DRAFT
NATIVE PRAIRIE SURVEY
WILTON IV WIND ENERGY CENTER
BURLEIGH COUNTY
NORTH DAKOTA

PREPARED FOR

NEXTera ENERGY RESOURCES

Prepared by

TETRA TECH EC, INC.

October 2011

Executive Summary

Wilton Wind IV, LLC (Wilton IV) proposes to develop the Wilton IV Wind Energy Center, a 99 megawatt (MW) wind energy facility in Burleigh County, North Dakota (Wilton IV or Project). The Project Area is located on 15,751 acres of private land in Crofte, Ghylin, and Ecklund Townships in Burleigh County, North Dakota (Figure 1). Although there are no federal or state regulations explicitly protecting native prairie, the North Dakota Game and Fish Department (NDGFD) and the U.S. Fish and Wildlife Service (USFWS) have highlighted the significance of native prairie in this region in consultation letters with respect to development in this region and have recommended avoiding areas of native prairie to the extent possible. Wilton IV is committed to environmental due diligence and contracted Tetra Tech EC, Inc. (Tetra Tech) to conduct a survey for native prairie and to evaluate the presence of Dakota skipper (*Hesperia dacotae*) habitat.

A field biologist conducted ground surveys of 6,563 acres of the Project Area in Crofte and Ghylin Townships where Project facilities are proposed on June 29 to 30, July 1 to 2, and August 8, 2011. The portion of the Project Area in Crofte Township (the southwest portion) was originally surveyed as part of the Baldwin Wind Energy Center from September 18 to 21, 2009. The results of the previous survey have been incorporated into the Wilton IV survey. The central portion of the Project Area in Ecklund Township was not surveyed because Wilton IV is not planning to construct any facilities within this area.

During ground surveys, the field biologist classified 1,532 acres (10 percent of the total Project Area) as native prairie and 1,897 acres (12 percent of the total Project Area) as tame grassland; the remaining acreage consists primarily of agricultural croplands with a few residential homesteads and farmyards. The largest contiguous areas of native prairie were found in the southern part of the Project Area in Ghylin Township.

The Dakota skipper, a species of butterfly which is currently classified as a federal candidate species, may occur within the Project Area. The field biologist classified approximately 632 acres of grassland as Excellent/Likely potential habitat for the Dakota skipper, which represents approximately 18 percent of the total grassland habitat present within Project Area. An additional 1,064 acres of grassland habitat was classified as Good/Possible potential Dakota skipper habitat, which represents approximately 31 percent of the total grassland habitat present within the Project Area. Together, the Excellent and Good potential Dakota skipper habitat represents 11 percent of the total Project Area.

At the time of report preparation, the proposed turbine layout dated September 21, 2011 consisted of 62 GE 1.6 MW xle wind turbines and 2 alternate turbine locations. Under the proposed configuration, 11 turbines (this includes one alternate turbine) would be placed within native prairie. Three of the proposed turbines fall within Excellent/Likely potential Dakota skipper habitat. An additional 6 turbines would be located within Good/Possible potential Dakota skipper habitat

TABLE OF CONTENTS

1. Introduction

Wilton Wind IV, LLC (Wilton IV) proposes to develop the Wilton IV Wind Energy Center, a 99 megawatt (MW) wind energy facility in Burleigh County, North Dakota (Wilton IV or Project). The Project Area is located on 15,751 acres of private land in Crofte, Ghylin, and Ecklund Townships in Burleigh County, North Dakota (Figure 1). The Project Area encompasses land that consists primarily of agricultural crops and grasslands classified as tame grassland or native prairie. Although there are no federal or state regulations explicitly protecting native prairie, the North Dakota Game and Fish Department (NDGFD) and the U.S. Fish and Wildlife Service (USFWS) have highlighted the significance of native prairie in this region in consultation letters with respect to development in this region and have recommended avoiding areas of native prairie to the extent possible. In their letters, the USFWS has indicated native prairie as a habitat type of high value habitat avoidance for North Dakota.

The Project Area is located in the Missouri Coteau region of the Northwestern Glaciated Plains (Bryce et al. 1998). The Northwestern Glaciated Plains ecoregion marks the westernmost extent of continental glaciation and is characterized by significant surface irregularity and high concentrations of wetlands. The wetlands of the Missouri Coteau and the neighboring prairie pothole region are the major waterfowl production areas in North America. Land use on the coteau is a mixture of tilled agriculture in flatter areas and grazing lands on steeper slopes. Native prairie, characterized by dominant species such as western wheatgrass (*Agropyron smithii*), big bluestem (*Andropogon gerardii*), needle-and-thread grass (*Stipa comata*), and green needlegrass (*Stipa viridula*), remains on unbroken areas.

Native prairie is untilled grassland dominated by non-introduced species, or previously tilled grassland that has reverted back to native vegetation (Appendix 2: Photos 1, 2, and 3). In contrast, tame grassland (e.g., pasturelands) is comprised primarily of non-native species (Appendix 2: Photos 4 and 5). Native prairie further differs from tame grassland in that native prairie is found primarily on unbroken soil whereas tame grassland occurs on tilled soils that have been planted. Native prairie is found throughout North Dakota; however, since settlement began in the 1800s, North Dakota has lost approximately 80 percent of its native prairie, with most remaining native prairie being found in the arid western portions of the state (North Dakota Parks and Recreation Department undated).

Native prairie may be utilized by people in several ways. Most native prairie in private holdings is used for cattle ranching and is managed as rangeland. On rangeland, the soil is not tilled and fire is often used to suppress the growth of woody species (Hagen et al. 2005); other forms of management (e.g., seeding, fertilizing) are less common. Native prairie may also be placed in conservation easements or held privately or publicly as grassland preserves or wildlife refuges. Preserves and refuges can be difficult to visually distinguish from rangeland because the same types of management (i.e., fire and grazing) are often applied.

Native prairie serves as a vital ecological resource by improving water quality, providing erosion control, and supporting a diverse population of plants and animals; however, due to the fertile soil and predominantly flat topography of native prairie, many areas of native prairie have been converted to agricultural lands. The widespread loss of native prairie makes it an ecosystem of conservation concern and one of the most endangered ecosystems in North America (Samson et al. 2004). Additional factors that have altered the ecology of prairie ecosystems include colonization of non-native plant species, loss of native grazers (e.g., bison), altered fire regime, and fragmentation in the form of urban development. The lack of fire coupled with overgrazing can reduce the value of native prairie to wildlife because these factors may result in the conversion of prairie to shrubland or woodland, which may not be utilized by grassland species (Grant et al. 2004, Reinking 2006).

Native prairie serves as vital habitat for the Dakota skipper, a species of butterfly which is currently classified as a candidate species for listing under the ESA. The Dakota skipper is classified as a candidate species because, although its historic range once consisted of vast, unfragmented native prairie in north-central U.S. and south-central Canada, its current range is now limited to scattered remnants of high quality native prairie in Minnesota, North and South Dakota, and southern Manitoba (USFWS 2002). The Dakota skipper population has declined due to sensitivity to disturbances, such as grazing and agriculture. The Dakota skipper's classification as a federal candidate species does not currently entitle it to legal protection under the ESA; however, if a candidate species becomes listed as threatened or endangered, then protection for that species is mandated under the ESA.

One additional concern about the conversion of native prairie is the potential impact on breeding migratory waterfowl. Native prairie provides suitable stopover habitat during migration and upland nesting cover for such waterfowl species as northern pintail (*Anas acuta*), blue-winged teal (*Anas discors*), and mallard (*Anas platyrhynchos*). The prairie region of the northern Great Plains is one of the most important areas for duck reproduction in North America (Samson et al. 1998, Jones-Farrand et al. 2007). The region produces, on average, 50 percent of the primary species of game ducks on the continent (Smith 1995). Twelve of the 34 species of North American ducks are common breeders in the region (Samson et al. 1998, Jones-Farrand et al. 2007). For seven species — mallard, gadwall (*Anas strepera*), blue-winged teal, northern shoveler (*Anas clypeata*), northern pintail, redhead (*Aythya americana*), and canvasback (*Aythya valisineria*) — the prairie region accounts for more than 60 percent of the breeding population (Smith 1995). The region is also a major migration corridor during fall and spring for other ducks, geese, shorebirds and other waterbirds (Skagen and Knopf 1994, Samson et al. 1998, Jones-Farrand et al. 2007). Although construction of a wind energy facility differs from wholesale conversion of grassland to agricultural croplands, disturbances of native prairie, particularly native prairie that surrounds permanent or semi-permanent wetlands (prairie potholes), have the potential to affect these important breeding and migratory stopover areas.

Wilton IV is committed to environmental due diligence and contracted Tetra Tech EC, Inc. (Tetra Tech) to conduct a native prairie survey for the Project Area and to determine the extent of native prairie that may be used by the Dakota skipper.

2. Methods

A field biologist conducted ground surveys of 6,563 acres of the Project Area in Crofte and Ghylin Townships where Project facilities are proposed on June 29 to 30, July 1 to 2, and August 8, 2011. These dates encompass the appropriate time of year to identify plant species due to their flowering seasons and to assess grazing intensity. The portion of the Project Area in Crofte Township (the southwest portion) was originally surveyed as part of the Baldwin Wind Energy Center from September 18 to 21, 2009 (Tetra Tech 2009). The results of the previous survey have been incorporated into the Wilton IV survey. The central portion of the Project Area in Ecklund Township was not surveyed because Wilton IV is not planning to construct any facilities within this area.

In order to systematically identify areas of native prairie, the field biologist visually assessed each square mile (section) of land within the Project Area by making roadside stops and walking surveys to delineate and describe all grassland habitat. In many areas, one square-mile sections of land were bordered by county roads or section-line two-track trails, which made them easy to evaluate. Roadside stops were made when needed (e.g., change in habitat, change in land use, or limited view), which was generally once each quarter-mile. Whenever possible, walking surveys were done within representative areas of each grassland parcel. Large contiguous tracts of grassland that could not be identified from roads were accessed on foot, resulting in almost complete coverage of the Project Area.

When grassland was encountered during field surveys, the field biologist determined if the grassland was native prairie or tame grassland. Native prairie was defined as that which had never been tilled ("broken") or planted to crops or introduced plants. Tame grassland was defined as grassland created by planting native or non-native plant species (other than cropland or hay). The field biologist determined grassland type based on several visual cues including the following: dominant visible plant species, particularly the proportion of native to non-native dominant species in core areas away from fence lines; frequency of typical native prairie species that are not as common or not present at all in tilled and seeded pastureland compared to native prairie; topography (feasibility of being tilled); presence of piles of rocks (which indicate clearing of rock from an area in preparation for cultivation); and vegetation obviously growing in rows (indicating prior tilling and seeding). The biologist also noted any obvious uses of the grassland parcel and the predominant type of grassland community (herbaceous-perennial; herbaceous-annual; woody encroached). Areas of presumably unbroken soil that retained native prairie plants were classified as native prairie, and may have included rangelands, conservation easements, or other types of reserves. Areas that appeared to have been tilled and were comprised of mostly non-native species were classified as tame grassland. Two common land use practices sometimes made these distinctions difficult in the field. Overseeding involves directly seeding introduced plants to native prairie sod (without completely breaking/tilling the soil); parcels that appeared to have been overseeded were considered native prairie. Haying native prairie or tame grassland is also common; hayland that was dominated by grasses was considered tame grassland or native prairie as appropriate, whereas hayland obviously planted to legumes such as alfalfa (*Medicago sativa*) or sweetclover (*Melilotus* sp.) were not considered grassland.

The field biologist also evaluated grassland to determine their suitability as habitat for the Dakota skipper. The criteria used during classification were the current grazing intensity, the overall quality and diversity of the native prairie within the grassland, and the presence of key plant species which the Dakota skipper depends upon (e.g., bluestem (*Andropogon* species), coneflower (*Echinacea* species), and camas (*Zygadenus* species). Excellent habitat was defined as grassland, both tame grassland and native prairie, where only light grazing had occurred and at least 1 key plant species was present; good habitat was defined as grassland, both tame grassland and native prairie, with moderate grazing and where key plant species were either present or not; and poor habitat was defined as grassland, both tame grassland and native prairie, where heavy grazing had occurred and key plant species were either present or not. The field biologist recorded grazing intensity by estimating the percentage of vegetation grazed in broad classes: 0-25 percent (light), 25-50 percent (moderate), 50-75 percent (heavy), and 75-100 percent (overgrazed). The habitat types and quality classifications were then delineated by the field biologist on aerial photographs of each section of land; the locations of grassland and habitat quality were digitized from the aerial photographs using ArcGIS 9.3.

3. Results

Overall, 1,532 acres (10 percent of the Project Area) were classified as native prairie, and 1,897 acres (12 percent of the Project Area) were classified as tame grassland (Figure 2). The largest contiguous areas of native prairie were found in the southern part of the Project Area in Ghylin Township (Figure 2).

A total of 9 grass (7 non-natives), 6 tree and shrub (0 non-native) and 44 forb (8 non-natives) species were identified in patches of native prairie within the Project Area (Table 1). Nine grass (5 non-native), 3 tree and shrub (0 non-native) and 43 forb (10 non-natives) species were identified in tame grassland within the Project Area (Table 2). None of the plant species detected within the Project Area are listed as federally endangered or threatened.

The North Dakota Department of Agriculture (NDDA) defines two categories of invasive species: 1) "noxious weeds," any plants that have been designated as injurious to public health, livestock, land or

other property, and 2) "invasive species," species that are non-native and whose introduction causes or is likely to cause economic or environmental harm or harm to human health (NDDA 2011). Four species listed as North Dakota State Noxious Weeds were found within the Project Area: absinthe wormwood (*Artemisia absinthium)*, Canada thistle (*Cirsium arvense*), leafy spurge (*Euphorbia esula)*, and field bindweed (*Convolvulus arvensis*; NDDA 2011). Two additional species, common ragweed (*Ambrosia artemisiifolia*) and prairie goldenrod (*Solidago missouriensis*), considered troublesome native species, are also listed (USDA 2011). An additional 3 species listed as North Dakota State Invasive Species for Burleigh County was found within the Project Area: yellow sweet clover (*Melilotus officinalis*), crested wheatgrass (*Agropyron cristatum)*, and goat's beard (*Tragopogon dubius*; EDDMapS 2011).

A total of 632 acres of grassland (348 native and 284 tame) was classified as Excellent/Likely potential habitat for the Dakota skipper, approximately 18 percent of the total grassland habitat present within Project Area (Figure 3). The majority of areas classified as Excellent/Likely Dakota skipper habitat were located in the southern portion of the Project Area in Ghylin Township and the northeast and southern portions of the Project Area in Crofte Township (Figure 3). An additional 1,064 acres of grassland habitat (732 native and 332 tame) was classified as Good/Possible potential Dakota skipper habitat, approximately 31 percent of the total grassland habitat present within the Project Area (Figure 3). Together, the Excellent and Good potential Dakota skipper habitat represents 11 percent of the total Project Area (49 percent of the total grassland habitat). The remaining 1,688 acres of grassland habitat (50 percent) was classified as Poor/Unlikely potential Dakota skipper habitat (Figure 3).

At the time of report preparation, the proposed turbine layout dated September 21, 2011 consisted of 62 GE 1.6 MW xle wind turbines and 2 alternate turbine locations.. Under the proposed configuration, 11 turbines would be placed within native prairie. Three of the proposed turbines fall within Excellent/Likely potential Dakota skipper habitat (Figure 3). An additional 6 turbines would be located within Good/Possible potential Dakota skipper habitat (Figure 3). Turbines found in native and tame grasslands and Dakota skipper habitat are listed in Appendix 1.

4. Discussion

Native Prairie is an ecosystem of conservation concern (Samson et al. 2004) and the NDGFD and the USFWS have recommended avoiding areas of native prairie to the extent possible. Native prairie comprises 10 percent of the Project Area, and under the current configuration, 17 percent of turbines (10 turbines and 1 alternate location) would be located within native prairie. The USFWS has recommended that:

> High-value wildlife habitat types in North Dakota include native prairie, wetlands, wooded draws and riparian forests. We recommend that construction of wind towers and appurtenant facilities in these habitat types be avoided whenever possible.

Additionally the NDGFD has recommended that:

> Work within native prairie be avoided to the extent possible. This could include micro-siting turbines onto adjacent previously disturbed land, locating access roads on existing section line trails rather than across undisturbed native prairie, etc.

Maintaining unfragmented areas of native prairie in the Project Area may be of greatest benefit to wildlife in general. Raptors, such as short-eared owl (*Asio flammeus)* and ferruginous hawk (*Buteo regalis*), benefit from large areas of prairie for nesting (Blair and Schitoskey 1982, Holt and Leasure 1993), as do waterfowl (Klett et al. 1988). Large expanses of native prairie provide suitable nesting habitat for songbirds, and lower rates of brood parasitism by brown-headed cowbirds have been observed within

larger tracts of prairie (Shaffer et al. 2003, Davis et al. 2006). Although some mammal species such as deer thrive in altered landscapes, others, such as swift fox, may require areas of unfragmented native prairie (Kamler et al. 2003). Areas of native prairie that also contain permanent or semi-permanent wetlands (prairie potholes) or riverine drainages could provide important breeding and stopover habitat for various waterfowl and shorebird species.

Within the Project Area, four noxious weeds (absinthe wormwood, Canada thistle, leafy spurge, and field bindweed) were located in native prairie and/or tame grassland. North Dakota law (NDCC § 63-01.1-01) requires North Dakota landowners and other persons in charge of or in possession of land to eradicate or control the spread of noxious weeds. County and city weed boards enforce the existing statute through inspections, issuance of notice to control and follow-up re-inspections. If unhandled by the landowner or other persons in charge of or in possession of infested land, the weed boards have the authority to control weeds on the land in question and charge the landowner the cost of control through levying additional real estate taxes upon the landowner the following year (North Dakota Weed Control Association 2011). Depending upon their management goals, the landowners are responsible for invasive species management. Construction activities within the Project Area could spread these species into areas currently not occupied; therefore, coordination with local agencies is recommended in order to develop best management practices aimed at preventing the spread of noxious weeds and invasive species.

Excellent and Good potential Dakota skipper habitat comprised 11 percent of the total Project Area suggests that the Project Area is less suitable for Dakota skipper than other regions in North Dakota. No legal protection is currently provided to the Dakota skipper as a candidate species under the ESA, but limiting impacts to Dakota skipper habitat may result in a more positive review from agencies if the species does become listed under the ESA.

6. References

Blair, C.L., and F. Schitoskey Jr. 1982. Breeding biology and diet of the Ferruginous Hawk in South Dakota. Wilson Bulletin 94:46-54.

Bryce, S., J.M. Omernik, D.E. Pater, M. Ulmer, J. Schaar, J. Freeouf, R. Johnson, P. Kuck, and S.H. Azevedo. 1998. Ecoregions of North Dakota and South Dakota. Jamestown, ND: Northern Prairie Wildlife Research Center. Available online at: http://www.npwrc.usgs.gov/resource /habitat/ndsdeco/index.htm. (Version 30NOV1998).

Davis, S.K., R.M. Brigham, T.L. Shaffer, and P.C. James. 2006. Mixed-grass passerines exhibit weak and variable responses to patch size. Auk 123:807-821.

EDDMapS. 2011. Early Detection & Distribution Mapping System. The University of Georgia - Center for Invasive Species and Ecosystem Health. Available online at http://www.eddmaps.org/; last accessed September 7, 2011.

Grant, T.A., E. Madden, and G.B. Berkey. 2004. Tree and shrub invasion in northern mixed-grass prairie: Implications for breeding grassland birds. Wilson Bulletin 32:807-818.

Hagen, S.K., P.T. Isakson, and S.R. Dyke. 2005. North Dakota Comprehensive Wildlife Conservation Strategy. North Dakota Game and Fish Department. Bismarck, ND.. http://www.gf.nd.gov/conservation/cwcs.html.

Holt, D.W., and S.M. Leasure. 1993. Short-eared Owl (*Asio flammeus*). In The Birds of North America, No. 62 (A. Poole and F. Gill, editors). The Birds of North America, Inc., Philadelphia, PA

Jones-Farrand, D.T., D.H. Johnson, L.W. Burger, Jr., and M.R. Ryan. 2007. Grassland Establishment for Wildlife Conservation. Pages 25-43 in Fish and Wildlife Response to Farmbill Conservation Practices. Technical Review 07-1.

Kamler, J.F., W.B. Ballard, E.B. Fish, P.R. Lemons, K. Mote, and C.C. Perchellet. 2003. Habitat use, home ranges, and survival of swift foxes in a fragmented landscape: conservation implications. Journal of Mammalogy 84:989-995.

Klett, A.T., T.L. Shaffer, and D.H. Johnson. 1988. Duck nest success in the prairie pothole region. Journal of Wildlife Management 52:431-440.

North Dakota Department of Agriculture (NDDA). 2011. Invasive Species Web-based Manual. Available online at http://www.agdepartment.com/noxiousweeds/index.asp. Accessed August 2011.

North Dakota Century Code (NDCC). 2003. *Noxious weed control*. State of North Dakota. Available online http://www.legis.nd.gov/cencode/t04-1c47.pdf. Accessed September 2011.

North Dakota Parks and Recreation Department. No Date. North Dakota prairie: our natural heritage. North Dakota Parks and Recreation Department, U.S. Department of the Interior, U.S. Fish and Wildlife Service. Jamestown, ND: Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/habitat/heritage/index.htm (Version 05MAY99). Accessed September 2011.

North Dakota Weed Control Association. 2011. North Dakota Noxious Weed Law enforcement procedures. Available online at http://ndweeds.homestead.com/. Accessed September 2011.

Reinking, D.L. 2006. Fire in the tallgrass prairie – Balance of burning for the birds. Birding Jan/Feb: 33-38.

Samson, F.B., F.L. Knopf, and W.R. Ostlie. 2004. Great Plains ecosystems: Past, present and future. Wildlife Society Bulletin 32:6-15.

Samson, F.B., F.L. Knopf, and W.R. Ostlie. 1998. Regional trends of biological resources--grasslands. Pages 437-472 in M. J. Mac, P. A. Opler, C. E. Puckett Haecker, and P. D. Doran, editors. Status and trends of the nation's biological resources. Volume 2. U.S. Department of the Interior, Geological Survey, Reston, Virginia.

Shaffer, J.A., C.M. Goldade, M.F. Dinkins, D.H. Johnson, L.D. Igl, and B.R. Euliss. 2003. Brown-headed Cowbirds in grasslands: Their habitats, hosts, and response to management. Prairie Naturalist 35:145-186.

Skagen, S.K., and F.L. Knopf. 1994. Migrating shorebirds and habitat dynamics at a prairie wetland complex. Wilson Bulletin 106:91-105.

Smith, G.W. 1995. A critical review of aerial and ground surveys of breeding waterfowl in North America. National Biological Service Biological Science Report 5.

Tetra Tech EC (TetraTech) 2009. Native Prairie Survey – Baldwin Wind Energy Center Burleigh County, North Dakota. Prepared for NextEra Energy Resources, LLC. October 2009

U.S. Fish and Wildlife Service (USFWS). 2002. Status Assessment and Conservation Guidelines, Dakota skipper.

U.S. Fish and Wildlife Service (USFWS). 2003. Interim guidance on avoiding and minimizing wildlife impacts from wind turbines. Available online at: http://www.fws.gov/habitatconservation /wind.html. Accessed October 2009.

Tetra Tech personnel who prepared/reviewed report:

Kathy Bellrichard	August 10, 2011
Field Support	Date
Jim Kowalsky	September 7, 2011
Report Author	Date
Tracey Dubuque/Irina Gumennik	November 1, 2011
Project Manager/Deputy PM	Date
Jennifer Taylor	September 14, 2011
Technical Review	Date
Kim Gorman	August 10, 2011
GIS Technician	Date
Tim Dougherty	August 30, 2011
GIS Technician	Date

Table 1. Plant species observed in native prairie within the Wilton IV Wind Energy Center.

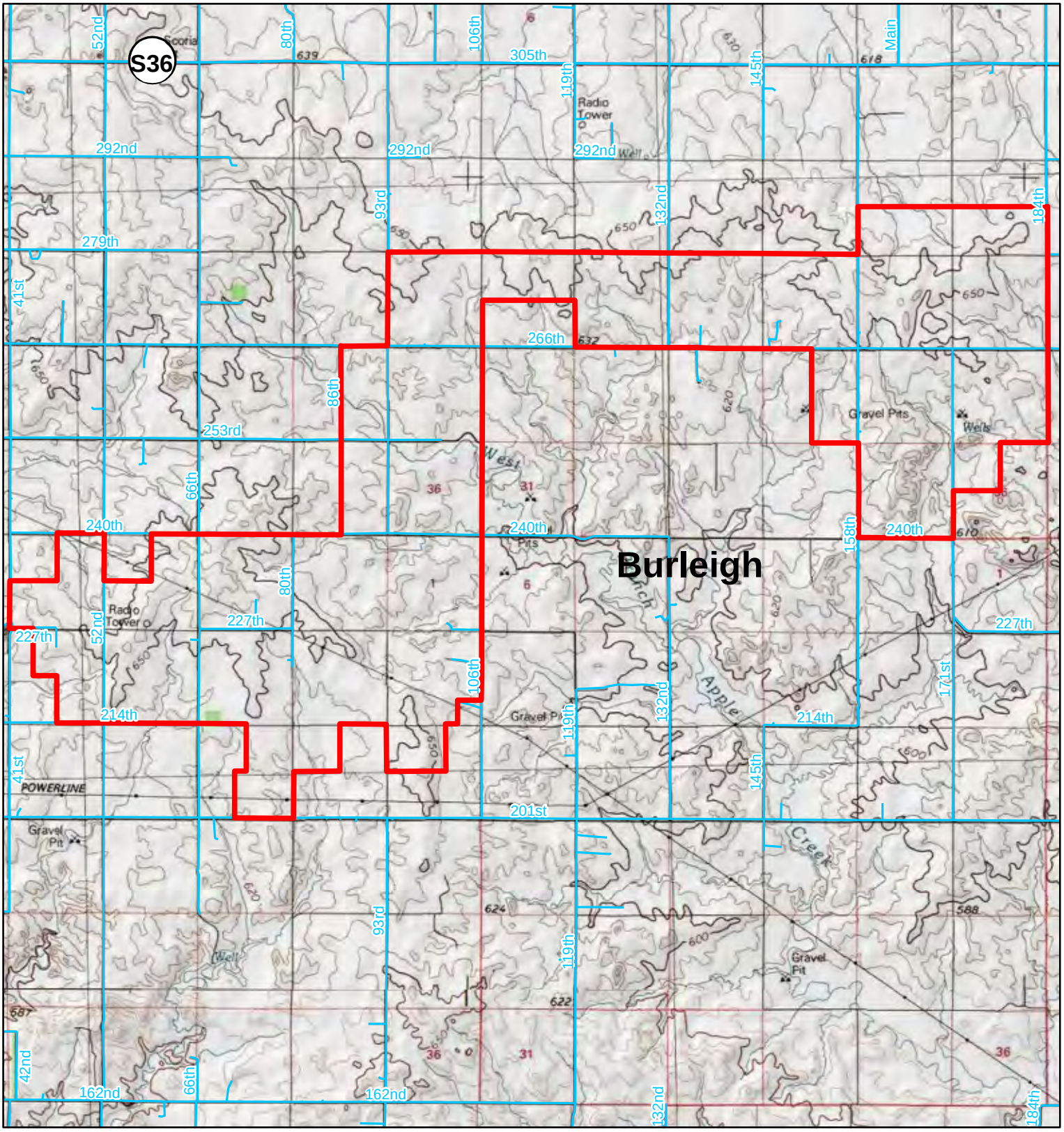
Forbs			
Scientific name	**Common name**	**Scientific name**	**Common name**
Achillea millefolium	yarrow	*Geum triflorum*	torch flower
Ambrosia artemisiifolia	common ragweed*	*Helianthus rigidus*	stiff sunflower
Anemone canadensis	meadow anemone	*Hordeum jubatun*	foxtail barley
Anemone cylindrica	candle anemone	*Lactuca oblongifolia*	blue lettuce
Antennaria neglecta	field pussy-toes	*Liatris punctata*	dotted blazing star
Artemisia absinthium	**wormwood*†**	***Melilotus albus***	**white sweet clover**
Artemisia ludoviciana	white sagewort	***Melilotus officinalis***	**yellow sweet clover†**
Asclepias ovalifolia	oval-leaf milkweed	*Musineon tenuifolium*	slender wild parsley
Calylophus serrulatus	plains yellow primrose	*Onosmodium molle*	false gromwell
Campanula rotundifolia	harebell	*Oxytropis lambertii*	purple locoweed
Cerastium vulgatum	mouse-ear chickweed	*Penstemon pallidus*	pale penstemon
Cirsium arvense	**Canada thistle*†**	*Polygala alba*	white milkwort
Cirsium undulatum	wavy-leaf thistle	*Psoralea argophylla*	silver-leaf scurf pea
Comandra umbellata	bastard toadflax	*Ratibida columnifera*	prairie coneflower
Convolvulus arvensis	**field bindweed*†**	*Rumex crispus*	curly dock
Dalea purpurea	purple prairie clover	*Sisyrinchium campestre*	white-eyed grass
Descurainia sophia	**flixweed†**	*Sphaeralcea coccinea*	red false mallow
Echinacea angustifolia	purple coneflower	***Taraxacum officinale***	**common dandelion**
Erigeron strigosus	daisy fleabane	*Thaspium trifoliatum*	meadow parsnip
Gaillardia aristata	blanket flower	***Tragopogon dubius***	**goat's beard†**
Galium boreale	northern bedstraw	*Vernonia fasciculata*	ironweed
Gaura coccinea	scarlet gaura	*Vicia americana*	American vetch
Grasses			
Scientific name	**Common name**	**Scientific name**	**Common name**
Agropyron cristatum	**crested wheatgrass†**	*Koeleria macrantha*	junegrass
Agropyron smithii	western wheatgrass	***Poa pratensis***	**Kentucky bluegrass**
Agrostis stolonifera	**redtop**	*Stipa spartea*	porcupine grass
Andropogon scoparius	little bluestem	*Stipa viridula*	green needlegrass
Bromus inermis	**smooth brome**		
Trees and Shrubs			
Scientific name	**English name**	**Scientific name**	**English name**
Juniperus horizontalis	creeping juniper	*Rosa arkansana*	pasture rose
Populus deltoides	cottonwood	*Salix candida*	hoary willow
Populus tremuloides	quaking aspen	*Amorpha canescens*	lead plant

Non-native species in bold.
- * Indicates species found on the North Dakota's noxious and troublesome weed list (NDDA 2011).
- † Indicates species considered invasive in Burleigh County, North Dakota (EDDMapS 2011).
- Nomenclature follows Great Plains Flora Association. 1986. Flora of the Great Plains. University Press of Kansas.

Table 2. Plant species observed in tame grassland within the Wilton IV Wind Energy Center.

Forbs			
Scientific name	**Common name**	**Scientific name**	**Common name**
Achillea millefolium	yarrow	*Lactuca oblongifolia*	blue lettuce
Allium stellatum	pink wild onion	*Liatris aspera*	rough blazing star
Ambrosia artemisiifolia	common ragweed*	*Liatris punctata*	dotted blazing star
Anemone canadensis	meadow anemone	***Medicago lupulina***	**black medick**
Anemone cylindrica	candle anemone	***Medicago sativa***	**alfalfa**
Artemisia absinthium	**wormwood*†**	***Melilotus albus***	**white sweet clover**
Artemisia ludoviciana	white sagewort	***Melilotus officinalis***	**yellow sweet clover†**
Asclepias ovalifolia	ovalleaf milkweed	*Musineon tenuifolium*	slender wild parsley
Calylophus serrulatus	plains yellow primrose	*Oenothera biennis*	common evening primrose
Campanula rotundifolia	harebell	*Onosmodium molle*	false gromwell
Cirsium arvense	**Canada thistle*†**	*Oxytropis lambertii*	purple locoweed
Cirsium undulatum	wavy-leaf thistle	*Penstemon pallidus*	pale penstemon
Convolvulus arvensis	**field bindweed*†**	*Polygala alba*	white milkwort
Dalea purpurea	purple prairie clover	*Psoralea argophylla*	silver-leaf scurf pea
Echinacea angustifolia	purple coneflower	*Ratibida columnifera*	prairie coneflower
Erigeron strigosus	daisy fleabane	*Rumex crispus*	curly dock
Euphorbia esula	**leafy spurge*†**	*Solidago missouriensis*	prairie goldenrod*
Gaillardia aristata	blanket flower	***Tragopogon dubius***	**goat's beard†**
Gaura coccinea	scarlet gaura	***Trifolium pratense***	**red clover**
Haplopappus spinulosus	cutleaf ironplant	*Vernonia fasciculata*	ironweed
Helianthus rigidus	stiff sunflower	*Vicia americana*	American vetch
Helianthus petiolaris	prairie sunflower		
Grasses			
Scientific name	**Common name**	**Scientific name**	**Common name**
Agropyron cristatum	**crested wheatgrass†**	***Bromus inermis***	**smooth brome**
Agropyron intermedium	**intermediate wheatgrass**	*Koeleria macrantha*	junegrass
Agropyron smithii	western wheatgrass	***Poa pratensis***	**Kentucky bluegrass**
Agrostis stolonifera	**redtop**	*Stipa spartea*	porcupine grass
Andropogon scoparius	little bluestem		
Trees and Shrubs			
Scientific name	**English name**	**Scientific name**	**English name**
Rosa carolina	pasture rose	*Populus deltoides*	cottonwood
Amorpha canescens	lead plant		

Non-native species in bold.
- * Indicates species found on the North Dakota's noxious and troublesome weed list (NDDA 2011).
- † Indicates species considered invasive in Burleigh County, North Dakota (EDDMapS 2011).
- Nomenclature follows Great Plains Flora Association. 1986. Flora of the Great Plains. University Press of Kansas.



Legend

- ND DOT Roads
- Wilton IV Project Boundary 9/28/2011
- County Boundary

Sources: ND DOT Roads, ESRI Topo Maps

Figure 1
Wilton IV
Field Survey Data Overview

Burleigh County, ND

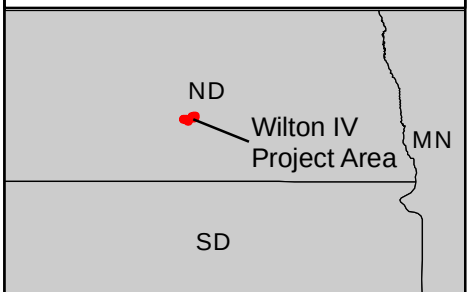
OCTOBER 2011

N

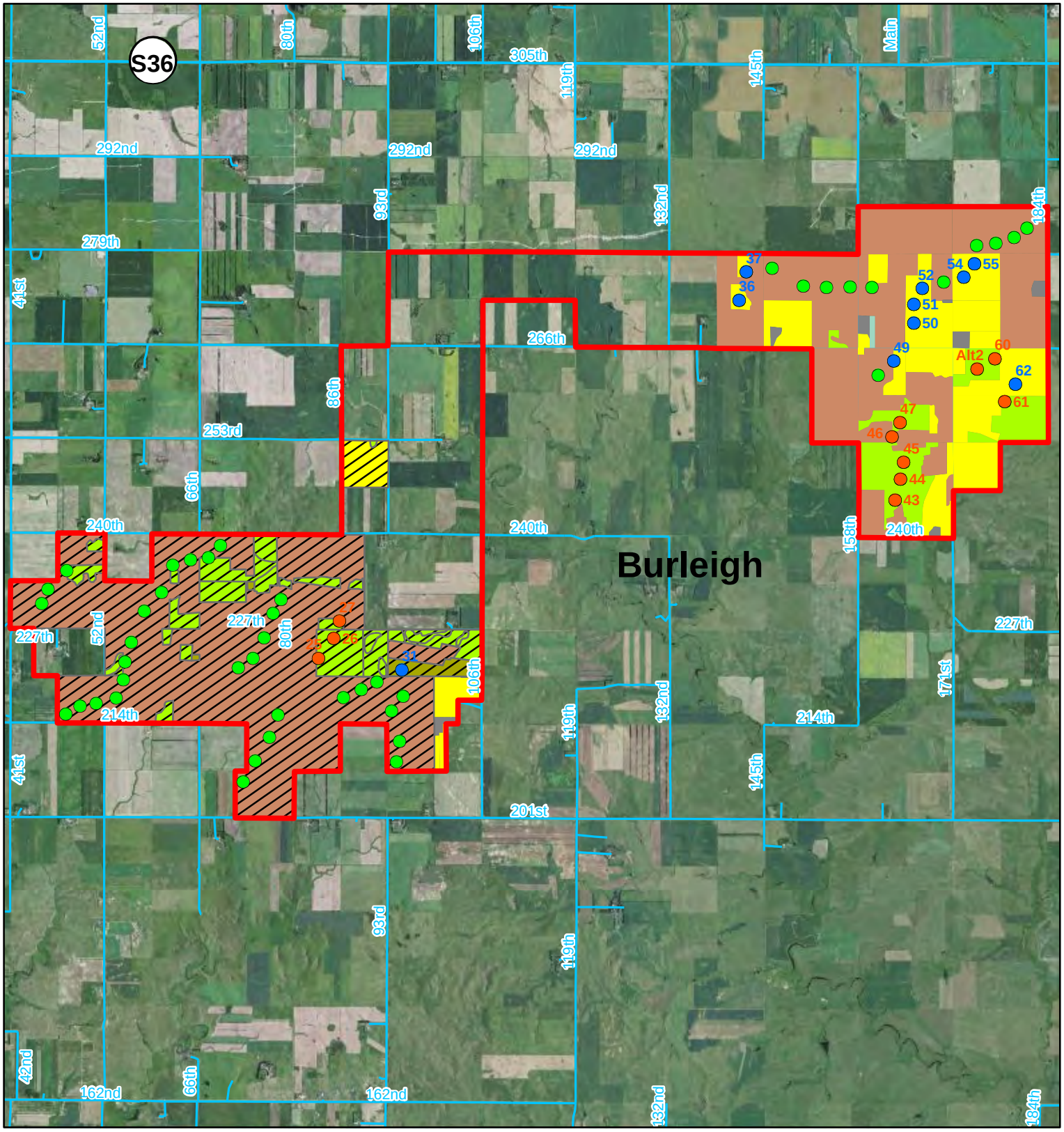
0 2

Miles

MAP OVERVIEW



File: P:\FPL Energy\Dakotas\Contract 4379 - Wilton IV\GIS\Spatial\MXD\WiltonIV_Native_Prairie_Analysis_20110829\WiltonIV_Field_Survey_Overview_20110829.mxd Coordinate System: WGS 1984



Legend

Turbines (9/21/11)

- Proposed Wind Turbine on Native Grassland
- Proposed Wind Turbine on Tame Grassland
- Proposed Wind Turbine
- ND DOT Roads
- Wilton IV Project Boundary 9/28/2011
- County Boundary

Wilton IV Field Survey Data

- Cropland, Unknown Type
- Cropland, Alfalfa
- Cropland, Hay
- Grassland, Native
- Grassland, Tame
- Other

Baldwin Survey September 2009

- Cropland, Hay
- Grassland, Native
- Grassland, Tame
- Cropland, Unknown Type

Sources: ND DOT Roads, NAIP Imagery

Figure 2
Wilton IV
Native Prairie Survey

Burleigh County, ND

OCTOBER 2011

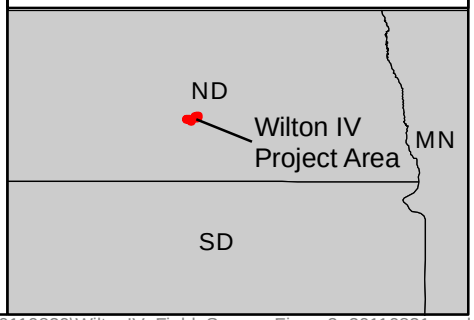
N

0 2

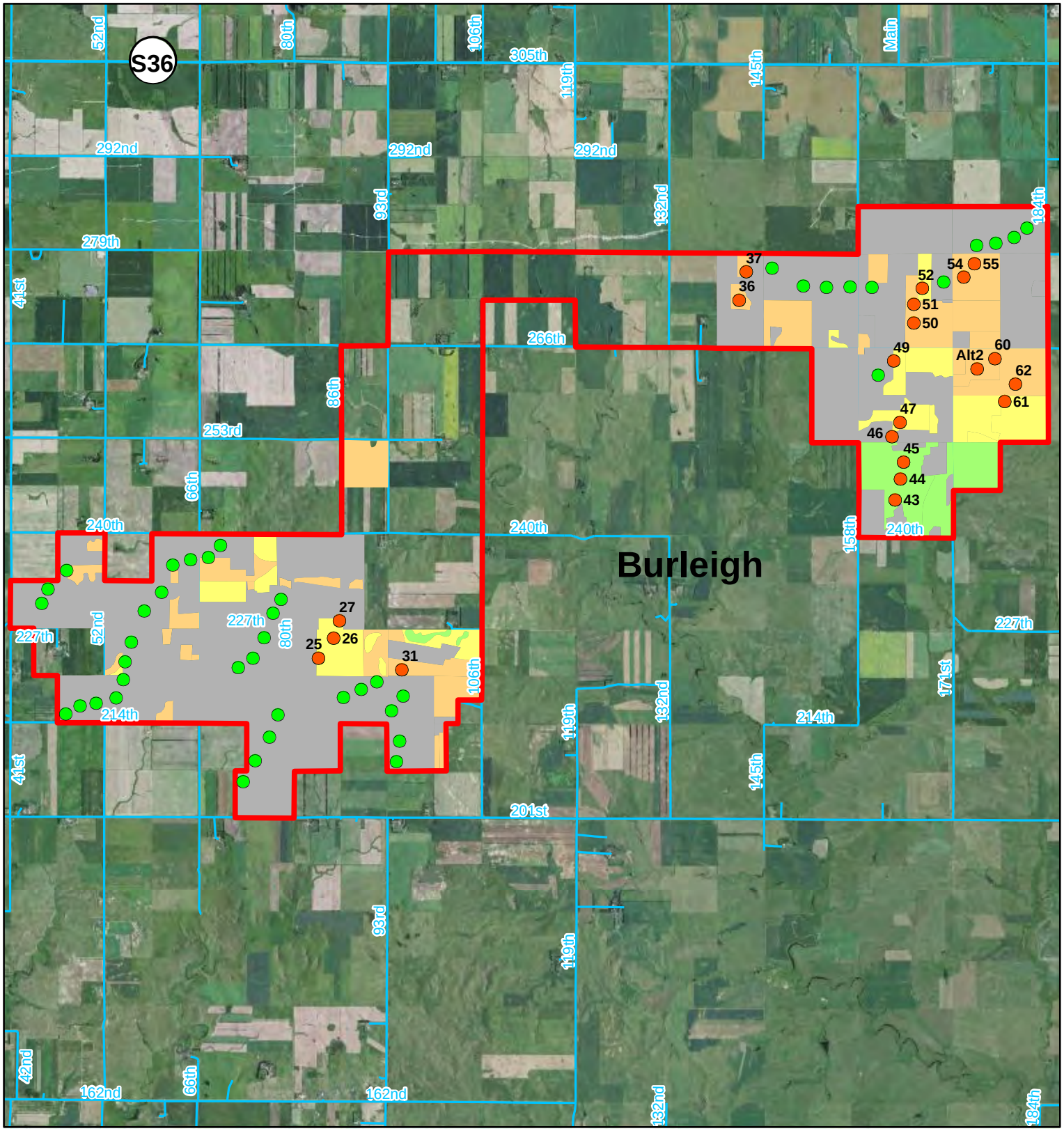
Miles

TETRA TECH EC INC

MAP OVERVIEW



File: P:\FPL Energy\Dakotas\Contract 4379 - Wilton IV\GIS\Spatial\MXD\WiltonIV_Native_Prairie_Analysis_20110829\WiltonIV_Field_Survey_Figure2_20110831.mxd



Legend
Turbines (9/21/11)

- Proposed Wind Turbine on Potential Dakota Skipper Habitat
- Proposed Wind Turbine
- ND DOT Roads
- Wilton IV Project Boundary 9/28/2011
- County Boundary

Wilton IV Field Survey Data

- Excellent/Likely
- Good/Possible
- Poor/Unlikely
- Other

Sources: ND DOT Roads, NAIP Imagery

Figure 3
Wilton IV
Potential Dakota Skipper Habitat

Burleigh County, ND

OCTOBER 2011

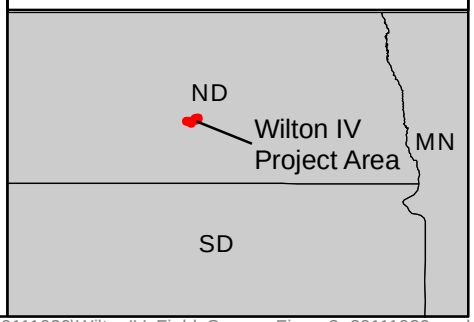
N

0 2

Miles

TETRA TECH EC INC

MAP OVERVIEW



File: P:\FPL Energy\Dakotas\Contract 4379 - Wilton IV\GIS\Spatial\MXD\WiltonIV_Native_Prairie_Analysis_20111020\WiltonIV_Field_Survey_Figure3_20111020.mxd

Appendix 1: Turbines located within Native Prairie at the Wilton IV Wind Energy Center.

Turbine Number	Easting	Northing	Skipper Habitat Rank
Turbines on Native Grassland			
43	383892	5214662	Excellent/Likely
44	384044	5215309	Excellent/Likely
45	383992	5215022	Excellent/Likely
25	373979	5212152	Good/Possible
26	374247	5212489	Good/Possible
27	374351	5212781	Good/Possible
46	383856	5215745	Good/Possible
47	384002	5215986	Good/Possible
61	385799	5216312	Good/Possible
60	385642	5217050	Poor/Unlikely
Alt 2	385334	5216874	Poor/Unlikely
Turbines on Tame Grassland			
49	383912	5217042	Good/Possible
52	384424	5218275	Good/Possible
31	375406	5211920	Poor/Unlikely
36	381288	5218131	Poor/Unlikely
37	381418	5218612	Poor/Unlikely
50	384265	5217683	Poor/Unlikely
51	384272	5218002	Poor/Unlikely
54	5218452	5218452	Poor/Unlikely
55	385322	5218674	Poor/Unlikely
62	385986	5216604	Poor/Unlikely

Appendix 2: Site Photographs

Photo 1 Direction: Southwest Location: T142N R78W S35
Description: Native prairie on steep hill slopes

Photo 2 Direction: West Location: T142N R78W S26
Description: High diversity native prairie with abundant little bluestem (*Andropogon scoparius*) and purple coneflower (*Echinacea angustifolia*).

Photo 3 Direction: East Location: T142N R78W S25
Description: Heavily grazed, poor quality native prairie. Abundant invasive species including yellow sweet clover (*Melilotus officinalis*), common ragweed (*Ambrosia artemisiifolia*) and Canada thistle (*Cirsium arvense*).

Photo 4 Direction: East Location: T142N R78W S36
Description: High diversity tame grassland including abundant purple coneflower (*Echinacea angustifolia*) and prairie coneflower (*Ratibida columnifera*).

Photo 5 Direction: North Location: T142N R78W S22
Description: Low diversity tame grassland/hay land.