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A photograph of a rural landscape with rolling hills, fields, and trees under a blue sky. The image is framed by a thick black border.

**Cameco Resources
Marsland Expansion Area Uranium Project
Class III Cultural Resource Investigation
Dawes County, Nebraska**

ARCADIS Project No. WY002368.0001.0001

April 28, 2011

Prepared for:

Cameco Resources
Crawford, Nebraska

Nebraska State Historical Society/SHPO
Lincoln, Nebraska

Nebraska Department of Environmental Quality
Lincoln, Nebraska

Nuclear Regulatory Commission

Prepared by:

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Marsland Expansion Area Uranium Project

Cultural Resource Inventory

Prepared for:

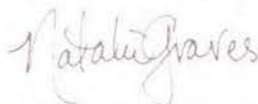
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Nuclear Regulatory Commission

April 28, 2011



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This investigation was carried out in accordance with policies and regulations implementing Section 106 of the National Historic Preservation Act of 1966 (Public Law 89-665). The cultural resource inventory was undertaken to locate, identify, and document cultural resources that might be affected within the APE of the proposed undertaking, and to provide recommendations of eligibility to the National Register of Historic Places (NRHP) as specified in Title 36 of Codes of Federal Regulations (36 CFR 60.4). NRHP eligibility is evaluated in terms of the integrity of the resource, and: (a) its association with significant events, or patterns in history or prehistory; (b) its association with the specific contributions of individuals significant in our past; (c) its engineering, artistic, or architectural values; or (d) its information potential for important research questions in history or prehistory (National Park Service 1998). The implementing regulations of Section 106 state that, "The goal of consultation is to identify historic properties potentially affected by the undertaking, assess its effects and seek ways to avoid, minimize or mitigate any adverse effects on historic properties" (36 CFR 800.1b). Therefore, the management recommendations made by ARCADIS archaeologists focus primarily on the potential of the undertaking to pose an adverse effect to historic properties, as defined in 36 CFR 800.5.

This report was prepared to conform with the Nebraska State Historical Society Format, Guidelines, and Standards for Cultural Survey Reports.

**Marsland Expansion Area
Uranium Project, Class III
Cultural Resource Inventory**

Planning and Permitting

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ARCADIS

II. Abstract

A. Project Type

Cameco Resources contracted ARCADIS U.S., Inc to complete a cultural resource inventory and report for the proposed Marsland Expansion Area Uranium Project in Dawes County, Nebraska. Cameco Resources is preparing a Nuclear Regulatory Commission (NRC) License Amendment Application to allow in-situ uranium mining at its Marsland Expansion Area site. A cultural survey and resulting report, then, is needed to comply with NRC NUREG-1569 Section 2.4 requirements; Nebraska Department of Environmental Quality, Title 122, Chapter 11 Sections 006.07 (determination of whether the facility is located on Indian lands, historic and/or archaeological sites); and the Nebraska State Historic Preservation Office National Historic Preservation Act Archeological Properties Section 106 Guidelines.

B. Investigation Type

ARCADIS' Buffalo office conducted the 100 percent pedestrian block inventory during the period of November 18, 2010 to February 20, 2011, covering a total of 4,500 acres.

C. Project Location

The Marsland Expansion Area Uranium Project is located in the northern Nebraska Panhandle roughly 10 to 12 miles south of Crawford, Nebraska. The region is generally characterized as Pine Ridge country, but the site itself actually lies just south of the Pine Ridge escarpment, north of the Niobrara River, and over 30 miles northwest of the famous Nebraska Sand Hills.

D. Summary of Results

ARCADIS recorded 15 newly discovered historic sites and five historic isolated finds within the project area. Newly recorded historic sites include six home/farmsteads (25DW359, 25DW360, 25DW361, 25DW365, 25DW366, 25DW370) three debris scatters (25DW357, 25DW363, 25DW369), two cisterns (25DW358, 25DW364), one corral (25DW367), one bridge (25DW362), one dugout (25DW368), and one quarry (25DW371). ARCADIS updated two previously recorded historic sites within the project area that includes two home/farmsteads (25DW00-242, 25DW00-243). ARCADIS recommends all sites in the MEAUP not eligible for listing on the NRHP, thus no further work such as monitoring construction activities is recommended. ARCADIS does recommend avoiding historic homestead site's 25DW00-242 and 25DW00-243. Due to the unknown occupancy status of homestead site 25DW00-242 and good condition of features recorded at this site, ARCADIS recommends Cameco Resources avoid all construction activities within 200 feet of the site boundary. Historic homestead site 25DW00-243 has numerous features and associated artifacts that, with further research beyond the scope of this undertaking, would reveal more complex and in-depth temporal contexts and spatial extents to provide meaningful data that would address more important research questions. ARCADIS recommends Cameco Resources avoid all construction activities within 200 feet of the 25DW00-243 site boundary. Given these results and management practices, ARCADIS recommends a finding of **no adverse affect to historic properties for construction of the proposed Cameco Resources Marsland Expansion Area Uranium Project.**

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Nebraska Cultural Properties Forms

Personnel Vitas

IV. Undertaking

A. Project Description

Cameco Resources (CR) contracted ARCADIS U.S., Inc. (ARCADIS) to complete a cultural resource inventory and report for the proposed Marsland Expansion Area Uranium Project (MEAUP) in Dawes County, Nebraska (**Figures 1 through 6**). The project area can be found on the Box Butte Reservoir West 1974 (42103d2), Marsland 1983 (42103d3), Coffee Mill Butte SW 1980 (42103e2), and Belmont 1980 (42103e3) USGS 7.5' topographic quadrangles (**Figure 7**). The project area encompasses 4,500 acres within Sections 26 and 35, T30N R51W; Sections 1, 2, 12, and 13, T29N R51W; and Sections 7, 18, 19, 20, 29, and 30, T29N R50W. The surface lands and minerals within the project area are privately owned. CR is preparing a Nuclear Regulatory Commission (NRC) License Amendment Application to allow in-situ uranium mining at its Marsland Expansion Area site. A cultural survey and resulting report, then, is needed to comply with NRC NUREG-1569 Section 2.4 requirements; Nebraska Department of Environmental Quality, Title 122, Chapter 11 Sections 006.07 (determination of whether the facility is located on Indian lands, historic and/or archaeological sites); and the Nebraska State Historic Preservation Office (SHPO) National Historic Preservation Act Archeological Properties Section 106 Guidelines. The proposed undertaking consists of in-situ uranium mining and related activities for 4,500 acres at the Marsland Expansion of the Crow Butte Mine (**Table 1**).

B. Anticipated Disturbance

Table 1. Anticipated Disturbance.

"The Crow Butte operation uses the in situ recovery (ISR) mining method. ISR mining produces no waste rock or tailings and results in minimal disturbance to the surface and underground areas mined. Uranium at Crow Butte occurs in sandstone aquifers as coatings on sand grains at up to 300 meters underground. Uranium is removed using a grid of injection and production wells. The uranium is insoluble in the native groundwater. Small amounts of oxygen and bicarbonate (baking soda) are added to the injection stream to dissolve the uranium. The uranium solution, less than 1/10 of 1% uranium, is then pumped from a production well to a satellite facility where the uranium is transferred to ion exchange resin beads similar to the sand from which it was extracted. The uranium-bearing resin is then pumped to a processing plant where it is removed from the beads, precipitated and dried to become the final product, yellowcake. This is essentially a closed-loop recirculation system. Water from the production wells is reintroduced in the injection wells. Slightly less water is injected than withdrawn to ensure the fluids are confined to the ore zones intended for extraction. Monitor wells are installed to allow testing of groundwater quality above, below and around the target zones to ensure fluids do not move outside those areas (Cameco Corp. 2011)."

C. APE

ARCADIS has defined the area of potential effect (APE) as the 4,500 acres comprising the area included in the NRC License Amendment Application. According to 36 CFR 800.16(d), the area of potential effects (APE) is the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist. The APE is influenced by the geographic area, the scale and nature of the undertaking, and the effects (physical, visual, auditory, atmospheric). In defining the APE of the current undertaking, direct physical effects on 4,500 acres is

considered. No visual, auditory, or atmospheric effects to cultural resources are known outside the application area, and therefore the final proposed APE is 4,500 acres.

Understanding that the APE is dynamic, the federal agency, in consultation with the SHPO will establish the final APE in the event minor changes are made to the project, alternate historic routes or Traditional Cultural Properties areas are discovered, socio-cultural effects are re-considered, effects on culturally sensitive natural resources emerge, or indirect or secondary effects (erosion, public use) are determined. ARCADIS has defined the APE described above based on the best information available in regards to proposed impacts of the MEAUP, and the best available data for archaeological and historic property locations at the time of the writing of this report.

D. Survey Acreage

The entire APE, 4,500 acres, was 100 percent pedestrian block inventoried for the MEAUP. ARCADIS' Buffalo, Wyoming Office conducted the survey during the period of November 18, 2010 to February 20, 2011 expending roughly 1,000 person hours.

E. Overview Photographs



Figure 1. Project overview in Section 29 T29N R50W, facing south. Photograph taken by A. Graves, on 11/18/2010.



Figure 2. Project overview in Section 26 T30N R51W, facing west. Photograph taken by A. Graves, on 11/20/2010.



Figure 3. Project overview in Section 26 T30N R51W, facing south. Photograph taken by A. Graves, on 11/20/2010.