TransCanada Keystone XL Pipeline Project

Initial Report Identifying Alternative and Preferred Corridors for Nebraska Reroute

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1. Introduction

In response to specific concerns raised by the State of Nebraska, TransCanada Keystone Pipeline LP (Keystone) has agreed to reroute its proposed Keystone XL Pipeline Project to avoid the Sandhills region in Nebraska (Nebraska Reroute). This report, which is being provided to the Nebraska Department of Environmental Quality (NDEQ), presents an initial analysis of alternative pipeline corridors that avoid the Sandhills. Each of the "corridors" discussed in this report represents a 2,000-foot-wide area. The statistics presented and maps provided represent the centerline of these 2,000-foot-wide corridors.

KXL Project Overview

The Keystone XL Pipeline Project (hereinafter referred to as the "Keystone XL Project" or the "Project") is a proposed approximate 854-mile, 36-inch diameter pipeline to transport crude oil from Hardisty, Alberta, Canada to Steele City, Nebraska. From That point, the project will connect with the existing Keystone Pipeline Cushing Extension. At the terminus of the Cushing Extension, the oil will be delivered into a new 36-inch pipeline to be constructed as the Keystone Pipeline Gulf Coast Project for transportation to refinery markets in the Gulf Coast area of the United States. The Project will have an initial nominal throughput capacity of 700,000 barrels per day (bpd) and can be expanded to an ultimate nominal capacity of 830,000 bpd through the installation of additional pumping capacity.

Background and Reroute Report Purpose

In September 2008, Keystone filed an application with the U.S. Department of State (DOS) for a Presidential Permit authorizing the construction and operation of the proposed Keystone XL Pipeline Project at the U.S.-Canada border crossing location in Montana. At that time, the proposed project consisted of a 2,232-mile, 36-inch diameter pipeline and appurtenant facilities to transport crude oil from Hardisty, Alberta, Canada to Nederland/Port Arthur, Texas. Upon receipt of that application, DOS led a comprehensive environmental review of all aspects of the original Keystone XL Project. The environmental review culminated August 26, 2011 with the release of the Final Environmental Impact Statement (FEIS) for the project. This review was the most detailed and comprehensive environmental review ever undertaken for a cross border crude oil pipeline. The FEIS concluded that "[t]he analysis of potential impacts associated with construction and normal operation of the proposed Project suggest that there would be no significant impacts to most resources along the proposed Project corridor…" (FEIS at p.3.15-1).

In November 2011, the DOS determined that, in order to make the required National Interest Determination with respect to the original Keystone XL Pipeline Project, it was necessary to conduct an in-depth assessment of potential alternative routes that would avoid the Sandhills region in Nebraska. Pursuant to authorization provided in Nebraska statue LB 4 – as adopted in the Special Legislative Session of November 2011 – the NDEQ also commenced leading the effort to assess alternative routes through Nebraska. The NDEQ also commenced negotiation of a Memorandum of Understanding with DOS, as provided for in LB – 4, in order to collaborate with DOS in the preparation of a Supplemental Environmental Impact Statement. Subsequently, the NDEQ hired a contractor to assist with the route review and published a map delineating the "Sandhills" region that any alternative route must avoid.

In late December 2011, Congress included a provision in the Payroll Tax Cut Extension Act requiring the President to make a decision on the Presidential Permit within 60 days. This Congressional action caused the State Department to suspend its work on an MOU with the NDEQ for the reroute process. This caused the NDEQ to suspend its work with respect to review of alternative routes in the State. In January 2012, the DOS announced its determination that the project – as presented and analyzed at that time – did not serve the national interest. The determination was based not on the merits of the project, but on

the rationale that the time provided by Congress for a decision was not adequate to complete the National Interest review of the project. Specifically, the DOS stated that there was insufficient time to develop and assess information regarding alternative pipeline routes in Nebraska.

On January 31, 2012, Keystone submitted a letter advising DOS of its intentions in response to the decision on the Presidential Permit. Keystone explained that the portion of the Keystone XL Pipeline project from Cushing, Oklahoma to the Gulf Coast has its own market purpose and commercial support – "independent utility" – and that Keystone would be developing that project as the stand-alone "Gulf Coast Project." Moreover, Keystone indicated that it soon would be filing a new application for a Presidential Permit for the Keystone XL Project – re-configured as the portion or the original project extending from the Montana-Canada border to Steele City, NE. Keystone further advised DOS that it would supplement that application with a new route through Nebraska as soon as such a route was approved by the State.

Finally, on April 11, 2012, the Nebraska legislature passed legislation authorizing NDEQ to resume its review of alternative routes avoiding the Sandhills. Keystone is submitting this report in cooperation with the renewed alternative route assessment process.

2.0 Nebraska Alternative Route Assessment Process Overview

The alternative route assessment process needed to recognize the project goals and remain consistent with the objectives that were utilized to develop the original route in 2008. The following sections describe the process of identifying feasible corridor alternatives for study that would culminate in the selection of a preferred reroute.

2.1 Study Goal and Objectives

The initial proposed KXL route through Nebraska trended in a southeasterly direction from a fixed entry point from South Dakota to meet the project's objectives of connecting to a fixed termination point at Steele City, Nebraska. Since the Keystone XL route through Nebraska trends in a southeasterly direction, the most logical point to begin identification of a study area and subsequent potential reroutes is a path that keeps to the east of the Sandhills.

Keystone employed a multidisciplinary approach to establish a comprehensive analysis of various potential corridor alternatives. The goals and objectives that were used to define the study area and help define proposed and alternate corridors for the Nebraska Reroute Report include:

- Utilize the existing starting point at the South Dakota – Nebraska border in Keya Paha County, NE; north of Mills, NE. This location has been approved by the South Dakota Public Utilities Commission in 2010 after a year-long review under the SD Energy Conversion and Transmission Facilities Siting Act;
- Avoid the "Sandhills" region as defined by the NDEQ (Appendix A);
- Minimize length of Nebraska Reroute by utilizing the previously studied KXL FEIS route to the greatest extent practicable. This results in minimizing the number of additional impacted landowners as much as possible;
- Rejoin the previously approved Keystone XL FEIS route at the Central City Pumping Station near Merrick, Nebraska. This provides the shortest path to return to the Keystone XL FEIS route, consistent with the other goals and objectives;
- Utilize co-location opportunities with other existing pipelines, electric transmission lines, railways, roadways, and other utilities to the extent practicable; and
- Identify other opportunities such as beneficial topography, following section lines, and compatible land use.

2.1.1 Study Area

As further discussed in Section 3.0, the study area is only within the State of Nebraska. The study area encompasses approximately 6,000 square miles bounded on the west by the KXL FEIS route and the Sandhills area and extending eastward to a north-south line extended along the eastern border of Antelope and Boone Counties. The study area is depicted in Figure 1.

The factors set forth below influenced the boundaries of the study area evaluated for the Nebraska Reroute:

- Regulatory restrictions (permitting constraints);
- Avoidance of Sandhills as defined by the NDEQ (see Appendix A);
- Crossing of the Niobrara River at a location not designated as wild and scenic;
- Starting point: KXL FEIS Route at South Dakota - Nebraska State line near Mills, Keya Paha County; and
- Ending point: Central City pumping station on the previously studied existing KXL FEIS route, Merrick, Nebraska.

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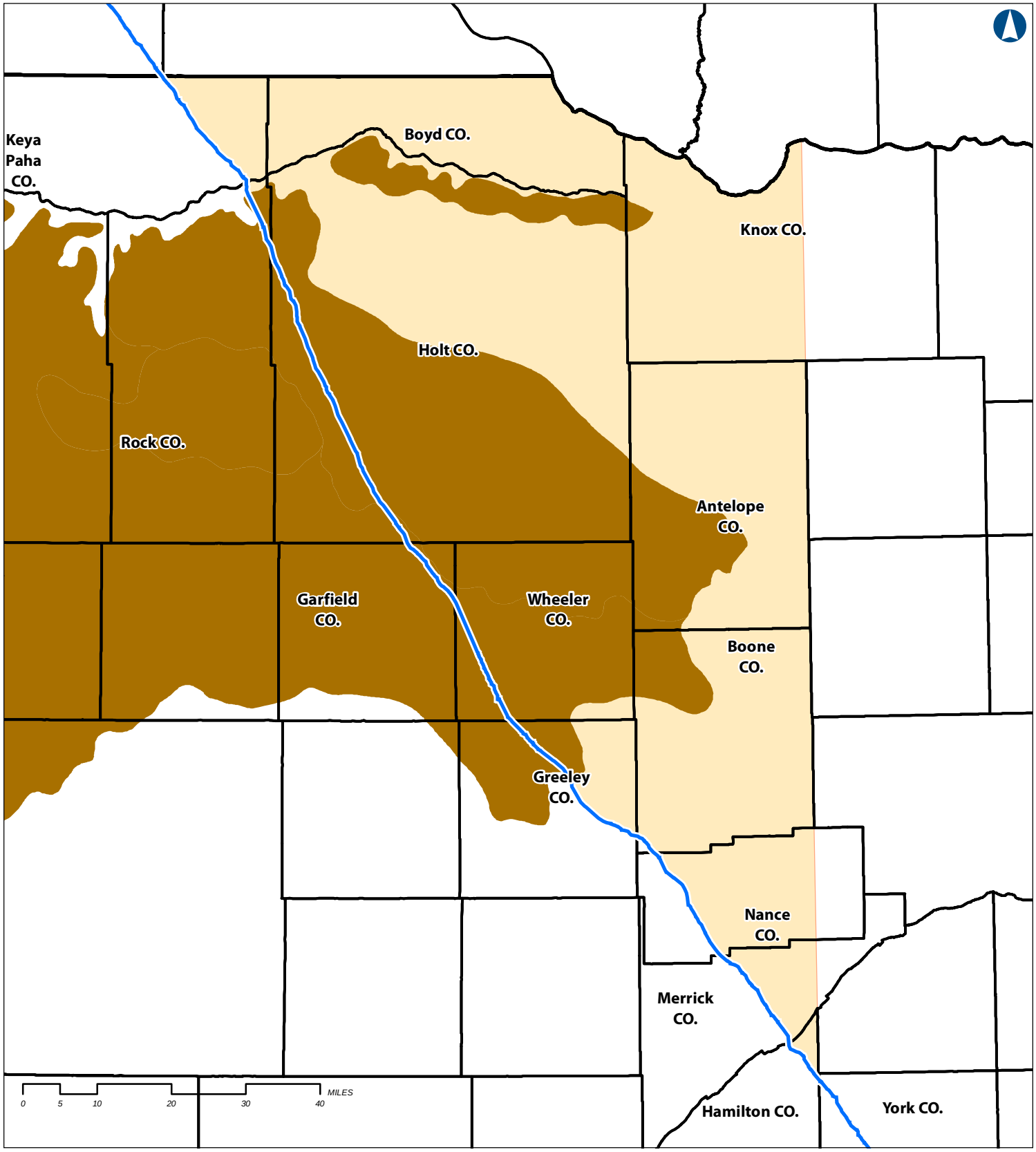
FIGURE 1 - STUDY AREA



LEGEND

- KEYSTONE XL PIPELINE PROJECT
- NEBRASKA SANDHILLS
- STATE BOUNDARY
- COUNTY BOUNDARY
- STUDY AREA

KEYSTONE XL PIPELINE PROJECT
Study Area

COUNTY:	-	DRAWN BY:	PD
STATE:	NEBRASKA	CHECKED BY:	JP

REV. NO.:	REVISION	DATE
0	ISSUED FOR REVIEW.	2011-12-27

PRELIMINARY

DATE: 2011-12-27 | PROJECTION: NAD83 | UTM14 N

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2.2 Develop GIS Database

Keystone developed a comprehensive database for the project study area by gathering existing Nebraska and other agency and public GIS databases, as well as additional data that was developed and analyzed by Keystone. Appendix C provides a listing of the data used for this GIS database and the references section of this report provides all the pertinent information on date, location, and format of the data used.

2.3 Define Exclusions, Constraints, and Opportunities

Once all of the data was compiled into the GIS database, Keystone mapped constraints to avoid during development of corridor options. Section 2.9 provides a complete listing of all of the constraints, exclusions, and opportunities used in development of corridor options.

In summary, Keystone avoided the NDEQ-defined Sandhills region, cities and towns, federally or state protected lands, and native allotments to the extent practicable. Constraints of a smaller scale like residences, water wells, wellhead protection areas and other HCAs could not be avoided by a 2000 foot wide corridor. However, every effort will be undertaken to avoid them to the extent practicable in the development of a route within the preferred corridor.

Keystone examined routing opportunities such as the use of existing rights-of-way within the study area that were oriented in the direction of potential corridor options.

2.4 Identify Corridors

Once the constraints, exclusion areas, and opportunities were mapped, Keystone created corridor options for analysis and further review by avoiding and/or taking advantage of these criteria.

In the course of identifying potential corridors within the study area, common points of convergence were established for comparison of corridor alternatives. Keystone established some intermediate nodes in the study area to facilitate comparison between corridor options. The nodes are as follows:

- Node 1: An acceptable crossing location of the Keya Paha River between two Sandhill regions located in Rock and Holt Counties (near Big Sandy Creek, Holt County)
- Node 2: A point immediately east of the north-eastern edge of the Sandhills region located approximately 6.3 miles northeast of Neligh in Antelope County

2.5 Desktop Review and Corridor Refinement

Corridor options were then reviewed by a multidisciplinary team (engineering, construction, environmental, regulatory, and land) using aerial imagery and the GIS data to correct the corridors for issues or flaws not previously identified. This analysis resulted in more realistic corridor options for subsequent comparison of the data using GIS. The resultant maps were then used in the next step of the analysis.

2.6 Field Reconnaissance

During December 2011, team members conducted aerial and ground reconnaissance on the corridors. Aerial reconnaissance was done via helicopter. There was little to no snow cover during aerial reconnaissance. On the ground, teams visited many accessible points of interest to assess constructability and restoration potential of the identified corridors. Features observed included potential pump station sites, roads, railroads, and waterbody crossings.

The corridor options were evaluated and observations documented for flaws in alignment, new or abandoned structures, constructability challenges and issues, determination of drainage patterns and crossings, and confirmation of GIS data to improve comparative analysis.

2.7 Corridor Modification

After the reconnaissance was completed, the team reconvened to analyze the data collected, recall the observations made, map the recommended changes to the corridors, and review the corridor segments again. Using GIS data and imagery, the team was able to refine the corridors to avoid certain constraints identified during the field reconnaissance activities.

2.8 Analysis of Corridors and Selection of Preferred Corridor

The centerline of each corridor was then analyzed in GIS and the results were tabulated (see Section 4.0) for environmental impact, land use impact, engineering design, constructability and operational integrity. Based on the comparison of the alternatives and coupled with the documented reconnaissance observations, a preferred corridor was then selected for analysis in the next step of the process.

2.9 Criteria Used

Through all stages of the alternative route assessment process, certain criteria specific to the siting and analysis of underground pipelines were used and analyzed for comparative purposes to assist in selection of a preferred corridor. The criteria for identifying pipeline corridors take into consideration numerous aspects: pipeline route length and overall project footprint, public safety, environmental constraints, population density, land-use compatibility, optimization with other industrial infrastructure, constructability limitations and regulatory constraints. Each of these criteria is further discussed below.

2.9.1 Length and Overall Project Footprint

One of the criteria examined when selecting a pipeline corridor is total length. Generally, the goal is to minimize the length of the pipeline, which decreases the project footprint and impacts on the environment and landowners.

Minimizing the length of a pipeline corridor is a major goal during the planning process but may not always be the preferred option. Routing a pipeline to avoid environmentally sensitive and densely populated areas, as well as the avoidance of large waterbody crossings via the implementation of the horizontal directional drill (HDD) technique, also play important roles in determining a pipeline route. Routing to avoid or minimize interaction with High Consequence Areas (HCAs) also is incorporated into the initial routing efforts. Many times, safety and environmental issues, in addition to geotechnical concerns, may outweigh the impacts of the additional length.

In the case of the Nebraska Reroute, efforts were also made to maximize the use of the existing Keystone XL FEIS Route. This allows the project to take advantage of a route that remains as direct as reasonably possible, and that has been examined in the field, reviewed by multiple agencies, and found acceptable in the FEIS for the original Keystone XL Project.

2.9.2 Environmental Constraints

Keystone also considered whether any environmental, land-use/planning, physiographic issues represent impediments to pipeline construction and operation within the study area. The data used for this analysis were generally based on publicly available information, especially existing GIS databases, and previous

experience/knowledge of the area in question. The approach for this desktop, aerial, and field reconnaissance analysis was to gather and assess data related to:

- Wetland Resource Areas;
- Waterbodies and associated riparian habitat/floodplain;
- Land Use and Public Lands, including park land and wildlife management areas;
- Federal Special Status Species (Threatened, Endangered, and Species of Concern) habitat;
- State Special Status Species habitat;
- Waterbody classifications;
- Wellhead protection areas and aquifers;
- Listed Contaminated Sites;
- Native American Lands; and
- HCAs as designated by the Pipeline Hazardous Materials and Safety Administration (PHMSA).

Additional corridor analysis and refinement will be conducted as part of continuing development of the preferred corridor. This analysis will be conducted in certain areas to determine the actual feature boundaries in comparison to those noted in the GIS databases.

2.9.3 Population Density

Population density within the Nebraska Reroute study area is relatively low along each of the corridor options, with the majority of the land used for agriculture and open range. Figure 2 shows that population density ranged from 1 person/square mile to over 17 people/square mile. For this report, population density was not a discriminating factor in determining corridor locations because all of the counties within the study area are sparsely populated and no cities or towns are impacted or encroached upon by proposed corridors.

2.9.4 Land Use Compatibility/Co-location Opportunities

Each corridor option was examined for potential land use concerns. The majority of the alternative corridors traverse agricultural areas, grasslands, and rangelands, so issues related to urban sprawl are not expected.

2.9.4.1 Avoidance Areas - Large Scale

Potential corridors were selected that avoided the following land use categories to the extent practical:

- National Parks, National Monuments, State Parks with developed recreation facilities;
- Other publicly owned lands including Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (USFWS), State Lands, NPS, USACE, DOD, tribal lands, etc.
- Urban areas;
- Military bases; and
- The Sandhills.

2.9.4.2 Avoidance Areas-Small Scale

For the purposes of identifying potential corridors in this report, and recognizing the limits of the scale and accuracy of the data that exists, the following areas will be avoided to the extent practical:

- Residences and farmsteads;
- Rural schools and recreational areas;
- Towns and suburban developments;
- Municipal sewage ponds;
- Industrial facilities (e.g., rail yards, warehouses, utility sites), except when in industrial alternative corridors;
- Agribusiness operations such as feed lots and concentrated swine and poultry raising facilities;
- Rural cemeteries;
- Oil/ natural gas fields; and
- Well heads and irrigation pivot points.

2.9.4.3 Co-location Areas-Large and Small Scale

For the purposes of this report, and recognizing the limits of the scale and accuracy of the data that exists, the following areas will be collocated with to the extent practicable:

- Existing pipelines;
- Existing roadways or section lines; and
- Electrical transmission lines.

2.9.4.4 Agricultural Lands, Shelterbelts and Wooded Areas

Cropland is the dominant land use throughout the study area. All corridor choices included ranch and farm land, therefore, this was not a discriminating factor. Shelterbelts and wooded areas will be avoided to the extent practicable.

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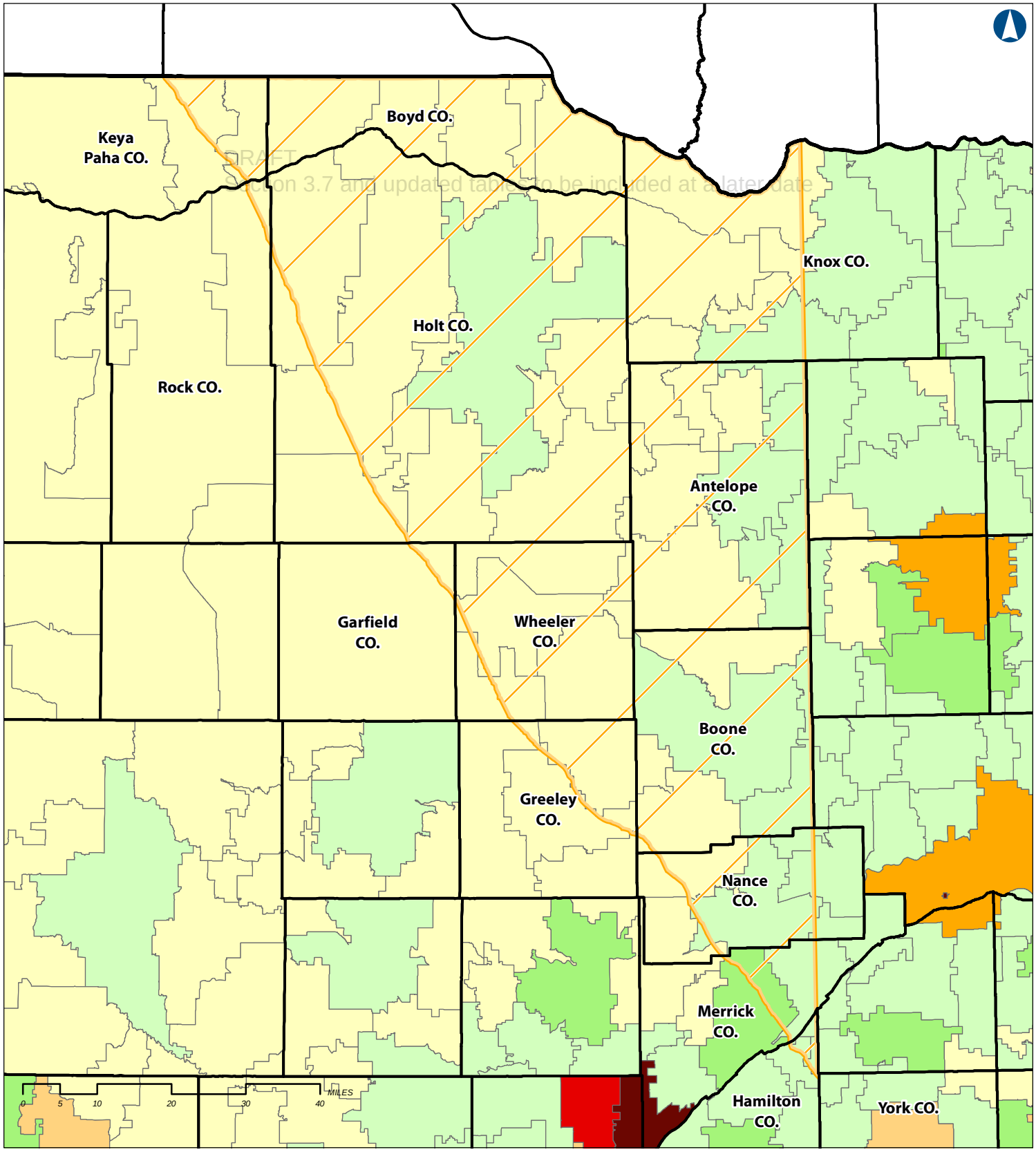
FIGURE 2 - STUDY AREA POPULATION DENSITIES



DRAFT
Section 3.7 and updated tables to be included at a later date

LEGEND

- STATE BOUNDARY
- COUNTY BOUNDARY
- STUDY AREA

PEOPLE PER SQUARE MILE (WITHIN ZIP CODE)

0.6 - 7.4 | 7.4 - 17.1 | 17.1 - 32.2 | 32.2 - 58.3 | 58.3 - 161.7 | 161.7 - 325.35 | 325.35 - 839.7

KEYSTONE XL PIPELINE PROJECT
Study Area Population Densities

COUNTY:	-	DRAWN BY:	PD
STATE:	NEBRASKA	CHECKED BY:	JP

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PRELIMINARY

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2.9.5 Construction and Saftey Issues

Each corridor was examined during the field reconnaissance activity for potential construction and operational problems or challenges that would affect the safety of the Project's workers and operational employees or public at large, unduly increase potential environmental impact(s), increase project footprint, impair construction quality, cause schedule delays and/or have significant effects on Project cost. Road crossings and major waterbody crossings were considered along with large wetland areas and the number of HDD's expected. Other factors considered were rough terrain and the associated erosion control and restoration limitations presented by construction in such areas.

2.9.6 Regulatory

The regulatory permitting process can influence routing considerations. Difficulty in receiving a given permit or permits as well as the time it takes for permits to be granted are key determinants in choosing a corridor.

3.0 Study Area Description

3.1 Study Area

Routing studies are bounded by control or begin/end points that define an area within which alternatives can be identified and evaluated. The study area depicted in Figure 1 encompasses approximately 6,000 square miles. The study area is bounded by a beginning point near the South Dakota/Nebraska line along the approved Keystone XL FEIS route and at the south end at the Central City pump station in Merrick County Nebraska along the Keystone XL FEIS approved route. The primary goal of the Nebraska Reroute effort is to avoid the area defined by the NDEQ as the Sandhills region. Therefore, the study area is bounded on the west by the Sandhills exclusion area. The study area is bounded on the east by a north-south line along the eastern border of Antelope and Boone counties which runs down to the ending point for this report, the Central City pump station.

3.2 Topography

Similar to the previously studied Keystone XL FEIS route, the study area is mostly located in the High Plains portion of the Great Plains Physiographic Province. The northern portion of the study area to the north of the Niobrara River falls within the southern extent of the glaciated Missouri Plateau. To the south of the Niobrara River, the study area falls within the unglaciated Missouri Plateau region. Surface elevations range from 1,400-feet to 2,200-feet. The topography is mostly flat with occasional hills and drainages. Most of the major rivers are meandering with braided channels and broad floodplains.

From north to south, the Nebraska Reroute study area covers 3 USEPA Ecoregions: Northwestern Glaciated Plains; Western Corn Belt Plains; and, Central Great Plains. The predominant land use along all corridor options is agriculture.

3.3 Geology

The underlying bedrock consists of Tertiary-aged Ogallala Group and Cretaceous sedimentary rocks (Pierre Shale, Niobrara Formation, Carlisle Shale, Greenhorn Limestone and Graneros Shale, and Dakota Group).

The Pierre Shale is exposed in the northern portion of the study area and is composed of fissile clay shale, claystone, shaly sandstone, and sandy shale. This formation is prone to slumping and is especially weak where layers of volcanic ash are present.

Geology beneath the Nebraska Reroute study area is detailed in Table 2.

Table 1 Nebraska Geography Within the Study Area

Physiographic Description	Elevation Range (ft. msl)	Local Relief Range (ft.)	Surface Geology	Bedrock Geology
Northwestern Glaciated Plains – Southern River Breaks				
Lightly glaciated dissected hills and canyons. Topography contains slopes of high relief bordering major rivers and alluvial plains.	1,250 - 2,000	250 -700	Cretaceous shale	Pierre Shale
Northwestern Glaciated Plains – Southern River Breaks				
Dissected hills and canyons. Topography contains slopes of high relief bordering major rivers and alluvial plains.	1,400 - 2,000	250 - 500	Cretaceous shale	Pierre Shale
Northwestern Great Plains – Keya Paha Tablelands				
Unglaciated, level to rolling sandy plains. Topography is dissected near streams; contains isolated gravelly buttes.	1,900 - 2,400	20 - 400	Aeolian and alluvial sand and silt	Ogallala Sandstone
Northwestern Great Plains – Niobrara River Breaks				
Unglaciated, dissected canyons. Contains slopes of high relief adjacent to river	1,700 - 2,700	200 - 600	Sandy residuum	Miocene soft sandstone over Pierre Shale
Central Great Plains – Central Nebraska Loess Plains				
Rolling dissected plains with deep layer of loess. Contains perennial and intermittent streams	1,600 - 3,100	50 -275	Calcareous loess, alluvial sand, gravel, and lacustrine sand and silt	Ogallala Sandstone
Central Great Plains – Platte River Valley				
Flat, wide alluvial valley. Contains shallow, interlacing streams on a sandy bed	1,300 - 2,900	2 - 75	Alluvial, sand, silt, clay, and gravel deposits	Quaternary and Tertiary unconsolidated sand and gravel
Central Great Plains – Rainwater Basin Plains				
Flat to gently rolling loess covered plains. Historical rainwater basins and wetlands	1,300 - 2,400	5 - 100	Loess and mixed loess and sandy alluvium	Ogallala Sandstone Niobrara Formation Carlisle Shale

3.4 Shallow Bedrock

There appears to be no shallow bedrock within the Nebraska Reroute study area that would necessitate ripping or blasting. Field confirmation studies may be conducted prior to construction.

3.5 Seismic Considerations

No surface faults are within the study area therefore there are no seismic hazards associated with the Nebraska Reroute.

3.6 Geologic Hazards

At certain locations within the study area, landsliding, subsidence, or flooding could be possible. Since any reroutes would be located in the relatively flat and stable continental interior, the potential for impacts from geologic hazards is lower than for facilities located in active mountain belts or coastal areas.

The Cretaceous and Tertiary rocks in the Missouri River Plateau have the potential for slumping due to high clay content. Within the study area, potentially unstable soils or geologic formations are present at the Keya Paha River, and Niobrara River crossings (depending on alternate corridor crossing location site characteristics). In Nebraska potential karst features are present in the Niobrara Formation; however, these potential hazards are considered minimal since approximately 50-feet of sediment typically covers this formation.

3.7 Groundwater

The study area crosses over the northern portion of the High Plains aquifer, whose principal water-bearing unit is the Ogallala Formation. The High Plains aquifer covers approximately 85% of the entire state, of which the Ogallala Formation is a subset.

The Ogallala underlies a significant portion of Nebraska and the majority of the length of the study area (after Stanton, et. al., 2007) with the exception being the first 10 miles, which is located in southeast Keya Paha County (no identified aquifer exists in this area). Thus, the Ogallala underlies most of the proposed re-route study area.

Where it exists, the Ogallala in the study area varies in saturated thickness from greater than 400 feet in the north to less than 100 feet thick along the southeast (after Gurdak, et. al., 2006). The water-bearing unit is unconfined for some of the proposed study area, generally where any re-route crosses rivers or tributaries; the remainder (approximately 75 percent) is under confined conditions. Depths to the water-bearing unit range from greater than 150 feet below ground surface (bgs) in confined areas to less than five feet bgs in unconfined areas (after Gurdak, et. al., 2006). Recharge to the Ogallala typically varies from two to five inches per year depending on soil permeability and presence or lack of a confining layer above the water-bearing unit (Gutentag, et. al., 1984). Areas in the northern portion of the proposed study area generally exhibit higher recharge rates due to higher soil permeability in the area compared to areas along the eastern portion (after Stanton, et. al., 2007). Groundwater generally flows from west to east mimicking topography (after Gutentag, et. al., 1984).

3.8 Soils

The Nebraska Reroute study area in north-central Nebraska is located within the Western Great Plains Range and Irrigated Land Resource Region. This region is characterized by a nearly level to gently rolling fluvial plain. Keya Paha and Holt Counties lie within the Dakota-Nebraska Eroded Tableland Resource Area. These soils are generally sandy, very deep, excessively drained to somewhat poorly drained.

In Antelope and Boone Counties, the study area encompasses the Central Feed Grains and Livestock Land Resource Region. This area is further classified as the Loess Uplands Resource Area, with soils consisting of deep loess deposits that are susceptible to erosion. In Nance and Merrick Counties, the

study area encompasses the Central Nebraska Loess Hills and the Central Loess Plains Resource Areas (Central Great Plains Winter Wheat and Range Land Resource Region). These areas feature soils consisting of deep loess with some organic enrichment.

3.9 Land Use Settings

The predominant land use along all of the potential corridor segments is agriculture. Agriculture is comprised of croplands, grasslands/range, and land hayed for livestock. Pivot irrigation is used for cropland operations in a significant portion of the southern half of the study area. There are some minor developed areas along some of the corridor segments, and very few wetlands (<1.5 miles). Some deciduous forest land is present along some of the river bottoms and as tree breaks along some of the corridor options.

3.10 Environmental Settings

Because the predominant land use is agricultural (range land, hay fields, and crop), the biological communities are similar to those found in other agricultural settings. A description of the mammals, birds, and plants found in northeastern and central Nebraska is found in Sections 3.5 through 3.8 of the FEIS for the original Keystone XL Project. Suitable habitat may be present along some of the corridor segments for the American burying beetle (ABB), piping plover, interior least tern, whooping crane, massasauga snake, northern redbelly dace, river otter, small white lady's slipper, and the western prairie fringed orchid might be found along some of these corridor segments. These species are also addressed in the FEIS.

4.0 Alternative Corridors Identified

After the data layers were collected and the study area was mapped with the GIS data layers, a number of potential corridors were identified. As discussed in Section 2.4, to facilitate development and comparison of corridor options, Keystone determined some points, or "nodes", through which most of the options would need to be routed. Nodes were used in the absence of natural choke points for the purpose of segmenting corridor options. Using these nodes allowed Keystone to develop corridor segments and compare them against other corridor segments between the same nodes. The corridors identified in the desk top analysis are provided in Figure 3.

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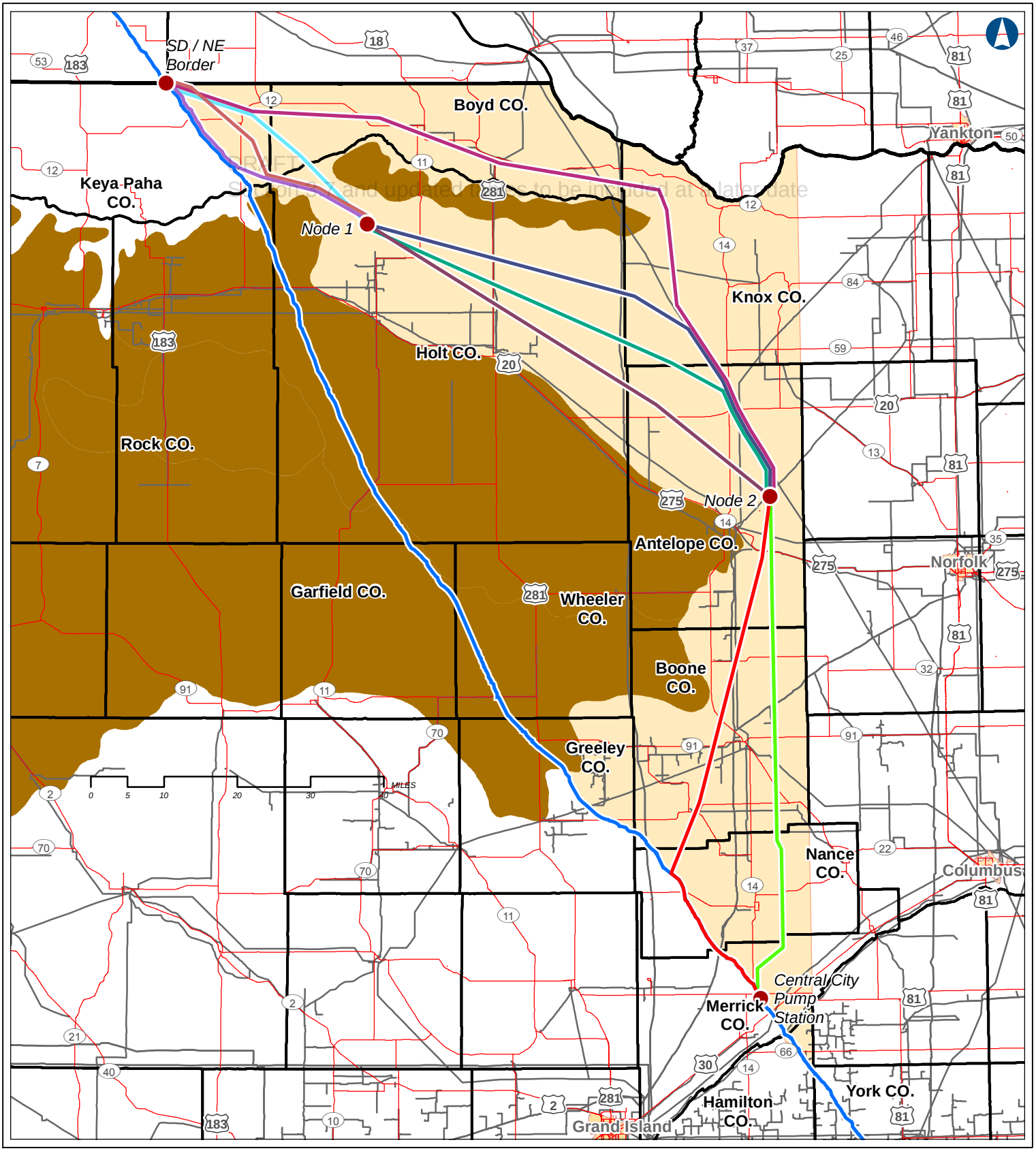
FIGURE 3 - DESKTOP CORRIDORS



DRAFT
Subject to change and updated routes to be included at a later date

LEGEND

- CONTROL POINTS AND NODES
- KEYSTONE XL PIPELINE PROJECT
- STATE BOUNDARY
- COUNTY BOUNDARY
- POWER LINE, PIPELINE
- STUDY AREA
- Option A
- Option B
- Option C
- Option D
- Option E
- Option F
- Option G
- Option H
- Option I
- NEBRASKA SANDHILLS

KEYSTONE XL PIPELINE PROJECT
Desktop Corridors

COUNTY:	-	DRAWN BY:	PD
STATE:	NEBRASKA	CHECKED BY:	JP

REV. NO.:	REVISION	DATE
0	ISSUED FOR REVIEW.	2012-01-13

PRELIMINARY

DATE: 2012-01-13 | PROJECTION: NAD83 | UTM14 N

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4.1 Desktop Overview

A routing workshop was conducted utilizing GIS data, USGS Quadrangle Maps, and current aerial imagery to characterize, evaluate, and refine each corridor. The findings of the workshop were used to identify areas that should be further evaluated by field and aerial reconnaissance study. The following summarizes the team's findings.

4.1.1 Corridor Options from Start Point to Node 1

Option A

Option A is a 34.6 mile segment that diverges from the Keystone XL FEIS route near FEIS milepost 615.6 –and traverses Keya Paha, Rock and Holt Counties. The Option A corridor crosses primarily ranch land with limited access roads and crosses approximately five (5) pivot irrigated tracts. Analysis showed Option A would require HDD crossings of the Keya Paha and Niobrara rivers as well as 14 road bores.

Option B

Option B departs from the Keystone XL FEIS route near FEIS milepost 601. Option B is 34.2 miles long and traverses Keya Paha and Holt Counties in a south easterly direction away from the Keystone XL FEIS route. The corridor crosses primarily range land and hay fields and approximately four (4) pivot irrigated tracts. Analysis showed Option B would require HDD crossings of the Keya Paha and Niobrara rivers as well as 12 road bores.

Option C

Option C departs from the Keystone XL FEIS route near FEIS milepost 601 and extends south easterly through portions of Keya Paha, Boyd and Holt Counties. The corridor crosses primarily range land and hay fields and two (2) pivot irrigated tracts. Analysis showed Option C would require three crossings of the Keya Paha River and an HDD crossing of the Niobrara River as well as fourteen (14) road bores.

4.1.2 Corridor Options Between Start Point to Node 2

Option D

Option D starts at the Keystone XL FEIS route near FEIS milepost 601 and extends easterly through Boyd County. The corridor crosses primarily range land (113.8 miles) and 14 pivot irrigated tracts. Analysis showed Option D would require an HDD of the Keya Paha River and the Niobrara as well as 91 road bores. The corridor is located along a half-section line, providing an opportunity for the final route to minimize potential impacts to crops. The corridor has a collocation opportunity with a 345 KV transmission powerline for approximately 26 miles.

4.1.3 Corridor Options Between Node 1 to Node 2

Option E

Option E extends southeast for approximately 66.5 miles through portions of Holt and Antelope Counties. The Option E corridor crosses 69 pivot irrigated tracts, with the majority of the remaining corridor being composed of additional cropland and approximately four (4) miles of range land. Fifty-nine roads would be bored and several smaller ditches and wetlands would be crossed; however, no major named streams would be crossed along this corridor.

Option F

Option F extends southeasterly and south for approximately 70 miles through Holt, Knox and Antelope Counties. This option crosses 42 pivot irrigated tracts, with the remainder of the corridor divided into hay fields and non farmable land. Eagle Creek and the South Branch Verdigre Creek are the largest streams crossed along this corridor. Fifty-one roads would need to be bored along this corridor. The corridor is collocated along a 345 KV transmission powerline for approximately 12.5 miles.

Option G

Option G is an approximate 72 miles long through Holt, Knox and Antelope Counties and is the northern-most Option evaluated of the east/west corridors between Node 1 and Node 2. Option G crosses 45 pivot irrigated tracts, with the remainder of the corridor being primarily range land. Option G crosses Red Bird Creek and North Branch Verdigre Creek and would require 52 road bores. This corridor follows a collocation opportunity with a 345 KV transmission powerline for approximately 22.5 miles.

4.1.4 Corridor Options Between Node 2 to End Point

Option H

Option H is an approximate 74.5 mile segment traversing in southwesterly direction through portions of Antelope, Boone and Nance Counties, before joining the existing Keystone XL FEIS route near FEIS MP 733.5 in Merrick County. The option ends at the Central City Pumping Station at FEIS MP 754.7. Approximately 57 pivot irrigated tracts are crossed along this corridor and the majority of the land is under row crop cultivation. Option H involves HDD crossings of the Elkhorn River, US 275/ abandoned Grand NW Railroad (Cowboy Trail) crossings, and the Cedar River. One (1) rail road crossing and 96 road bores would be required.

Option I

Option I is an approximate 70.2 mile segment in Antelope, Boone and Nance County and connects with the existing Keystone XL FEIS route in Merrick County. Option I crosses primarily farm land, but avoids many of the pivot irrigation conflicts due to its north/south orientation and location on section lines. Approximately ten (10) irrigated tracts would be crossed. The corridor would include HDD crossings of the Elk Horn River, US 275/ abandoned Grand NW Railroad (Cowboy Trail) crossings and the Loup River along with two railroad crossings and 13 road bores.

4.1.5 Desktop Analysis Conclusion

At the conclusion of the desktop analysis Option D was eliminated from further evaluation because the pipeline crossing location of the Niobrara River would fall within a designated Wild and Scenic section of the Niobrara River. The remaining corridors were carried forward for field reconnaissance as shown in Figure 4.

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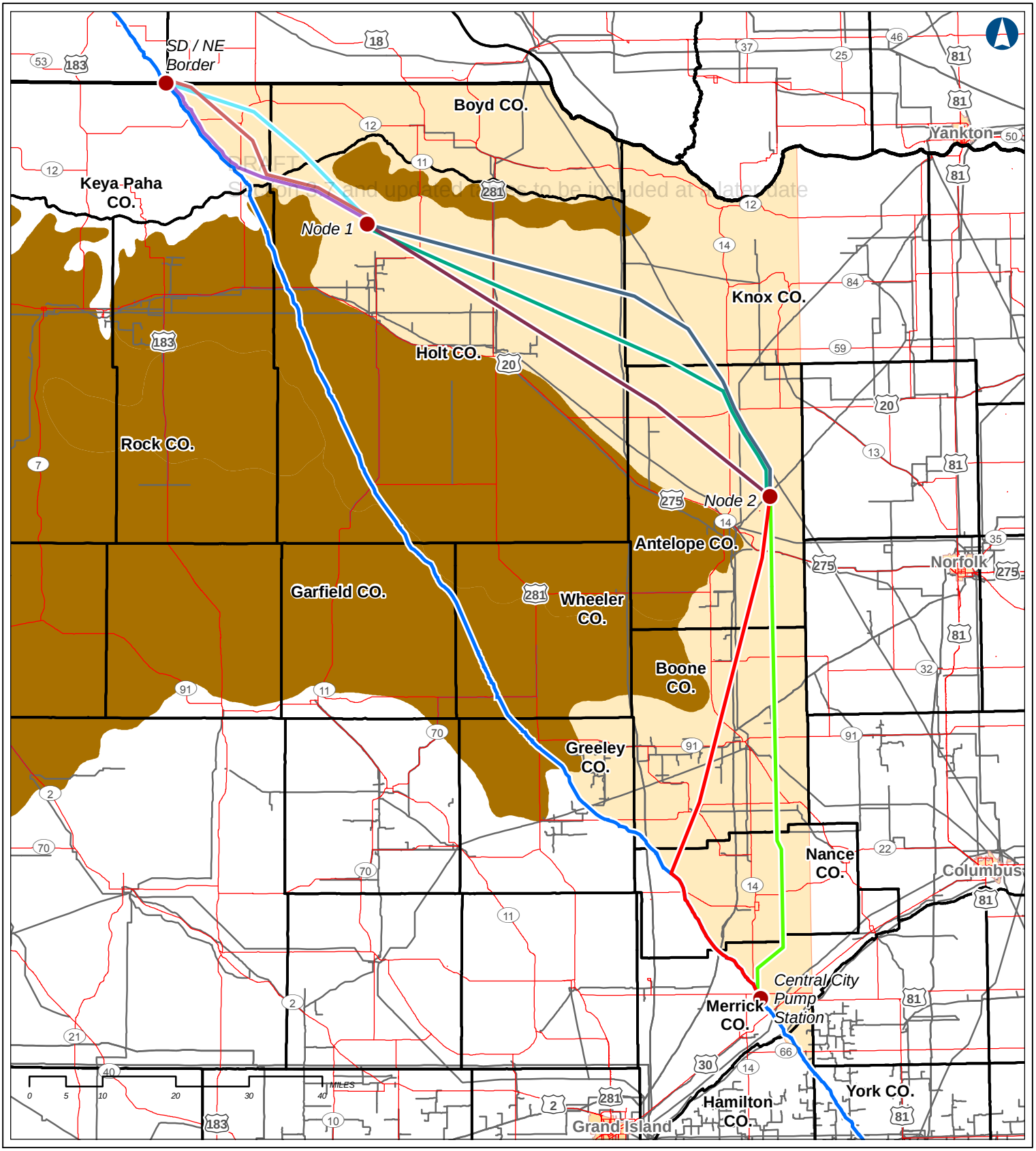
FIGURE 4 - FIELD RECONNAISSANCE STUDY CORRIDORS



LEGEND

- CONTROL POINTS AND NODES
- KEYSTONE XL PIPELINE PROJECT
- STATE BOUNDARY
- COUNTY BOUNDARY
- POWER LINE, PIPELINE
- STUDY AREA
- Option A
- Option B
- Option C
- Option E
- Option F
- Option G
- Option H
- Option I
- NEBRASKA SANDHILLS

KEYSTONE XL PIPELINE PROJECT
Field Reconnaissance Study Corridors

COUNTY:	-	DRAWN BY:	PD
STATE:	NEBRASKA	CHECKED BY:	JP

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4.2 Field Reconnaissance of Remaining Corridors

Subsequent to the desktop analysis, field reconnaissance was conducted to allow for further assessment of potential corridors, confirm data used during the desktop analysis, and refine corridors to reflect observations made in the field.

4.2.1 Corridor Options Between Start Point to Node 1

Option A

Field reconnaissance of Option A identified the need for three (3) additional HDDs at the Otter Creek, Beaver Creek and Big Sandy Creek crossings. The surrounding topography at the Niobrara River crossing was also noted as being a potential challenge due to the limited options for HDD entry and exit point placement based on surrounding topography.

Option B

The field reconnaissance effort identified very rough terrain along portions of Option B, as well as high ground water in many areas. The option also will need three (3) additional HDDs at the Otter Creek, Beaver Creek and Big Sandy Creek crossings. A ten (10) mile stretch of rough terrain represents reclamation challenges with adequately stabilizing the construction areas, preventing soil erosion and establishing vegetation on the right of way. The team searched for a more constructible pathway on either side of the corridor but all terrain within the vicinity was similar.

Option C

The field reconnaissance effort identified two significant constraints along this Option. These include approximately 15 miles of rough choppy terrain[1] and a poor crossing location of the Niobrara River. The team searched for a more constructible corridor on either side of the corridor and rolling terrain was observed north of the corridor. Aerial and limited ground reconnaissance was then performed north of the corridor. In this new area, a suitable location for crossing the Niobrara was observed and documented for revising the option after field reconnaissance.

4.2.2 Corridor Options Between Node 1 to Node 2

Option E

Option E avoided shelterbelts and had terrain that presented more manageable conditions for construction and post-construction restoration/revegetation. Construction in this corridor would increase the likelihood of a quicker and more successful reclamation effort. Middle Branch Eagle Creek, approximately 13 miles into Option E was observed to have surrounding choppy terrain for approximately seven (7) miles. The team searched for a more constructible corridor on either side of the corridor and better terrain was observed south of the corridor. The Middle Branch Eagle Creek will still be crossed but the surrounding terrain includes only moderate elevation changes. Aerial and limited ground reconnaissance was conducted south of the corridor to identify/verify this new corridor through the area.

[1] "Choppy" terrain refers to terrain that exhibits sharp and abrupt changes in elevation. This creates risk to personnel during both construction and operations. To the greatest extent possible, land is typically restored to its original state; however, in choppy terrain, this is not possible.

Option F

Option F passed very close to a large poultry farm. The corridor was adjusted around and away from this operation following field reconnaissance. The Middle Branch Eagle Creek, approximately 13 miles into Option F had surrounding choppy terrain for approximately 7.5 miles total. There were numerous waterbody crossings that exhibited steep slopes, unstable soils, and larger crossing widths. Rerouting further south is necessary to avoid these conditions during construction. The north/south section of this Option is co-located with a transmission powerline for approximately 12.5 miles and is reasonably constructible along this path.

Option G

Option G crossed a number of areas with predominantly steep slopes, unstable soils, large waterbody crossing widths, head cutting[2], and drainages due to the proximity of the Niobrara River watershed; which would result in difficult construction conditions requiring increased footprint due to larger workspace requirements. Rerouting a significant distance to the south would be required to avoid the difficult construction conditions in this area. The first ten (10) miles of the transmission powerline located along this Option were unsuitable for pipeline construction due to large hills, side slopes, and unstable soils which would require routing away from the existing power infrastructure.

4.2.3 Corridor Options Between Node 2 to End Point

Option H

Option H had difficult to extreme terrain with frequent and steep elevations changes and head cuts suggesting unstable soils. The corridor passed through a recently constructed wind farm (not found in any agency data base) 23 miles down from the start of this option. Option H at this location would cross through a large number of densely clustered wind farm towers. The nature of the wind farm facility and its operation pose construction safety challenges, create the risk of stray current induced corrosion, and hinder the pipeline operator's ability to patrol and access the pipeline.

Option I

Option I was observed to be reasonably constructible with minor refinements. This Option allows alignment of the final construction centerline parallel to the section/half section line resulting in less impact to irrigated land and structures (pivots, wells, residences, etc.). Option I terrain is significantly more favorable to efficient and effective soil stabilization and reclamation/restoration of the Pipeline right of way than option H.

4.3 Post-reconnaissance Alternative Corridor Overview

Figure 5 depicts the post-reconnaissance corridors. At the conclusion of the post reconnaissance review Options B, F, G and H were determined to be already optimized to the extent practicable. Options A, C, E, and I corridors were adjusted as follows:

[2] Head cutting is an erosion condition where intermittent and perennial streams have an abrupt vertical drop in the streambed. Head cuts resemble small waterfalls or when not flowing, the head cut will resemble a very short cliff or bluff. A small plunge pool may be present at the base of the head cut due to high energy erosion at the base of the falls. Ground seeps and springs are sometimes found along the face, sides, or base of a head cut.

Modified Option A

This Option was modified to adjust the crossings of the Niobrara River, Otter Creek, Beaver Creek and Big Sandy Creek to reduce the choppy terrain adjacent to these crossings. Option A crosses Nebraska Department of Education lands in two parcels for a total of 1.39 miles. The wild and scenic river designation depicted in Table 2 comes from the USDOT HCA database. The Niobrara River, is not designated wild and scenic by the National Park Service (NPS) where Options A and B cross this river.

Modified Option C

The area northeast of the original Option C was identified as more suitable for construction and restoration through the field reconnaissance exercise. This area included flatter, higher ground, thereby avoiding areas of shallow groundwater. This more north easterly corridor also avoids most of the areas with multiple stream crossings with severe head cutting features and significant and frequent elevation changes. The modified corridor minimizes the number of stream crossings.

Modified Option E

The first 20 miles of this corridor was moved farther south following aerial and ground reconnaissance of the corridor. This move avoided shelterbelts and crosses more agricultural land and rolling hills. The modified Option E was determined to be very constructible and had high likelihood for rapid soil stabilization, revegetation and success of the right-of-way restoration. The modified Option E corridor also better avoids structures (agricultural operations, residences, shelterbelts, grain bins, etc.).

Modified Option I

This Option was adjusted to minimize impact to irrigated land, and structures (pivots, wells, residences, etc.).

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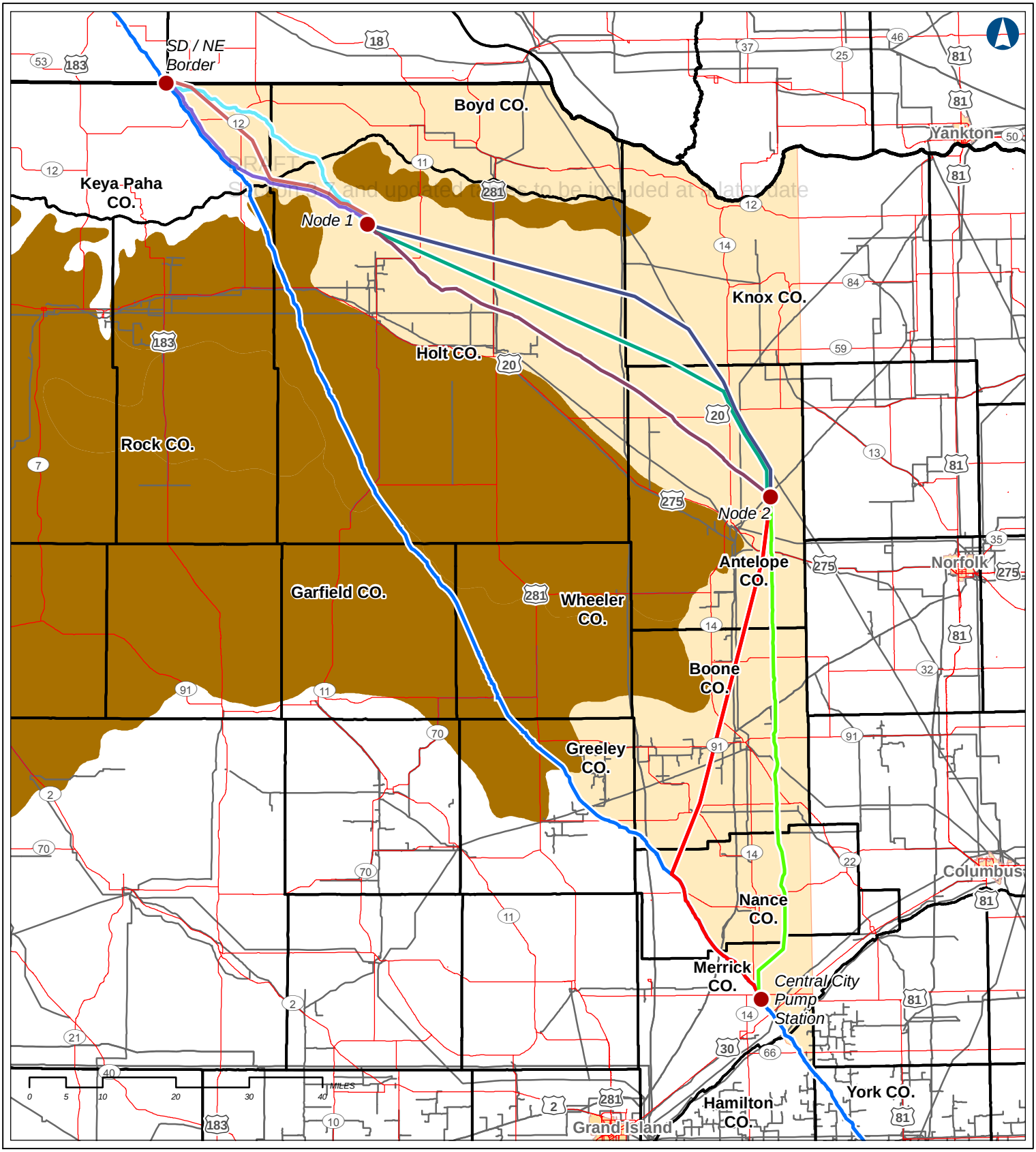
FIGURE 5 - POST RECONNAISSANCE CORRIDORS



LEGEND

- CONTROL POINTS AND NODES
- KEYSTONE XL PIPELINE PROJECT
- STATE BOUNDARY
- COUNTY BOUNDARY
- POWER LINE, PIPELINE
- STUDY AREA
- NEBRASKA SANDHILLS
- OPTION A
- OPTION B
- OPTION C
- OPTION E
- OPTION F
- OPTION G
- OPTION H
- OPTION I

KEYSTONE XL PIPELINE PROJECT
Post Reconnaissance Corridors

COUNTY:	-	DRAWN BY:	PD
STATE:	NEBRASKA	CHECKED BY:	JP

REV. NO.:	REVISION	DATE
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PRELIMINARY

DATE: 2012-01-13 | PROJECTION: NAD83 | UTM14 N

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4.4 Summary of Siting Constraints and Opportunities for Each Corridor Option

Table 2 summarizes the constraints impacted by each corridor segment after the field reconnaissance was completed. The statistics represent the centerline of each corridor segment, and are used for relative comparison purposes. The discussion below highlights differences between corridors and is not a description of the criteria found in each corridor. Most of the criteria are not significantly different between the alternate corridors.

As shown in Table 2, the corridor segments are similar in the miles of features crossed and the number of constraints impacted. The data provided in this table reflect the revised corridors that include the results of the field assessment of constructability, soils re-stabilization, ability to restore and revegetate the land, and minimization of pipeline operational integrity and safety issues.

The wetland types that are crossed are characteristic of forested, scrub shrub, and emergent wetlands found throughout the region. Alternatives analysis information is based upon USFWS National Wetland Inventory (NWI) data. Options H and I are the only options that cross small areas of forested wetlands.

Each alternative crosses potential suitable habitat for one or more listed species: ABB, piping plover, interior least tern, river otter, northern redbelly dace, small white lady's slipper, western prairie fringed orchid and whooping crane. Surveys will be required to determine the quality of the suitable habitat and if the species is present in that habitat. The presence of suitable habitat does not preclude the use of any of the alternatives since none of the habitat crossed is designated critical habitat.

There are no tribal lands crossed. Options A and F cross some Nebraska Department of Education land, however, this does not preclude use of these options. Option H, which includes a portion of the FEIS route, crossed the Bureau of Reclamation managed Fullterton Canal.

Table 3 is broken down into two sections. The first section, Classification of Profile Slope, provides an elevation profile along the centerline of each corridor. The slope is grouped into three categories: 0 to 10 degrees, 10 to 20 degrees, and, 20 to 30 degrees slope. In GIS, slope was measured over 30 foot increments along the centerline of each corridor. The information provided is the number of times where the particular slope category is present along the corridor. A greater number indicates that the particular slope category is more prevalent along the corridor. The higher the number under the steeper slope categories are, the choppier or more difficult from a construction standpoint.

The second section of the table, Classification of Terrain Slope, provides an indication of the number of locations where the pipeline will be located with side slopes along the centerline of the corridor. Combined with the slope categories, this provides an indication of the degree of difficulty Keystone would have in installing the pipeline and restoring the hilly terrain. The third section of the table provides an indication of the additional workspace required for the terrain as described in the previous two sections of this table.

The information provided in Table 3 demonstrates the degree of difficulty and complexity of construction, restoration success, risk of geotechnical and mechanical damage operational and associated integrity threats, and risks to construction and operational personnel, as they relate to the various options. The corridors in the Node 1 to Node 2 section of the study area progressively improve in constructability and operational integrity the further south the corridor is from the Niobrara River drainages. This can be seen in Option E being preferable over F and G. Likewise, corridors A and I are clearly in flatter terrain for pipeline construction, relative to options B, C, and H.

The closer to flat the proposed right-of-way is, the smaller the construction footprint will be because of the lack of significant grading necessary to create a safe, flat working surface.

Table 2 Constraints Analysis for Corridor Segments

	SD/NE Border to Node 1			Node 1 to Node 2			Node 2 to Central City PS	
Parameter/Constraint	**Option A**	**Option B**	**Option C**	**Option E**	**Option F**	**Option G**	**Option H**	**Option I**
Length (miles)	34.55	34.43	35.65	67.76	70.17	72.29	74.49	70.22
Listed Species Habitat (miles crossed)								
American Burying Beetle (ABB)	34.55	34.43	35.65	56.19	50.46	50.02	--	--
Finescale Dace	--	--	--	--	--	--	11.83	--
Interior Least Tern	12.27	10.79	8.67	--	--	--	7.25	8.2
Northern redbelly dace	19.57	19.45	15.87	--	--	--	--	--
Piping plover	12.27	10.79	8.67	--	--	--	7.25	8.2
River otter	--	--	--	--	--	--	7.25	11.61
Small white lady's slipper	16.97	14.72	13.2	4.56	--	--	24.9	25.2
Western prairie fringed orchid	--	--	--	60.02	14.91	14.91	30.81	29.7
Whooping crane	34.55	34.43	35.65	67.76	70.18	72.31	74.5	70.22
Public Lands (miles crossed)								
Federal	--	--	--	--	--	--	0.02[5]	--
State	1.39[1]	--	--	--	0.39[1]	--	--	--
HCAs (miles crossed)								
Commercially navigable waterways	--	--	--	--	--	--	--	--
Drinking water unusually sensitive areas (DW)	--	--	--	--	--	--	--	--
Ecologically unusually sensitive areas (ECO)	1.76	2.05	2.2	--	--	--	1.97	--
Highly populated areas (HPA)	--	--	--	--	--	--	--	--
Other populated areas (OPA)	--	--	--	--	--	--	--	--
Other (miles crossed)								
Populated places	--	--	--	--	--	--	--	--
Urban areas	--	--	--	--	--	--	--	--
Wellhead protection areas	--	--	--	--	--	--	--	--
Wild and Scenic rivers (number crossed)[2]	1	1	--	--	--	--	--	--
Depth to Groundwater (miles crossed)[3]								
0 to 5 feet	--	--	--	--	--	--	--	--
5 to 10 feet	3.4	0.32	--	--	--	--	3.16	7.09
10 to 15 feet	7.05	13.85	8.19	--	1.1	1.1	3.44	5.33
15 to 20 feet	8.57	5.6	9.23	0.51	2.58	2.51	1.63	2.95
➢ 20 feet	15.53	14.66	18.23	67.25	66.5	68.7	66.27	54.85

Waterbody Crossings (number)								
Perennial	16	16	12	10	13	16	5	3
Intermittent	4	10	10	15	15	10	55	46
Road/railroad/pipeline/powerline crossings (number)	30	36	29	96	84	80	80	78
Land Use[4] (miles crossed)								
Open Water	0.33	0.36	0.3	--	0.06	0.06	0.44	0.28
Developed (low and medium density)	0.82	1.02	0.97	3.09	2.65	2.32	2.73	2.48
Deciduous forest	0.98	1.14	0.41	0.28	1.37	1.34	1.18	0.14
Evergreen forest	0.05	0.05	--	--	--	0.02	--	--
Grassland/herbaceous	28.63	28.34	29.57	23.84	37.57	37.24	29.44	13.78
Pasture/hay	0.29	0.29	0.42	0.12	0.5	1.97	1.04	1.15
Cultivated crops	2.2	2.44	3.37	40.08	27.54	28.72	38.38	51.76
Forested wetlands	--	--	--	--	--	--	0.18	0.21
Herbaceous/riverine/open water wetlands	0.37	0.62	0.36	0.03	0.23	0.1	0.68	0.49

[1] Nebraska Department of Education lands in two parcels

[2] The USDOT HCA database designates the entire Niobrara River as wild and scenic, which is not the case where these corridors cross the river according to the National Park Service.

[3] Determined from Nebraska Department of Natural Resources (NDNR) well data

[4] Land use from NLCD data coverage except for wetland categories which come from NWI data

[5] Fullerton Canal Crossing (Bureau of Reclamation)

Table 3 Analysis of Difficult Terrain and Constructability

Classification of Profile Slope Along Routes - NED 10m Data[1]

	Number (count) of locations with slope category							
	SD / NE Border to Node 1			Node 1 to Node 2			Node 2 to Central City Pump Station	
Terrain Slope (Deg)	Option A	Option B	Option C	Option E	Option F	Option G	Option H	Option I
0 - 10	36	44	65	9	74	83	121	9
10 - 20	39	49	69	9	76	83	124	8
20 - 30	5	5	4	-	2	1	4	-
Total	**80**	**98**	**138**	**18**	**152**	**167**	**249**	**17**

Classification of Terrain Slope - NED 10m Data[1]

	Number (count) of locations with slope category							
	SD / NE Border to Node 1			Node 1 to Node 2			Node 2 to Central City Pump Station	
Terrain Slope (Deg)	Option A	Option B	Option C	Option E	Option F	Option G	Option H	Option I
0 - 10	65	76	148	18	175	205	225	19
10 - 20	70	85	151	16	180	211	229	17
20 - 30	9	11	4		7	9	7	
Total	**144**	**172**	**303**	**34**	**362**	**425**	**461**	**36**

Classification of Additional Estimated Footprint Due to Terrain Slopes

	Acreage[2]							
	SD / NE Border to Node 1			Node 1 to Node 2			Node 2 to Central City Pump Station	
Terrain Slope (Deg)	Option A	Option B	Option C	Option E	Option F	Option G	Option H	Option I
10 - 20	3.78	6.00	8.16	0.87	9.60	12.12	13.32	1.12
20 - 30	0.68	0.76	0.16	0.00	0.32	0.74	0.31	0.00
Total	**4.45**	**6.75**	**8.32**	**0.87**	**9.92**	**12.86**	**13.63**	**1.12**

1 slope determined from USGS Digital Elevation Model (DEM) data at 10 meter internals

[2]Notes:

0 - 20 Degree Slope: 25 Additional ft wide ATWS for the length of terrain

20 - 30 Degree Slope: 50 Additional ft wide ATWS for the length of terrain

5.0 Recommendation

Based on an evaluation of the corridor selection criteria, preferred corridor segments were selected between each node. These segments were then linked together to form the preferred corridor: "A-E-I" as shown in Figure 6. A summary of the criteria analysis for the centerline of this corridor is reflected in Table 4.

From the start to Node 1, Option A is preferred for the following reasons:

1. It maximizes the use of the Keystone XL FEIS route between these nodes. As such, it impacts the fewest additional landowners
2. It has fewer waterbody crossings
3. It has the more favorable terrain, which has a number of benefits:
    a. It has the smallest environmental footprint, relative to the comparable alternative segments
    b. It maximizes constructability and minimizes risks to personnel during construction and operations, as compared with the alternative segments
    c. It reduces erosion risk and has greater potential for successful restoration and reclamation, as compared with the alternative segments

From Node 1 to Node 2, Option E is the preferred corridor for the following reasons:

1. It has a smaller footprint, thus impacting fewer new landowners
2. It has fewer major waterbody crossings
3. It has the most favorable terrain of the three comparable alternative options, which results in the benefits enumerated above

From Node 2 to the end of the preferred route, Option I is the preferred option for the following reasons:

1. It results in fewer impacts to pivot irrigated lands due to north-south orientation, as compared with the alternative segments
2. It has far more favorable terrain of the comparable options, which results in the benefits enumerated above

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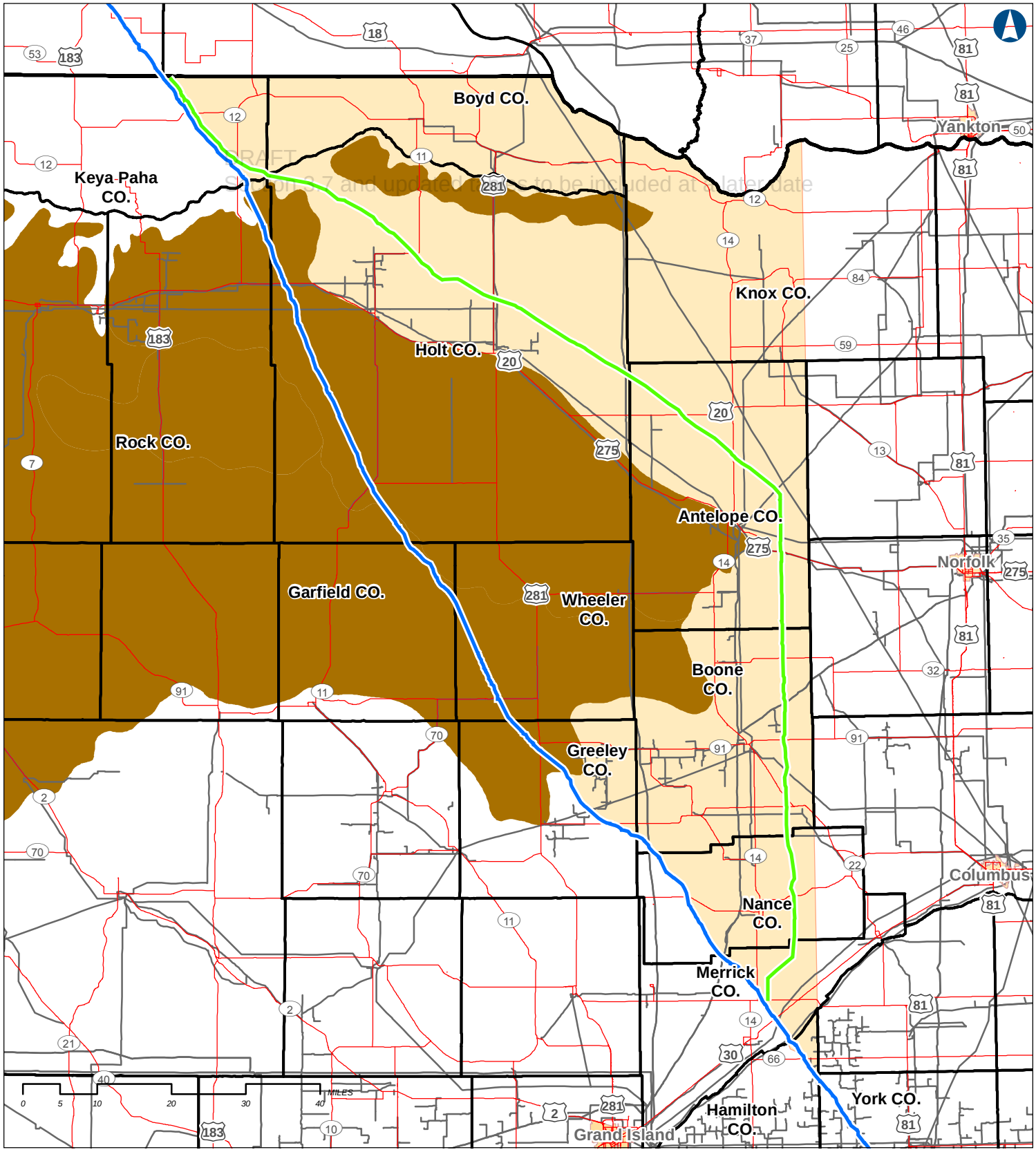
FIGURE 6 - PREFERRED ALTERNATIVE CORRIDOR



LEGEND

- KEYSTONE XL PIPELINE PROJECT
- STATE BOUNDARY
- COUNTY BOUNDARY
- POWER LINE, PIPELINE
- STUDY AREA
- NEBRASKA SANDHILLS
- PREFERRED ALTERNATIVE CORRIDOR

KEYSTONE XL PIPELINE PROJECT
Preferred Alternative Corridor

COUNTY:	-	DRAWN BY:	PD
STATE:	NEBRASKA	CHECKED BY:	JP

REV. NO.:	REVISION	DATE
0	ISSUED FOR REVIEW.	2012-01-13

PRELIMINARY

DATE: 2012-01-13 | PROJECTION: NAD83 | UTM14 N

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DWG: XL-31-P-7080-PARC | SHEET: 1

Table 4 Summary of Preferred Corridor

Parameter/Constraint	Corridor A-E-I
Length (miles)	173.53
Listed Species Habitat (miles crossed)	
American Burying Beetle (ABB)	90.75
Interior Least Tern	20.47
Northern redbelly dace	19.57
Piping plover	20.47
River otter	11.61
Small white lady's slipper	46.73
Western prairie fringed orchid	89.72
Whooping crane	172.53
Public Lands (miles crossed)	
Federal	0
State	1.39
HCAs (miles crossed)	
Commercially navigable waterways	0
Drinking water unusually sensitive areas (USA)	0
Ecologically unusually sensitive areas (USA)	1.76
Highly populated areas (HPA)	0
Other populated areas (OPA)	0
Populated places	0
Urban areas	0
Wellhead protection areas	0
Wild and Scenic rivers (number crossed) [3]	1
Depth to Groundwater (miles crossed)[1]	
0 to 5 feet	0
5 to 10 feet	10.48
10 to 15 feet	12.38
15 to 20 feet	12.03
➢ 20 feet	137.64
Waterbody Crossings (number)	
Perennial	29
Intermittent	65
Road/railroad/pipeline/power line crossings (number)	204

Parameter/Constraint	Corridor A-E-I
Length (miles)	173.53
Land Use[2] (miles crossed)	
Open Water	0.61
Developed (low and medium density)	6.39
Deciduous forest	1.39
Evergreen forest	0.05
Grassland/herbaceous	66.25
Pasture/hay	1.57
Cultivated crops	94.04
Forested wetlands	0.21
Herbaceous/riverine/open water wetlands	0.89

[1] Determined from Nebraska Department of Natural Resources (NDNR) well data
[2] Land use from NLCD data coverage for US
[3] The USDOT HCA database designates the entire Niobrara River as wild and scenic, which is not the case where these corridors cross the river according to the National Park Service.

6.0 References

Class	Feature	Privileged & Confidential	Complete Reference
Biological	ABB captures post 1992	YES	Data compiled from Report: Hoback, et.al. 2011. NEW RECORDS OF CARRION BEETLES IN NEBRASKA REVEAL INCREASED PRESENCE OF THE AMERICAN BURYING BEETLE, NICROPHORUS AMERICANUS OLIVIER (COLEOPTERA: SILPHIDAE). *Great Plains Research 21* (Fall 2011):131–43
Biological	Critical Habitat	NO	U.S. Fish and Wildlife Service, Critical Habitat, Final Rule, USFWS accessed 06/28/2011 from USFWS website at: http://criticalhabitat.fws.gov/crithab/
Biological	Threatened and Endangered Species Habitat and Ranges	NO	Data compiled from Report: Range maps for Nebraska's Threatened and Endangered Species. *Nebraska Game and Parks Commission - White Papers, Conference Presentations, & Manuscripts.* September 2011.
Boundaries	All Protected Areas	NO	US Geological Survey, Gap Analysis Program (GAP). February 2011. Protected Areas Database of the United States (PADUS), version 1.2.
Boundaries	Conservation Reserve Program (CRP) Easements	YES	Received via email from Billie Jo Smith, Farm Service Agency, Nebraska State Office on Sept. 30, 2008
Boundaries	Counties	NO	TIGER/Line Shapefile, 2010, 2010 state, Nebraska, 2010 Census County and Equivalent State-based. http://www.census.gov/geo/www/tiger/tgrshp2010/tgrshp2010.html
Boundaries	Federal and Other Non-Private Land (Stewardship)	NO	Data compiled by exp staff from multiple sources.
Boundaries	Federal Lands - ESRI	NO	U.S. National Atlas Federal and Indian Land Areas, ESRI Data and Maps v10
Boundaries	NE Township Boundaries	NO	Bureau of Land Management. Public Land Survey System Township (twnshp). http://www.geocommunicator.gov/GeoComm/lsis_home/home/
Boundaries	Nebraska State Boundary	NO	U.S. States and Canada Provinces, ESRI Data and Maps v10
Boundaries	Section Lines	NO	Bureau of Land Management. Public Land Survey System Township First Division (Section). http://www.geocommunicator.gov/GeoComm/lsis_home/home/

Boundaries	Wetlands Reserve Program (WRP) Easements	NO	Accessed via the Internet Map Service using ArcGIS Desktop. Hosted by USDA Natural Resources Conservation Service (NRCS) at http://gdwweb1.ftw.nrcs.usda.gov/arcgis/services. Additional information available at http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/technical/nra/dma/?&cid=stelprdb1043930
Geology		NO	Gurdak, J.J., and Qi, S.L., *Vulnerability of Recently Recharged Groundwater in the High Plains Aquifer to Nitrate Contamination,* Scientific Investigations Report 2006-5050, U.S. Department of the Interior, U.S. Geological Survey, 2006.
Geology		NO	Gutentag, E.D., Heimes, F.J., Krothe, N.C., Luckey, R.R., and Weeks, J.B., *Geohydrology of the High Plains Aquifer In Parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming,* U.S. Geological Survey Professional Paper 1400-B, 1984.
Geology		NO	Rundquist, D.C., Peters, A.J., Liping, D., Rodekohr, D.A., Ehrman, R.L., and Murray, G., *Statewide Groundwater-Vulnerability Assessment in Nebraska Using the Drastic/GIS Model,* Geocarto International, 6:2, 51-51, 1991.
Geology		NO	Stanton, J.S., and Qi, S.L., *Ground-Water Quality of the Northern High Plains Aquifer, 1997, 2002*-2004, Scientific Investigations Report 2006-5138, U.S. Department of the Interior, U.S. Geological Survey, 2007.
Geology		NO	United States Environmental Protection Agency, *DRASTIC, A Standardized System for Evaluating Pollution Potential Using Hydrogeologic Settings*, EPA/600/2-87/035, June 1987.
Geology	Active Mineral Operations	NO	University of Nebraska - Lincoln - Conservation and Survey Division, Active Mineral Operations, accessed November 2011 from UNL website: http://snr.unl.edu/data/geographygis/NebrGISgeology.asp#mineral
Geology	Bedrock Geology	NO	U.S. Geological Survey and University of Nebraska - Lincoln - Conservation and Survey Division, 1986. Bedrock Geology of Nebraska, accessed 2011 from UNL website: http://snr.unl.edu/data/geographygis/NebrGISgeology.asp#bedrock
Geology	Construction Mineral Operations	NO	U.S. Geological Survey, 200512, Construction Minerals Operations: National Atlas of the United States, Reston, VA. Online Links: http://nationalatlas.gov/atlasftp.html?openChapters=chpgeol#chpgeol
Geology	Crushed Stone Operations	NO	Minerals Information Team, U.S. Geological Survey, 200506, Crushed Stone Operations in the United States: National Atlas of the United States, Reston, VA. Online Links: http://nationalatlas.gov/atlasftp.html?openChapters=chpgeol#

			chpgeol
Geology	Depth to Precambrian Rocks	NO	University of Nebraska - Lincoln - Conservation and Survey Division, Depth to Precambrian Rocks in Nebraska, accessed November 2011 from UNL website: http://snr.unl.edu/data/geographygis/NebrGISgeology.asp#precamb
Geology	Faults	NO	U.S. Geological Survey, 2005, Generalized Geologic Map of the Conterminous United States, accessed 2009 from USGS website: http://pubs.usgs.gov/atlas/geologic/48States/
Geology	Glacial Limits	NO	U.S. Geological Survey, 2005, Generalized Geologic Map of the Conterminous United States, accessed 2009 from USGS website: http://pubs.usgs.gov/atlas/geologic/48States/
Geology	Glacial Till Deposits	NO	University of Nebraska - Lincoln - Conservation and Survey Division, Glacial till deposits, accessed November 2011 from UNL website: http://snr.unl.edu/data/geographygis/NebrGISgeology.asp#till
Geology	Karst Areas	NO	Tobin, B.D., and Weary, D.J., 200506, Engineering Aspects of Karst: National Atlas of the United States, Reston, VA. Online Links: http://nationalatlas.gov/atlasftp.html?openChapters=chpgeol#chpgeol
Geology	Physiographic Divisions in the US	NO	Fenneman, N.M., and Johnson, D.W. U.S. Geological Survey, 1946, accessed from USGS website: http://water.usgs.gov/maps.html
Geology	Quaternary Fault Feature Regions	NO	U.S. Geological Survey, 2010, Quaternary fault and fold database for the United States, accessed 01/17/2012, from USGS web site: http//earthquakes.usgs.gov/regional/qfaults/.
Geology	Quaternary Faults and Folds	NO	U.S. Geological Survey, 2010, Quaternary fault and fold database for the United States, accessed 01/17/2012, from USGS web site: http//earthquakes.usgs.gov/regional/qfaults/.
Geology	Sand and Gravel Operations	NO	Minerals Information Team, U.S. Geological Survey, 200506, Sand and Gravel Operations in the United States: National Atlas of the United States, Reston, VA. Online Links: http://nationalatlas.gov/atlasftp.html?openChapters=chpgeol#chpgeol
Geology	US Geologic Units	NO	U.S. Geological Survey, 2005, Generalized Geologic Map of the Conterminous United States, accessed 2009 from USGS website: http://pubs.usgs.gov/atlas/geologic/48States/
Hazards	Earthquake Hazard	YES	US DOT Office Pipeline Safety, Earthquake Hazard Rank, accessed September 2008 from NPMS website: https://www.npms.phmsa.dot.gov/application.asp?tact=Data&page=subapp.asp?app=data&act=data_req

Hazards	Flood Hazard	YES	US DOT Office Pipeline Safety, Flood Hazard Rank, accessed September 2008 from NPMS website: https://www.npms.phmsa.dot.gov/application.asp?tact=Data&page=subapp.asp?app=data&act=data_req
Hazards	Landslide Hazard	YES	US DOT Office Pipeline Safety, landslide Hazard Rank, accessed September 2008 from NPMS website: https://www.npms.phmsa.dot.gov/application.asp?tact=Data&page=subapp.asp?app=data&act=data_req
Hazards	Landslide Incidence and Susceptibility	NO	Godt, Jonathan W. , 200102, Landslide Incidence and Susceptibility in the Conterminous United States: U.S. Geological Survey Open-File Report 97-289, U.S. Geological Survey, Reston, VA. Online Links: ◦<http://nationalatlas.gov/atlasftp.html?openChapters=chpgeol#chpgeol>
HCAs	Commercially Navigable Waterways	YES	U.S. Department of Transportation, Research and Special Projects Administration, Pipeline and Hazardous Materials Safety Administration, Commercially Navigable Waterways database , accessed September 2008 from NPMS website: https://www.npms.phmsa.dot.gov/application.asp?tact=Data&page=subapp.asp?app=data&act=data_req
HCAs	Drinking Water Unusually Sensitive Areas (USA)	YES	U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration (PHMSA). 200104. Unusually Sensitive Areas for Drinking Water in Nebraska: ne_dwusa_dd. Accessed September 2008 from NPMS website: https://www.npms.phmsa.dot.gov/application.asp?tact=Data&page=subapp.asp?app=data&act=data_req
HCAs	Ecological Unusually Sensitive Areas (USA)	YES	U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration (PHMSA). 200104. Ecological Unusually Sensitive Areas in Nebraska: ne_eco1 . Accessed September 2008 from NPMS website: https://www.npms.phmsa.dot.gov/application.asp?tact=Data&page=subapp.asp?app=data&act=data_req
HCAs	Highly Populated Areas (HPA)	YES	U.S. Department of Commerce U.S. Census Bureau Geography Division. High Population Areas (Version 2 - Data Derived from 2000 Census). Accessed September 2008 from NPMS website: https://www.npms.phmsa.dot.gov/application.asp?tact=Data&page=subapp.asp?app=data&act=data_req
HCAs	Other Populated Areas (OPA)	YES	U.S. Department of Commerce U.S. Census Bureau Geography Division. Other Populated Areas (Version 2 - Data Derived from 2000 Census). Accessed September 2008 from NPMS website: https://www.npms.phmsa.dot.gov/application.asp?tact=Data&page=subapp.asp?app=data&act=data_req
HCAs	Populated Places	NO	U.S. Populated Place Areas, ESRI Data and Maps v10
HCAs	Urban Areas	NO	U.S. Census Urbanized Areas, ESRI Data and Maps v10

HCAs	Wellhead Protection Areas	YES	Nebraska Department of Environmental Quality. Wellhead Protection Areas. Accessed November 2011 from NDEQ website: http://www.deq.state.ne.us/groundw.nsf/pages/whpa
HCAs	Wild and Scenic Rivers	NO	Bureau of Land Management, National Park Service, and U.S. Forest Service, U.S. Fish and Wildlife Service. National Wild and Scenic River system Segments. Accessed June 2011 from WSR website: http://www.rivers.gov/maps.html
Hydrology	Aquifers of Alluvial and Glacial Origin	NO	U.S. Geological Survey, 200209, Aquifers of Alluvial and Glacial Origin: U.S. Geological Survey, Reston, VA. Online Links: http://nationalatlas.gov/atlasftp.html
Hydrology	Depth to Groundwater - UNL 1979	NO	University of Nebraska - Lincoln - Conservation and Survey Division, 1979, Depth-to-Water, accessed, 11/11/2011 from UNL website: http://snr.unl.edu/data/geographygis/NebrGISwater.asp#depth
Hydrology	Depth to Groundwater From CSD Well Data	NO	Custom analysis performed by exp on UNL CSD well database provided to exp by Staff, Conservation and Survey Division, School of Natural Resources, University of Nebraska-Lincoln 12/16/2011.
Hydrology	Depth to Groundwater From DNR Well Data (Raster)	NO	Custom Analysis (raster) of static water level performed by exp on Nebraska Department of Natural Resources Registered Groundwater Well database. November 2011. Source data from http://dnrdata.dnr.ne.gov/wellscs/Menu.aspx
Hydrology	Depth to Groundwater From DNR Well Data (Vector)	NO	Custom Analysis (vector) of static water level performed by exp on Nebraska Department of Natural Resources Registered Groundwater Well database. November 2011. Source data from http://dnrdata.dnr.ne.gov/wellscs/Menu.aspx
Hydrology	DRASTIC Index	NO	Conservation & Survey Division, University of Nebraska - Lincoln (CSD). 1996. Groundwater Vulnerability to Contamination (DRASTIC) - Nebraska. http://dnr.ne.gov/databank/drastic.html
Hydrology	Groundwater Regions	NO	University of Nebraska - Lincoln - Conservation and Survey Division, Groundwater Regions, accessed November 2011 from UNL website: http://snr.unl.edu/data/geographygis/NebrGISwater.asp#depth
Hydrology	Impaired Waterbodies lines	NO	US Environmental Protection Agency ATTAINS 303(d) Listed Impaired Waters. Accessed November 23, 2011. http://www.epa.gov/waters/data/downloads.html#State and Watershed Geospatial Data
Hydrology	Impaired Waterbodies polygons	NO	US Environmental Protection Agency ATTAINS 303(d) Listed Impaired Waters. Accessed November 23, 2011. http://www.epa.gov/waters/data/downloads.html#State and Watershed Geospatial Data
Hydrology	Major Rivers	NO	U.S. Rivers (Generalized), ESRI Data and Maps v10
Hydrology	Major Water Lines	NO	U.S. National Atlas Water Feature Lines, ESRI Data and Maps v10

Hydrology	Major Waterbodies	NO	U.S. National Atlas Water Feature Areas, ESRI Data and Maps v10
Hydrology	Ogallala (High Plains) Aquifer Thickness	NO	U.S. Geological Survey. Digital map of the saturated thickness of the High Plains aquifer in parts of Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas and Wyoming, 1996-97. USGS OFR 00-300. http://water.usgs.gov/GIS/dsdl/sattk_97.shape.tgz
Hydrology	Principal Aquifers of the United States	NO	U.S. Geological Survey, 200310, Principal Aquifers of the 48 Conterminous United States, Hawaii, Puerto Rico, and the U.S. Virgin Islands: U.S. Geological Survey, Madison, WI, USA. Online Links: http://nationalatlas.gov/atlasftp.html
Hydrology	Streams	NO	U.S. Environmental Protection Agency (USEPA) and the U.S. Geological Survey (USGS). 2005. National Hydrography Dataset Plus - NHDPlus. Accessed November 2011 from NHDPlus Website: http://www.horizon-systems.com/NHDPlus/data.php
Hydrology	Water Table Configuration (1995)	NO	University of Nebraska - Lincoln - Conservation and Survey Division, Configuration of the Water Table, 1995, accessed November 2011 from UNL website: http://snr.unl.edu/data/geographygis/NebrGISwater.asp#wtable
Hydrology	Waterbodies	NO	U.S. Environmental Protection Agency (USEPA) and the U.S. Geological Survey (USGS). 2005. National Hydrography Dataset Plus - NHDPlus. Accessed November 2011 from NHDPlus Website: http://www.horizon-systems.com/NHDPlus/data.php
Hydrology	Watershed Boundaries (12 Digit)	NO	United States Geologic Survey, Reston, VA. Water Boundary Data - 12 digit Hydrologic Units. Accessed November 2011 from USDA NRCS website: http://datagateway.nrcs.usda.gov/
Hydrology	Wetlands	NO	U.S. Fish & Wildlife Service, National Wetlands Inventory. National Wetlands Inventory - Nebraska. http://www.fws.gov/wetlands/Data/DataDownload.html
Imagery	2010 Aerial Imagery	NO	USDA - Farm Service Agency - Aerial Photography Field Office. 2010. USDA-FSA-APFO NAIP County Mosaic. Accessed November 2011 from USDA NRCS website: http://datagateway.nrcs.usda.gov/
Infrastructure	Electric Transmission Lines	YES	Pennwell MAPSearch Electric GIS Data. 2011. http://www.mapsearch.com/index.html
Infrastructure	Pipelines	YES	Pennwell MAPSearch Pipeline GIS Data. 2011. http://www.mapsearch.com/index.html
Infrastructure	Nebraska Trails (Including Cowboy Trail)	NO	Nebraska Game and Parks Commission. Nebraska trail System. Accessed April 2011 from NGPC website: http://outdoornebraska.ne.gov/gisapps/trails/
Infrastructure	Railroads	NO	U.S. and Canada Railroads, ESRI Data and Maps v10
Infrastructure	Roads	NO	U.S. and Canada Detailed Streets, ESRI Data and Maps v10

Physiography	Ecoregions - Level III	NO	US Environmental Protection Agency. 2011. Level III Ecoregions of the Conterminous United States. Accessed November 2011 from EPA website: http://www.epa.gov/wed/pages/ecoregions/level_iii_iv.htm
Physiography	Ecoregions - Level IV	NO	US Environmental Protection Agency. 2011. Level IV Ecoregions of the Conterminous United States. Accessed November 2011 from EPA website: http://www.epa.gov/wed/pages/ecoregions/level_iii_iv.htm
Physiography	Rainwater Basin - EPA (Level 4 Ecoregion)	NO	US Environmental Protection Agency. 2011. Level IV Ecoregions of the Conterminous United States. Accessed November 2011 from EPA website: http://www.epa.gov/wed/pages/ecoregions/level_iii_iv.htm
Physiography	Rainwater Basin - USFWS	NO	Received via email on July 27, 2010 from Mark Ely, Division of Planning, USFWS.
Project Data	Desktop Route Options	NO	Keystone Project Data
Project Data	NE Study Area	NO	Keystone Project Data
Project Data	Post Field Recon Options	NO	Keystone Project Data
Project Data	Preferred Route Corridor	NO	Keystone Project Data
Soils	Compaction Prone Soils	NO	Custom analysis performed by exp on based on percentages of identified soils within each soil map unit. Soil Survey Geographic (SSURGO) Databases for Nebraska. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Available online at http://soildatamart.nrcs.usda.gov. Accessed 2011.
Soils	Drought Prone Soils	NO	Custom analysis performed by exp on based on percentages of identified soils within each soil map unit. Soil Survey Geographic (SSURGO) Databases for Nebraska. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Available online at http://soildatamart.nrcs.usda.gov. Accessed 2011.
Soils	Generalized Soils in Nebraska	NO	University of Nebraska - Lincoln - Conservation and Survey Division, Nebraska Soils, accessed November 2011 from UNL website: http://snr.unl.edu/data/geographygis/NebrGISsoils.asp
Soils	Hydric Soils	NO	Custom analysis performed by exp on based on percentages of identified soils within each soil map unit. Soil Survey Geographic (SSURGO) Databases for Nebraska. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Available online at http://soildatamart.nrcs.usda.gov. Accessed 2011.
Soils	Low Revegetation Potential Soils	NO	Custom analysis performed by exp on based on percentages of identified soils within each soil map unit. Soil Survey Geographic (SSURGO) Databases for Nebraska. Soil Survey Staff,

			Natural Resources Conservation Service, United States Department of Agriculture. Available online at http://soildatamart.nrcs.usda.gov. Accessed 2011.
Soils	Prime Farmland Soils	NO	Custom analysis performed by exp on based on percentages of identified soils within each soil map unit. Soil Survey Geographic (SSURGO) Databases for Nebraska. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Available online at http://soildatamart.nrcs.usda.gov. Accessed 2011.
Soils	Restrictive Layers	NO	Custom analysis performed by exp on based on percentages of identified soils within each soil map unit. Soil Survey Geographic (SSURGO) Databases for Nebraska. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Available online at http://soildatamart.nrcs.usda.gov. Accessed 2011.
Soils	Sandhills Soils	NO	Custom analysis performed by Westech on Soil Survey Geographic (SSURGO) Databases for Nebraska. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Available online at http://soildatamart.nrcs.usda.gov. Accessed 2011.
Soils	Severe Water Erodible Soils	NO	Custom analysis performed by exp on based on percentages of identified soils within each soil map unit. Soil Survey Geographic (SSURGO) Databases for Nebraska. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Available online at http://soildatamart.nrcs.usda.gov. Accessed 2011.
Soils	Severe Wind Erodible Soils	NO	Custom analysis performed by exp on based on percentages of identified soils within each soil map unit. Soil Survey Geographic (SSURGO) Databases for Nebraska. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Available online at http://soildatamart.nrcs.usda.gov. Accessed 2011.
Soils	Shallow Bedrock (None in Study Area)	NO	Custom analysis performed by exp on based on percentages of identified soils within each soil map unit. Soil Survey Geographic (SSURGO) Databases for Nebraska. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Available online at http://soildatamart.nrcs.usda.gov. Accessed 2011.
Soils	Soils Map Units	NO	Soil Survey Geographic (SSURGO) Databases for Nebraska. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Available online at http://soildatamart.nrcs.usda.gov. Accessed 2011.
Soils	Stony or Rocky Soils	NO	Custom analysis performed by exp on based on percentages of identified soils within each soil map unit. Soil Survey Geographic (SSURGO) Databases for Nebraska. Soil Survey Staff, Natural Resources Conservation Service, United States

			Department of Agriculture. Available online at http://soildatamart.nrcs.usda.gov. Accessed 2011.
Structures	Center Pivots	NO	University of Nebraska - Lincoln - Conservation and Survey Division, Center Pivot Irrigation Systems, accessed November 2011 from UNL website: http://snr.unl.edu/data/geographygis/NebrGISwater.asp#pivot
Structures	Historic Structures	NO	National Park Service - National Register of Historic Places. Accessed 2011. http://nrhp.focus.nps.gov/natreg/docs/Download.html#spatial
Structures	Oil/Gas Wells	NO	Nebraska Oil and Gas Conservation Commission. Nebraska Oil and Gas Wells. Accessed November 2011 from NOGCC website: http://www.nogcc.ne.gov/NOGCCPublications.aspx
Structures	Water Wells	NO	Nebraska Department of Natural Resources. Nebraska Registered Groundwater Wells. 1957-Present. Accessed November 2011 from NeDNR website: http://dnrdata.dnr.ne.gov/wellscs/Menu.aspx
Topography	24k Index Grid	NO	U.S. USGS 1:24,000 Topographic Quadrangle Series Index, ESRI Data and Maps
Topography	Countywide Topographic Maps	NO	USDA – Natural Resources Conservation Service. USDA-NRCS-NCGC Digital Raster Graphic County Mosaic. http://datagateway.nrcs.usda.gov/
Topography	Elevation Data (10m)	NO	U.S. Geological Survey (USGS), EROS Data Center. National Elevation Dataset - 10 meter. http://datagateway.nrcs.usda.gov/
Topography	Irrigated Farmland	NO	University of Nebraska - Lincoln - Conservation and Survey Division, 2005 Land Use Mapping, accessed November 2011 from UNL website: http://snr.unl.edu/data/geographygis/NebrGISland.asp#landuse05
Topography	Land Cover (NLCD 2006)	NO	U.S. Geological Survey. 20110216. NLCD 2006 Land Cover. http://www.mrlc.gov/nlcd2006.php
Topography	Slope Data (10m)	NO	Custom analysis performed by exp. Derived from U.S. Geological Survey (USGS), EROS Data Center. National Elevation Dataset - 10 meter. http://datagateway.nrcs.usda.gov/

Appendix A
NDEQ Notice on Sandhills Definition

PRESS RELEASE

from the Nebraska Department of Environmental Quality

For more information, contact
Brian McManus (402) 471-4223, or
Jim Bunstock (402) 471-4243

For Immediate Release
December 29, 2011

NDEQ Identifies Sandhills Regions to be Avoided in Alternative Pipeline Route

The Nebraska Department of Environmental Quality today announced the areas that it considers to be Nebraska Sandhills, based on an analysis of a variety of existing data. This information will be conveyed to TransCanada for their reference as the company develops a proposed new route for the Nebraska portion of the Keystone XL pipeline.

NDEQ Director Mike Linder said this was an important step resulting from legislation which was passed in November relating to the development of an alternative route that avoids the Nebraska Sandhills.

"Obviously, the applicant cannot propose the route without knowing the area to be avoided," Linder said. "NDEQ has been reviewing available information and has selected a map of ecoregions which was finalized in 2001 as best depicting the Sandhills region."

This map, titled "Ecoregions of Nebraska and Kansas" was a multi-year project involving numerous state and federal agencies, including: the U.S. Environmental Protection Agency, NDEQ, the U.S. Geological Survey, Nebraska Game and Parks Commission, and the U.S. Forest Service.

Attached is a map from NDEQ that shows an outline of the Sandhills region in Nebraska. The more comprehensive map that delineates a variety of ecoregions in both Nebraska and Kansas can be found on EPA's web site, at: ftp://ftp.epa.gov/wed/ecoregions/ks/ksne_eco_pg.pdf

This information is being conveyed to TransCanada today. TransCanada will consider this information as it develops an alternative route for the pipeline. When TransCanada submits alternative route information, NDEQ will move forward in the development of a Supplemental Environmental Impact Statement, which will consider a variety of potential environmental impacts.

NDEQ will provide opportunities for public participation during the process. Early in the process, the agency will conduct a series of information sessions to discuss what is being proposed and solicit public input. Later, when a draft Supplemental Environmental Impact Statement is developed, a formal public comment period will be held.

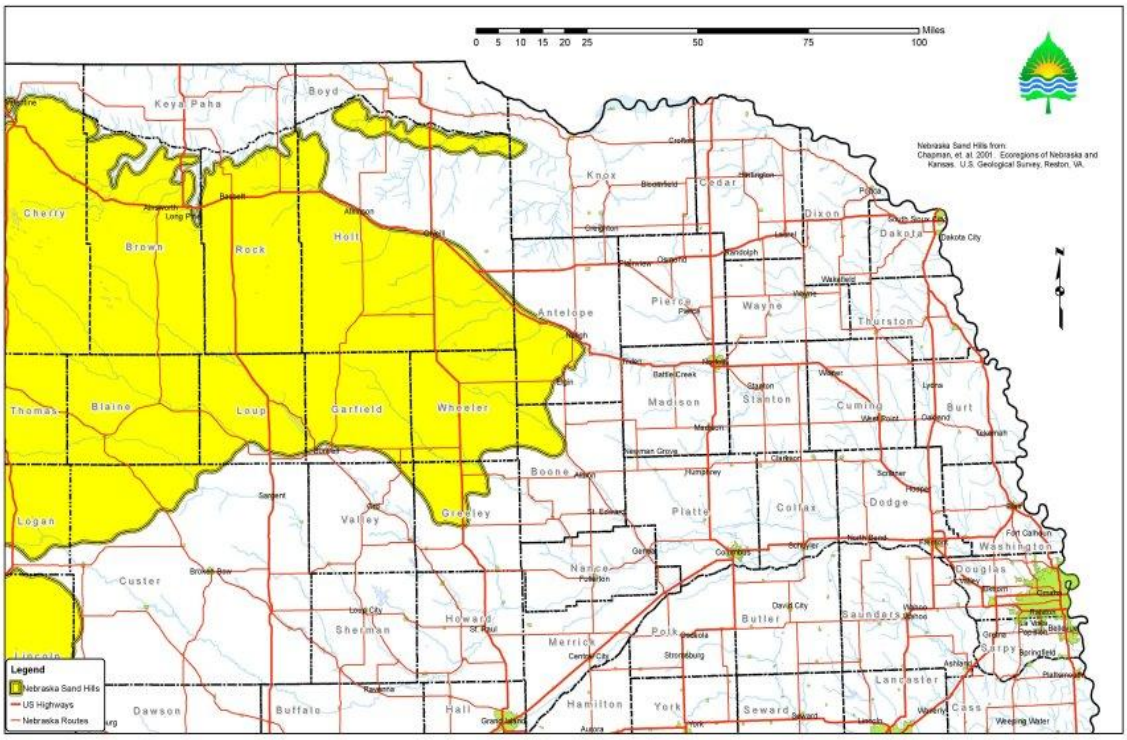
Information will continue to be updated on the agency web site. Go to www.deq.state.ne.us and select "NDEQ's Role in Pipeline Review" or follow the direct URL to: www.deq.state.ne.us/gen.nsf/Pages/Pipeline.

Questions and comments can be sent to a new NDEQ e-mail address: NDEQ.SEISpubliccomment@Nebraska.gov. An NDEQ pipeline telephone comment line has also been established at 1 (800) 295-8912.

Background on NDEQ's New Responsibilities

On November 22, 2011, Gov. Dave Heineman signed LB4 into law, which provides new responsibilities to NDEQ relating to supplemental environmental impact statements involving oil pipelines. The first application of the new law is the development of a supplemental environmental impact statement for the proposed TransCanada Keystone XL pipeline.

The legislation assigns NDEQ to work with the U.S. Department of State throughout the review. Negotiations continue with the U.S. Department of State to finalize a Memorandum of Understanding detailing how NDEQ's environmental review process will fit into the federal review process.



Maps of Sandhills Delineation	
Close-up perspective	Statewide perspective
FinalBase1M (2).pdf PDF Map File Size 1896 KB	FinalBase2M.PDF PDF Map File Size 1536 KB

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Appendix B
Cowboy Trail Discussion

The Cowboy Trail as a Potential Pipeline Corridor

It has been suggested by interested parties in Nebraska that the "Cowboy Trail" should be used to re-route the KXL pipeline to avoid the Nebraska Sandhills as delineated by the NDEQ.

The Cowboy Trail (see map below) is a former rail line that has been converted to a recreational trail currently along a continuous 195 mile path where is passes through 20 communities of varying sizes from west of Norfolk to Valentine, Nebraska. The trail was gifted to the State of Nebraska by Rails to Trails Conservancy and accepted under state legislation. The trail is under the care of the Nebraska Game and Parks Commission in accordance with federal rail-banking statutes.

Keystone examined the use of the Cowboy Trail in Rock, Holt, and Antelope counties as a potential pipeline corridor and found it to be incompatible with the study goals and objectives reasons including the following:

1. The trail is located in the NDEQ Sandhills exclusion area;
2. The trail is required to be maintained in a state such that a rail line could be reactivated;
3. The trail is not continuous; and
4. The trail would need to be taken out of service during pipeline construction, and then disturbed periodically over the life of the pipeline for maintenance work. The 110-foot wide construction area would impact the future width of the trail.

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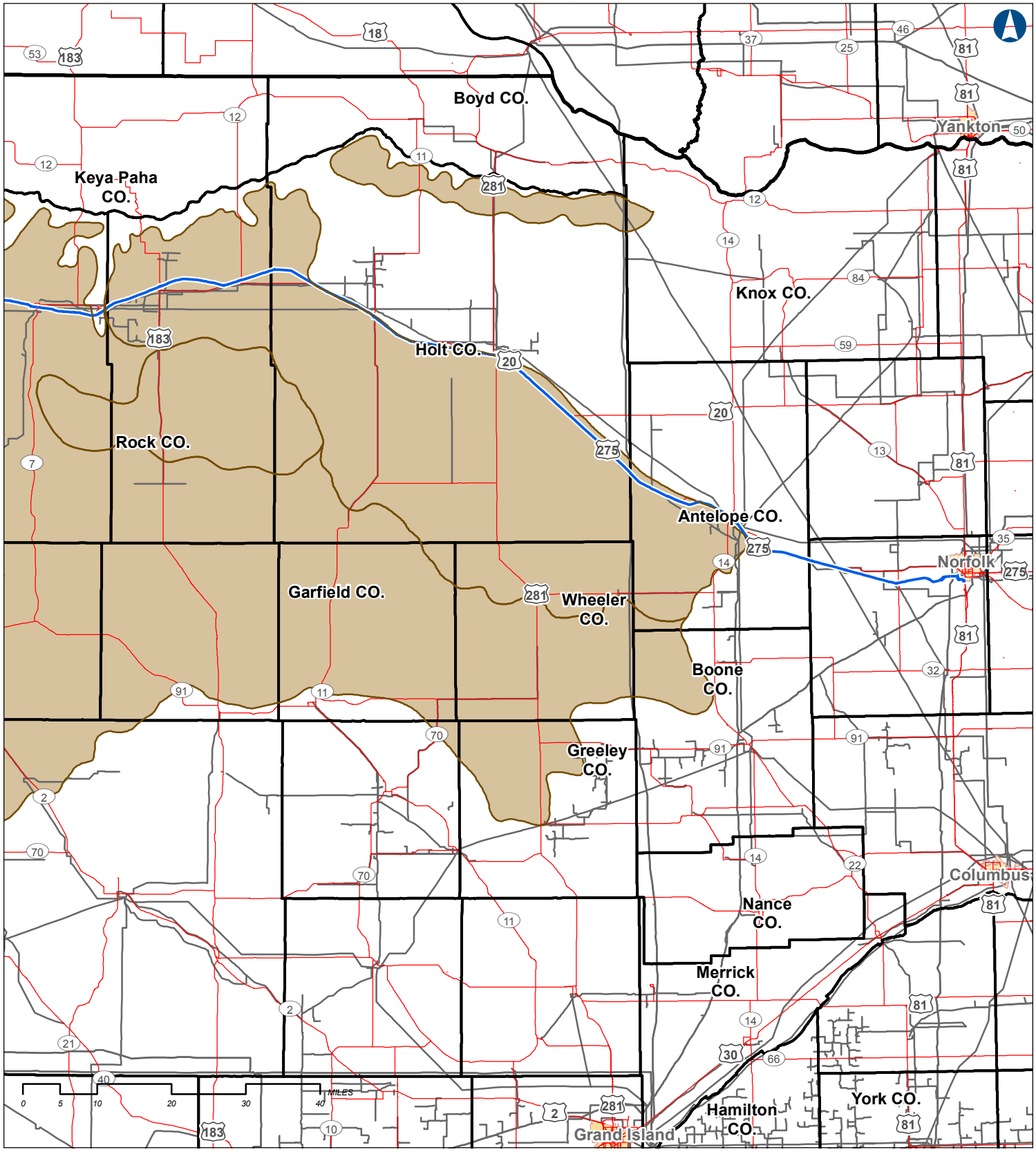
COWBOY TRAIL



LEGEND

- STATE BOUNDARY
- COUNTY BOUNDARY
- POWER LINE, PIPELINE
- NEBRASKA SANDHILLS
- COWBOY TRAIL

KEYSTONE XL PIPELINE PROJECT
Cowboy Trail

COUNTY:	-	DRAWN BY:	PD
STATE:	NEBRASKA	CHECKED BY:	JP

REV. NO.:	REVISION	DATE
0	ISSUED FOR REVIEW.	2012-01-13

PRELIMINARY

DATE:	2012-01-13	PROJECTION:	NAD83 | UTM14 N

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Appendix C
Listing and Source of Data

Class	Feature	Source of Data
Biological	ABB captures post 1992	University of Nebraska at Kearney
Biological	Critical Habitat	USFWS
Biological	Threatened and Endangered Species Habitat and Ranges	NE Game and Parks
Boundaries	All Protected Areas	USGS - GAP
Boundaries	Conservation Reserve Program (CRP) Easements	Farm Service Agency - NE State Office
Boundaries	Counties	CENSUS (TIGER)
Boundaries	Federal Lands	Multiple (exp)
Boundaries	Federal Lands - ESRI	ESRI
Boundaries	Local Government Lands	Multiple (exp)
Boundaries	National Parks and Monuments	Multiple (exp)
Boundaries	National Primitive Areas	Multiple (exp)
Boundaries	National Wilderness Areas	Multiple (exp)
Boundaries	National Wildlife Refuges and Ranges	Multiple (exp)
Boundaries	NE Township Boundaries	BLM PLSS
Boundaries	Other Conservation Lands	Multiple (exp)
Boundaries	Scanned Plat Books	County Plat Books
Boundaries	Section Lines	DOI - BLM
Boundaries	State Lands	Multiple (exp)
Boundaries	State Wildlife Management Areas	Multiple (exp)
Boundaries	Tribal Allotments	County Plat Books
Boundaries	Tribal Lands/Reservations	Multiple (exp)
Boundaries	Wetlands Reserve Program (WRP) Easements	NRCS
Geology	Active Mineral Operations	University of Nebraska - Lincoln - Conservation and Survey Division
Geology	Bedrock Geology	University of Nebraska - Lincoln - Conservation and Survey Division
Geology	Construction Mineral Operations	USGS from National Atlas
Geology	Crushed Stone Operations	USGS from National Atlas
Geology	Depth to Precambrian Rocks	University of Nebraska - Lincoln - Conservation and Survey Division
Geology	Faults	USGS - US Generalized Geologic Map
Geology	Glacial Limits	USGS - US Generalized Geologic Map
Geology	Glacial Till Deposits	University of Nebraska - Lincoln -

Class	Feature	Source of Data
		Conservation and Survey Division
Geology	Karst Areas	USGS from National Atlas
Geology	Physiographic Divisions in the US	USGS
Geology	Quaternary Fault Feature Regions	USGS from National Atlas
Geology	Quaternary Faults and Folds	USGS from National Atlas
Geology	Sand and Gravel Operations	USGS from National Atlas
Geology	US Geologic Units	USGS - US Generalized Geologic Map
Hazards	Earthquake Hazard	USDOT PHMSA
Hazards	Flood Hazard	USDOT PHMSA
Hazards	Landslide Hazard	USDOT PHMSA
Hazards	Landslide Incidence and Susceptibility	USGS
HCAs	Commercially Navigable Waterways	USDOT PHMSA
HCAs	Drinking Water Unusually Sensitive Areas (USA)	USDOT PHMSA
HCAs	Ecological Unusually Sensitive Areas (USA)	USDOT PHMSA
HCAs	Highly Populated Areas (HPA)	USDOT PHMSA
HCAs	Other Populated Areas (OPA)	USDOT PHMSA
HCAs	Populated Places	ESRI
HCAs	Urban Areas	ESRI
HCAs	Wellhead Protection Areas	NDEQ
HCAs	Wild and Scenic Rivers	NPS
Hydrology	Aquifers of Alluvial and Glacial Origin	USGS from National Atlas
Hydrology	Depth to Groundwater - UNL 1979	University of Nebraska - Lincoln - Conservation and Survey Division
Hydrology	Depth to Groundwater From DNR Well Data	Surface generated from static water level from DNR well data
Hydrology	Depth to Groundwater From CSD Well Data	Surfaces generated from UNL CSD well data (min, mean, median, max)
Hydrology	DRASTIC Index	University of Nebraska - Lincoln - Conservation and Survey Division
Hydrology	Groundwater Regions	University of Nebraska - Lincoln - Conservation and Survey Division
Hydrology	Impaired Waterbodies lines	EPA
Hydrology	Impaired Waterbodies polygons	EPA
Hydrology	Major Rivers	ESRI
Hydrology	Major Water Lines	ESRI
Hydrology	Major Waterbodies	ESRI
Hydrology	Ogallala (High Plains) Aquifer Thickness	USGS OFR 00-300
Hydrology	Principal Aquifers of the United States	USGS from National Atlas
Hydrology	Streams	NHD PLUS
Hydrology	Water Table Configuration (1995)	University of Nebraska - Lincoln - Conservation and Survey Division

Class	Feature	Source of Data
Hydrology	Waterbodies	NHD PLUS
Hydrology	Watershed Boundaries (12 Digit)	Geospatial Data Gateway
Hydrology	Wetlands	NWI - FWS
Imagery	2010 Aerial Imagery	NAIP - USDA
Infrastructure	Electric Transmission Lines	Pennwell MapSearch
Infrastructure	Foreign Pipelines	Pennwell MapSearch
Infrastructure	Railroads	ESRI
Infrastructure	Roads	ESRI
Physiography	Ecoregions - Level III	EPA
Physiography	Ecoregions - Level IV	EPA
Physiography	Major Land Resource Areas (MLRAs)	NRCS
Physiography	Rainwater Basin - EPA (Level 4 Ecoregion)	EPA
Physiography	Rainwater Basin - USFWS	USFWS
Physiography	Topographic Regions - NE	University of Nebraska - Lincoln - Conservation and Survey Division
Physiography	Topographic Regions - SD	University of Nebraska - Lincoln - Great Plains Research
Project Data	NE Study Area	EXP
Soils	Compaction Prone Soils	USDA NRCS SSURGO Analysis
Soils	Drought Prone Soils	USDA NRCS SSURGO Analysis
Soils	Generalized Soils in Nebraska	University of Nebraska - Lincoln - Conservation and Survey Division
Soils	Hydric Soils	USDA NRCS SSURGO Analysis
Soils	Low Revegetation Potential Soils	USDA NRCS SSURGO Analysis
Soils	Marsh Plains / Shallow Groundwater Soils	USDA NRCS SSURGO Analysis
Soils	Prime Farmland Soils	USDA NRCS SSURGO Analysis
Soils	Restrictive Layers	USDA NRCS SSURGO Analysis
Soils	Sandhills Soils	USDA NRCS SSURGO Analysis
Soils	Severe Water Erodible Soils	USDA NRCS SSURGO Analysis
Soils	Severe Wind Erodible Soils	USDA NRCS SSURGO Analysis
Soils	Shallow Bedrock	USDA NRCS SSURGO Analysis
Soils	Soils Map Units	USDA NRCS SSURGO
Soils	Stony or Rocky Soils	USDA NRCS SSURGO Analysis
Structures	Center Pivots	UNL
Structures	Historic Structures	NPS
Structures	Oil/Gas Wells	NOGCC
Structures	Water Wells	DNR
Topography	24k Index Grid	ESRI
Topography	Countywide Topographic Maps	Geospatial Data Gateway
Topography	Elevation Data (10m)	Geospatial Data Gateway

Class	Feature	Source of Data
Topography	Irrigated Farmland	UNL
Topography	Land Cover (NLCD 2006)	US DOI - USGS