately 850 acres were surveyed for archaeological resources.

Sixteen turbine pads, approximately 14.6 miles of access road and underground electrical collection system, approximately 13 miles of overhead electrical collection system, one meteorological tower pad, and an operations and maintenance laydown area could not be surveyed because of a lack of surface visibility or lack of landowner consent. FCRS recommends that survey be conducted for those portions of the project that have not been surveyed. Additionally, FCRS recommends that survey be conducted for those portions of the revised project design that are located outside of the original survey corridors.

No archaeological sites were identified during the Phase I archaeological survey. It is the opinion of FCRS that no archaeological sites eligible for or listed on the NRHP will be affected in the portions of the project area that have been surveyed to date.
9. REFERENCES CITED

Anfinson, S. F. (editor)

1997 *Southwestern Minnesota Archaeology: 12,000 Years in the Prairie Lakes Region.* Minnesota Historical Society Press, St. Paul.

Baronsky, C. W., E. C. Grimm, and H. E. Wright

Blegen, T. C.

Clayton, L., and S. R. Moran
1982 Chronology of Late Wisconsinan Glaciation in Middle North America. *Quaternary Science Reviews* 1:55-82.

Dobbs, C. A.
1988 *Outline of Historic Contexts for the Prehistoric Period (ca. 12,000 B.P. - A.D. 1700).* Reports of Investigation Number 37. Institute for Minnesota Archaeology, Minneapolis.

Ernst, C. H., and L. French

Florin, F.
1996 *Late Paleo-Indians in Minnesota and Vegetation Changes from 10,500 to 8,000 B.P.* Unpublished Master’s thesis, University of Minnesota, Minneapolis.

Genrich, R. C.

Gilbertson, J. P.
1990 *Quaternary Geology Along the Eastern Flank of the Coteau Des Prairies, Grant County, South Dakota.* Unpublished M.S. thesis, Department of Geology, University of Minnesota, Minneapolis.

Harrison, C.

Herrick, C. L.
Higginbottom, D. K.
1996 *An Inventory of Fluted Projectile Points from Minnesota.* Paper distributed at the 54th Annual Plains Conference, Iowa City, Iowa.

Hobbs, H. C., and J. E. Goebel

Hudak, J. G., E. Hobbs, A. Brooks, C. A. Sersland, and C. Phillips (editors)

Kehoe, T. F.

Marschner, F.

Matzdorf, K. D.

National Park Service

Pratt, D. R., D. Eigenberger, E. Palmer, and M. Madsen

Winchell, N. H.

Wright, H. E., Jr.