Native Grassland Survey
Cimarron Wind Energy Project – Phase 1
Gray County, Kansas

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1.0 INTRODUCTION

CPV Cimarron Renewable Energy Company, LLC (CPV) is developing a wind energy conversion facility in Gray County, Kansas. The Cimarron Wind Energy Project – Phase 1 (WEP) encompasses land that consists primarily of agricultural crops with limited amounts of native grasslands. Most of the native grasslands are currently being used for grazing or hay production by private landowners. CPV contracted Tetra Tech EC, Inc. (Tetra Tech) to conduct a native grassland survey of the area currently under agreement for development of the WEP. The purpose of this study was to field verify native grassland mapping in order to provide CPV with an accurate assessment of the extent and location of the vegetation cover within the WEP and provide CPV with recommendations on avoidance and minimization of impacts based on the latest WEP turbine layout.

Native grasslands serve as a vital ecological resource by providing habitat for a diverse population of plants and animals, including wildlife species that rely on native grassland plant species. However, due to the grasslands' fertile soils and predominantly flat topography, large portions have been converted to agricultural lands over the past 200 years. The widespread loss of native grasslands makes them an ecosystem of conservation concern. Additional factors that have altered the ecology of native grassland ecosystems include invasion of non-native plant species, loss of native grazers (e.g., bison), altered fire regimes, and habitat fragmentation. The lack of fire coupled with overgrazing can lead to the conversion of grassland to shrubland or woodland, thereby reducing the value of the converted habitat to wildlife (Grant et al. 2003; Reinking 2006).

Native grasslands within the Midwest region of the United States are utilized in a few ways. Most native grasslands in private holdings are used for cattle ranching and are managed as rangelands. On rangelands, the soil has not been tilled and fire is often used to suppress the growth of woody species (Hagen et al. 2005). Other forms of rangeland management, such as seeding, fertilizing, and invasive species control, are less common but both serve to promote the growth of grassland species over woody species. Native grasslands may also be placed in conservation easements, held privately or publicly as grassland preserves, or wildlife refuges. Preserves and refuges can be difficult to distinguish visually from rangelands because the same types of management (fire and grazing) are often applied; however, both forms of utilization or management can promote healthy grasslands.

2.0 STUDY AREA AND METHODS

2.1 Study Area

The proposed WEP is located in southwestern Kansas in Gray County, north of the City of Cimarron. The WEP is primarily cultivated and is home to a few rural residences and farmsteads. CPV currently has approximately 12,000 acres of land under lease agreement with private land owners for development of the WEP. As proposed, the WEP would generate up to 165.6 megawatts (MW) of renewable energy from approximately 72 2.3-MW Siemens wind turbine generators. On February 1, 2010, CPV provided a preliminary turbine layout to Tetra Tech for the WEP to be evaluated in this report. The study area for this effort is defined by the area under agreement with CPV or in progress to establish a lease which includes all 72 potential turbine locations and their associated facilities (access roads, electrical collection lines, substation, laydown areas, permanent meteorological tower locations, and operations and maintenance building).

The regional topography is characterized as relatively flat with some shallow stream drainages and a range in elevation from about 2,700 to 2,800 feet above mean sea level (Tetra Tech 2008). The United States Geological Survey (USGS) 1:100,000 scale quadrangle for the region is the Dodge City Quadrangle. Only a few water courses are present in the region, including Buckner Creek, which passes through the eastern portion of the WEP, and the Arkansas River, located approximately 1.5 miles south of the WEP. The Ogallala/High Plains Aquifer underlies the entire WEP area, and a large portion of western Kansas, as a whole.

2.2 Grassland Assessment Methodology

Prior to field surveys, Tetra Tech Geographic Information System (GIS) specialists performed a desktop analysis of grassland and crop land cover within the leased area of the WEP, using Kansas GAP Analysis Program (GAP) data from the Kansas Applied Remote Sensing Program (KARS 2001; Figure 1). A grassland biologist conducted field surveys in June 2009 to determine the accuracy of the land cover data bases. Mid-summer is an appropriate time to conduct these surveys because many native grassland plants are in bloom and easy to identify. In order to identify areas of native grassland systematically, the biologist visually assessed (using binoculars as needed) the habitat by making roadside stops to mark the habitat on field maps. In many areas, one square-mile sections of land were bordered by county roads and were easily evaluated. Roadside stops were made when there was a change in habitat or views became obstructed. For most sections of land, the habitat was viewed from several points along the road. Areas of presumably unbroken soil (i.e., untilled soil) that were comprised mostly of native grassland plants were classified as native grassland, and may have included rangelands and conservation easements.

Identification of native grasslands was based on several visual cues: 1) the presence of native grassland grass species, including big bluestem (*Andropogon gerardii*), switchgrass (*Panicum virgatum*), little bluestem (*Schizachyrium scoparium*), and sideoats gramma (*Bouteloua curtipendula*); 2) the presence of non-native species in core areas away from fence lines, including cheatgrass (*Bromus tectorum*), field bindweed (*Convolvulus arvensis*), and Johnsongrass (*Sorghum halapense*); 3) rolling topography that renders land less feasible for tilling; 4) the presence of rock piles which indicate clearing of rock from an area in preparation for cultivation; and 5) crop vegetation growing in obvious rows.

3.0 RESULTS AND DISCUSSION

The desktop assessment identified 1,403 acres of WEP as potentially containing native grassland plant species (Table 1; Figure 2). As such, all grasslands depicted in Figure 2 may have potential value in a management or conservation context. However, terrain classified in three categories (Grassland [G] and Grassland dominated by mostly native species [Gn and Gn?] represent the best native grassland habitat observed within the study area and, therefore, is the most worthy of additional attention during project development. Based on the most recent turbine layout (provided by CPV February 1, 2010), 4 turbines of the potential 72 turbines are presently sited in these three habitat types (B13A-14A, C25A-26A; Figure 2). B13A and B14A are located near the edges of grassland parcels and would therefore be less likely to fragment the habitat. Careful attention to micrositing these turbines and associated roadways could minimize impacts to the native grassland areas. A photograph log is presented as Appendix A of this report; the locations from which the photographs were taken during the field effort are shown on Figure 2.

Unfragmented areas of native grassland in the WEP may be of greatest benefit to wildlife as they maximize potential population sizes for grassland obligate species and they limit encroachment into grassland habitat of non-grassland influences (i.e., invasive species, predators). Federal (e.g., United States Fish and Wildlife Service) and state (e.g., Kansas Department of Wildlife and Parks) agencies have requested that, even though construction with native grassland is not regulated, developers attempt to minimize fragmentation of existing native grassland patches. The following practices can be employed during construction and operation to minimize impacts to native grassland:

- Site project facilities in areas that have a management history of combined fire suppression and overgrazing, both of which can greatly reduce grassland quality. The combination of these factors can result in increased bare ground, soil compaction, and erosion (Belsky and Blumenthal 1997). Native grassland that does not experience periodic fires can become encroached by woody plants and may be unsuitable for grassland wildlife species (Johnson 1997, Reinking 2006).

- Site project facilities along existing linear features (e.g., roads, rights of way, fence lines), or along the edges of native grassland parcels, if siting in the native grassland areas cannot be avoided completely, to avoid or minimize additional grassland fragmentation.
- A management plan should be developed to prevent the spread of noxious weeds throughout the WEP during construction and ongoing operations. Any area that is disturbed or altered should be managed appropriately to avoid the introduction or spread of noxious species. The appropriate weed control board should be consulted to develop this plan.

4.0 LITERATURE CITED

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TABLE

Table 1. Distribution of Grassland Habitat Types at WEP

Patch Type	Figure Code	# of Patches	Total Acres	# of Turbines
Grassland	G	1	182	2
Grassland used as hayfield	Gh	1	29	0
Invaded grassland	Gi	2	148	0
Grassland dominated by mostly native species	Gn	3	415	2
Grassland that may have been planted	Gp/Gp?	6	603	0
Grassy waterway	Gww	1	28	0
	Total	**14**	**1,403**	**4**

FIGURES

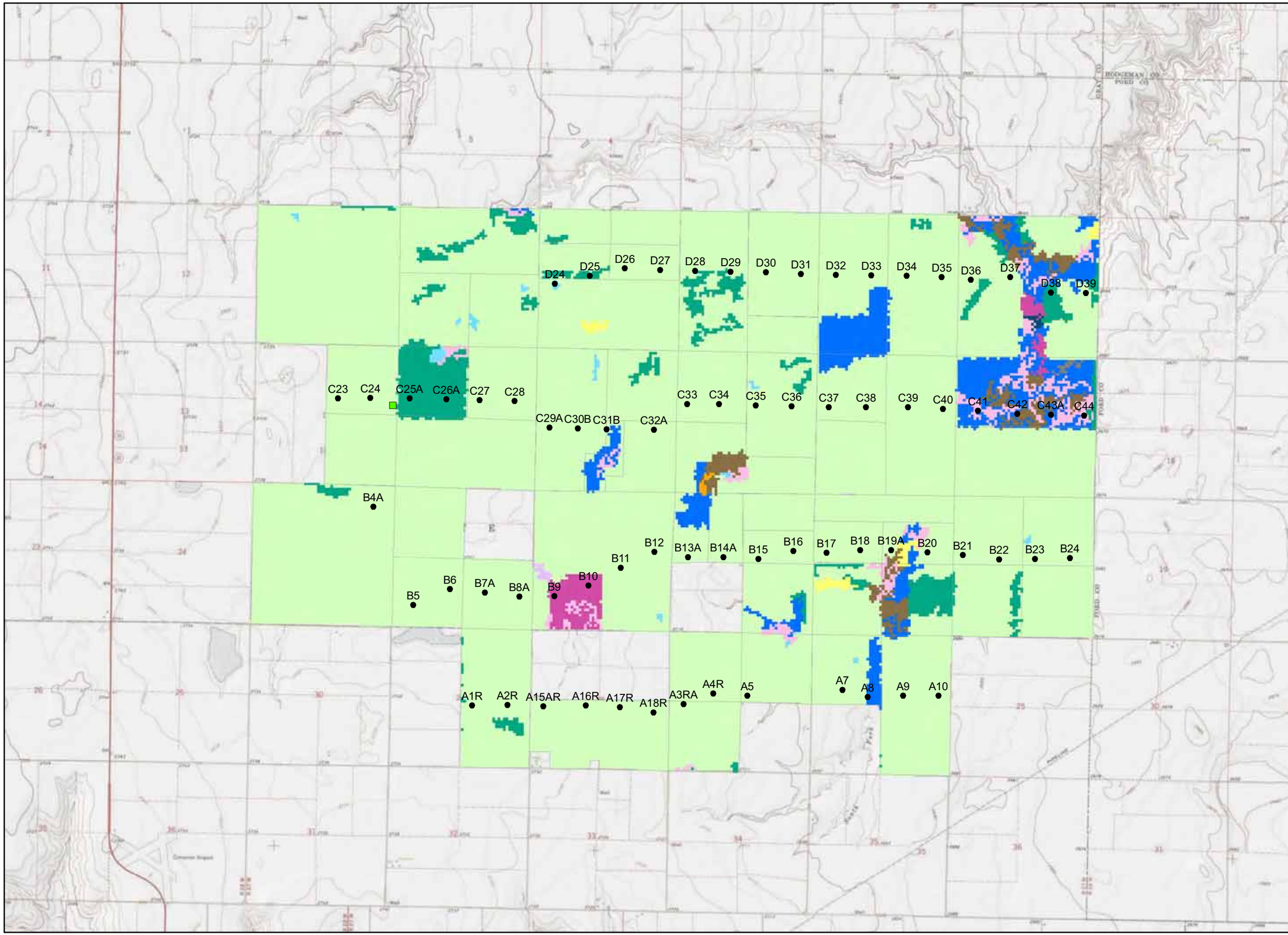

Figure 1: GAP Data

Cimarron Wind Energy Project
Phase 1
Gray County, Kansas

Legend

- Proposed Turbine
- Proposed Substation
- Leased Parcel

GAP Vegetation

- Alkali Sacaton Prairie
- Bulrush Marsh
- Cattail Marsh
- Conservation Reserve Program (CRP) Lands
- Cottonwood Floodplain/ Woodland
- Cultivated Land
- Mixed Prairie
- Salt Marsh/Prairie
- Sandsage Shrubland
- Shortgrass Prairie
- Water
- Western Wheatgrass Prairie

Source: GAP-Vegetation is mapped from satellite imagery, using the National Vegetation Classification System, 2001. (http://www.KansasGIS.org), Platts Powermap 2009
Turbine layout provided February 1, 2010.

N

0 0.25 0.5 Miles

TETRA TECH EC, INC.

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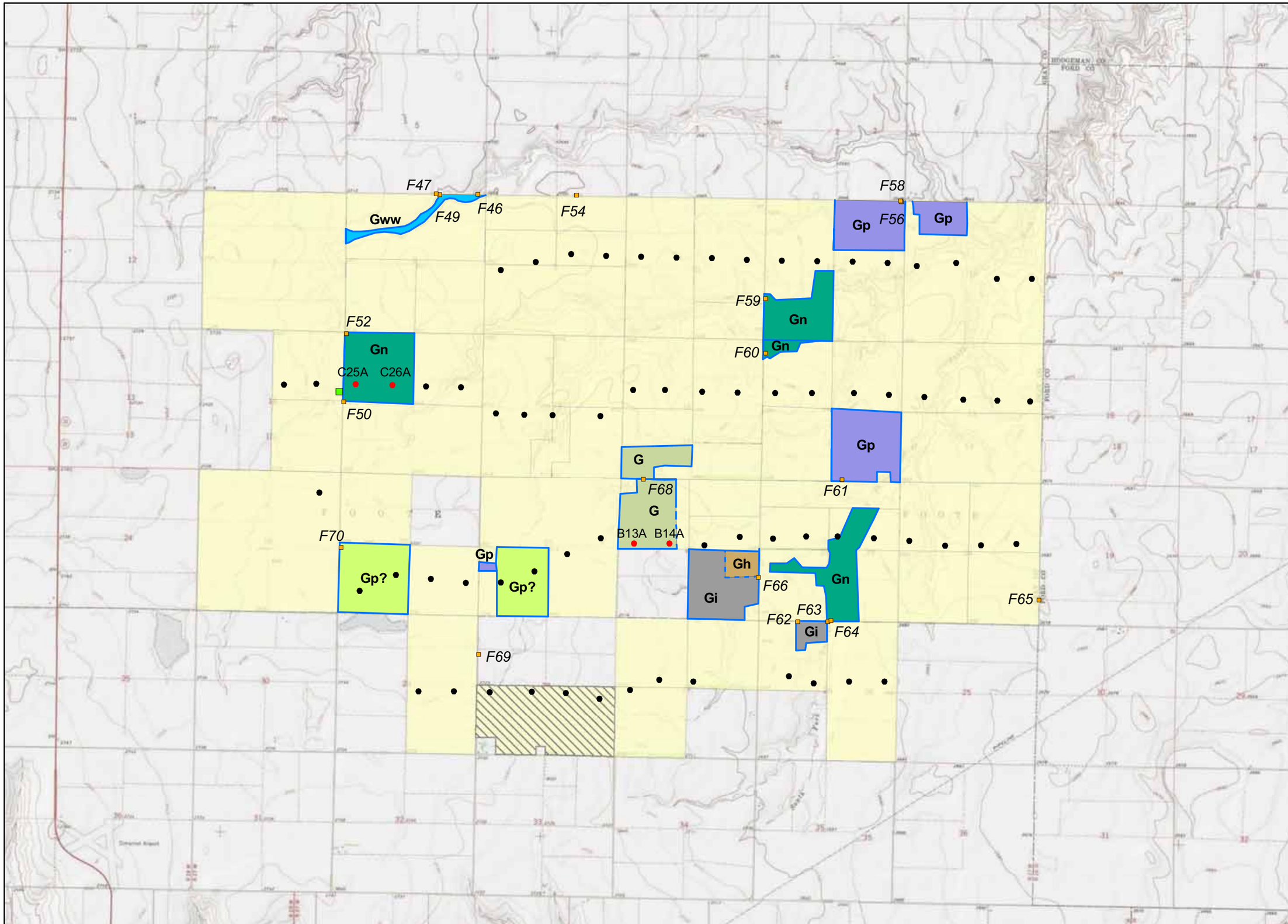
Figure 2: Native Grassland Survey

Cimarron Wind Energy Project
Phase 1
Gray County, Kansas



Legend

- Proposed Turbine
- Proposed Turbine in G or Gn
- Proposed Substation
- F51 Photo Location
- Leased Parcel

Land Cover Boundary

- Boundary estimated based on what was visible at site and/or assumed from aerial photo
- Boundary verified at site

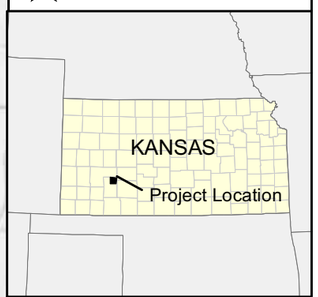
Grassland Cover Types

- G - Grassland
- Gh - Grassland used as Hayfield
- Gi - Invaded Grassland
- Gn - Grassland dominated by mostly native species
- Gp - Grassland that has been planted
- Gp? - Grassland that may have been planted
- Gww - Grassed Waterway
- Not Field Surveyed

Source: Turbine layout provided February 1, 2010.

N

0 0.25 0.5 Miles



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APPENDIX A

Photographic Log of Native Grassland Survey June 26-27, 2009

Photograph F46. Pivot corner, dominated by exotic/invaives, especially *Bromus tectorum*, *Bromus inermis*, and *Convolvulus arvensis*.

Photograph F47. Grassland waterway between fields. Invasives advancing from road.

Photograph F49. Pivot corner. *Pascopyrum smithii* dominant farther from road. Invasives dominant closer to road. Short cedar rows.

Photograph F50. Fairly decent grassland, although *Bromus tectorum*, *Bothriochloa laguroides*, *Melilotus officinale*, and *Convolvulus arvensis* distributed throughout.

Photograph F52. This end of the parcel appears to be in better condition than previous photograph point. Native grasses and forbs more dominant. Invasives also present.

Photograph F54. Sedge meadow adjacent to road and to the east of this point. Grassland area heavily dominated by *Bromus tectorum*.

Photograph F56. Hay meadow. Likely planted because almost all *Pascopyrum smithii* with *Medicago sativa* scattered.

Photograph F58. Likely converted from agriculture because terraces running through this parcel. Terraces almost exclusively *Solidago* stands.

Photograph F59. Large patches of *Bromus tectorum*.

Photograph F60. Fairly decent grassland, although *Bromus tectorum* forms large patches and few forbs visible.

Photograph F61. Likely a planted hay field. Almost entirely *Pascopyrum smithii*.

Photograph F62. Large patches of *Bromus tectorum* and *Convolvulus arvensis*.

Photograph F63. *Pascopyrum smithii* fairly abundant, *Solidago* also forming some distinct patches. *Bromus tectorum* and *Convolvulus arvensis* common.

Photograph F64. Dead brush along fenceline, seems to have an invading front of *Bromus tectorum*. Further from road, has standard mix of grasses and forbs.

Photograph F65. Pivot corner. Very wet, sedges abundant.

Photograph F66. Very dense stands of *Bromus tectorum* as far as I can see, with patches of *Pascopyrum smithii*, *Elymus canadensis* in between.

Photograph F68. Only parcel with *Opuntia* cactus. *Plantago patagonica* abundant in shorter patches. Taller areas contain *Pascopyrum smithii* and *Bromus tectorum*.

Photograph F69. Pretty decent grassland, although contains *Bromus tectorum* and *Medicago sativa*. May have been converted from agriculture.

Photograph F70. Heavily infested with *Bromus tectorum*. Further from road native grasses more abundant, but likely planted.