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**ARCHEOLOGICAL SURVEY OF KDOT PROJECT K-7389,  
COFFEY COUNTY, KANSAS**

Report submitted to the Kansas Department of Transportation  
in accordance with the provisions of the  
Cooperative Agreement for Highway Archeological Salvage Program

by Randall M. Thies  
Archeology Office, Cultural Resources Division  
Kansas State Historical Society  
19 June 2003

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INTRODUCTION

In accordance with the goals and procedures of the Cooperative Agreement for Highway Archeological Salvage Program and as requested by the Kansas Department of Transportation (KDOT), the Kansas State Historical Society (KSHS, or "the Society") recently completed a Phase II archeological field survey investigation of KDOT road project number 75-16 K-7389-01. The purpose of the investigation was to determine whether any significant archeological resources would be affected by the proposed project.

As required by the terms of the Cooperative Agreement, a Phase II survey must result in a report submitted to KDOT and the State Historic Preservation Officer (SHPO) wherein the investigation is described and recommendations are made for clearance or for further work to be done. This report was prepared to comply with that requirement. In accordance with the SHPO's request that site locational data be left out of the text of reports such as these, and to enable the easy removal of such data from copies of reports so as to guarantee confidentiality, all of the maps and figures pertaining to this investigation are contained within Appendix I.

The Phase II investigation was initiated by earlier correspondence between the Society and KDOT relating to the potential impact of the project on cultural resources. A Phase I investigation (archival research) was requested by KDOT on 7 May 2003. After reviewing the available documentation and consulting with the SHPO, the Society submitted a Phase I report dated 16 May 2003 recommending that a Phase II field survey investigation be performed. The recommended fieldwork was thereby carried out by Society staff archeologists Randall M. Thies and Timothy Weston on 10 and 18 June 2003.

As planned, the project will consist of two road constructions in Coffey County, Kansas (Figures 1 and 2). The primary portion of the project will feature the construction of a nearly a mile of new highway and a new bridge. The existing highway will be left in place, resulting in a four-lane double-embankment highway for this stretch of road. The new bridge and highway embankment will be to the west of the existing highway and will merge with the existing highway at either end of the project area. Construction limits will extend a maximum of 100 m to the west of the existing highway centerline for most of the length of the project, and will extend to 150 m near the river due to the construction of sizable bridge abutments.

The other portion of the project will involve the construction of a side road to carry local traffic on the south side of the river and west side of the highway. The side road construction will be relatively small in size with construction limits no more than 20 m wide.

## ENVIRONMENTAL SETTING

In physiographic terms, the project area is located within the Osage Cuestas division of the Osage Plains section of the Central Lowland province of the Interior Plains division of North America (Schoewe 1949:283-286). The bedrock of the region consists of interbedded limestone, shale, and sandstone formations of Pennsylvanian age. Exposure and differential erosion of the unequally resistant, westward sloping strata at the ground surface has created a series of low parallel ridges. These "cuestas" have steep, rugged, east facing escarpments that front on broad, gently inclined, westward sloping vales. Thus, the topography consists of long, low rolling hills and wide, shallow valleys. In general, the escarpments exhibit an irregular northeast-southwest trend. The major stream courses, however, flow to the east and southeast, transverse to the direction of the escarpments and against the westward dip of the rock formations.

The prehistoric vegetation of the Osage Cuestas was open prairie penetrated by thin ribbons of riverine forest. Kuchler (1974) lists the Cuestas as part of the tall grass bluestem prairies, described more specifically as an area with extensive interspersions of forest and prairie. Soil survey data and early historical accounts indicate that the wooded areas were confined to the floodplains and valley edges of the major stream courses and their tributaries. The timber consisted of medium tall to tall broadleaf deciduous forests, often with dense undergrowth and many lianas. Oak, black walnut, hickory, hackberry, cottonwood, willow, and elm were common along with a variety of smaller species such as persimmon, papaw, elderberry, serviceberry, chokecherry, and wild grape. Forestation was apparently not pervasive even in bottomland locations, however, since many of the common stream course soils have characteristics indicating that they developed under a native vegetation of both tall grasses and hardwood trees. In any case the forest belts and nearby prairies of the Osage Plains provided shelter and food for plentiful mammalian fauna, including bison, elk, deer, antelope, and bear, while the streams yielded an abundance of edible fish and shellfish. Wild turkey, prairie chicken, ruffed grouse, and quail were also available, and ducks and geese were present on a seasonal basis (Wedel 1959:14).

The natural ecology of the region has been greatly altered by modern land-use practices. Today, most of the lands within this part of the state are used for agricultural purposes, primarily the pasturing of cattle and the cultivation of crops such as wheat, corn, milo, and soybeans.

Conditions varied within the project area. Within the highway portion of the project area, cultivated fields were present, recently planted in soybeans. Due to the immaturity of the crop, conditions were excellent for the finding of artifacts on the ground surface, with ground visibility of approximately 90%. Within the side road portion of the project area, corn was present but the crop was immature and had virtually no weeds; ground visibility

was approximately 40% generally, with scattered areas of more open ground offering 100% visibility.

### CULTURAL-HISTORICAL SETTING

Archeologically, research in this region of Kansas has yielded evidence of prehistoric human occupation dating from around 11,000 years ago and extending up to the modern era, and certainly has the potential for yielding more such evidence. Sites in the region usually represent habitation areas or small workshops and more rarely occur as villages or burials. While the full extent of the area's archeological resources has yet to be determined, it is clear that the region contains materials deriving from all of the major cultural periods thus far identified in Kansas, i.e.,

Paleoindian	circa 9,000 B.C. to 7,000 B.C.
Archaic	circa 7,000 B.C. to A.D. 1
Early Ceramic	circa A.D. 1 to A.D. 1000
Middle Ceramic	circa A.D. 1000 to A.D. 1500
Late Ceramic	circa A.D. 1500 to A.D. 1800
Historic	A.D. 1541 to present

The list consists of broad and somewhat artificial categories, and there is some temporal overlap between periods. As might be expected, more is known about the most recent inhabitants than is known about the earliest (Lees 1989; Brown and Simmons 1987; Thies 1987; Wedel 1959).

With regard to the project that is the subject of this report, documentation consulted during the Phase I investigation indicated that no archeological sites had been reported in or near the project area. The topographic setting, however, suggested that there was some potential for prehistoric sites to be present. Since the project area had never been professionally inspected for archeological remains, a Phase II field survey was recommended.

### RESEARCH METHODOLOGY

The Phase II investigation consisted of a field inspection of the project area, including an intensive pedestrian survey of the specified project area and a reconnaissance survey of the surrounding area. The highway portion of the project area was systematically surveyed by a series of pedestrian transects spaced 15 meters apart and oriented in a north-south direction. The side road portion of the project area was surveyed in similar transects that followed the route of the road. Areas of high topographic potential for the finding of prehistoric archeological remains (specifically terrace formations in both portions of the project area) were criss-crossed to ensure that no archeological remains would be overlooked, and in those high potential locations, the survey was extended to cover ground lying outside of the specified project area. The amount of land covered in this survey amounted to approximately 35 acres (see Figure 3). As described in the Environmental Setting section of this report, the ground visibility ranged from 40-100%.

One result of the survey was the finding of a previously unreported archeological site. After the completion of the fieldwork, a site survey report form was prepared and submitted for inclusion in the Kansas State Historical Society's Master Site File. The submission was accepted and the site was subsequently designated as 14CF1345. A copy of the site form is included in Appendix I.

## SURVEY FINDINGS AND CONCLUSIONS

Despite the intensity of the survey and the presumed potential of the area to contain cultural remains, no significant archeological sites of the prehistoric or the historic period were found within the project area. One previously unknown prehistoric archeological site (14CF1345) was found nearby (see Figure 4), but will not be affected by the project. It should be noted as well that a substantial amount of burned earth and charcoal was found within and adjacent to the project area (see Figure 4). This material, however, was determined to be of recent origin, resulting apparently from the burning of trees that had been grubbed from an adjacent swale. It is of no archeological importance.

We conclude that the project will have no effect on any significant archeological resources, and we therefore recommend that the project proceed as planned. We see no need for any additional archeological investigations unless archeological discoveries are made during the course of the project.

It is always possible, of course, due to the nature of archeological manifestations, that buried cultural deposits could be encountered. If that occurs, the remains should be left in place and the State Archeologist contacted immediately so that appropriate mitigative actions can be carried out as soon as possible.

Randall M. Thies  
Archeology Office, Cultural Resources Division  
Kansas State Historical Society  
19 June 2003

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## **APPENDIX I.**

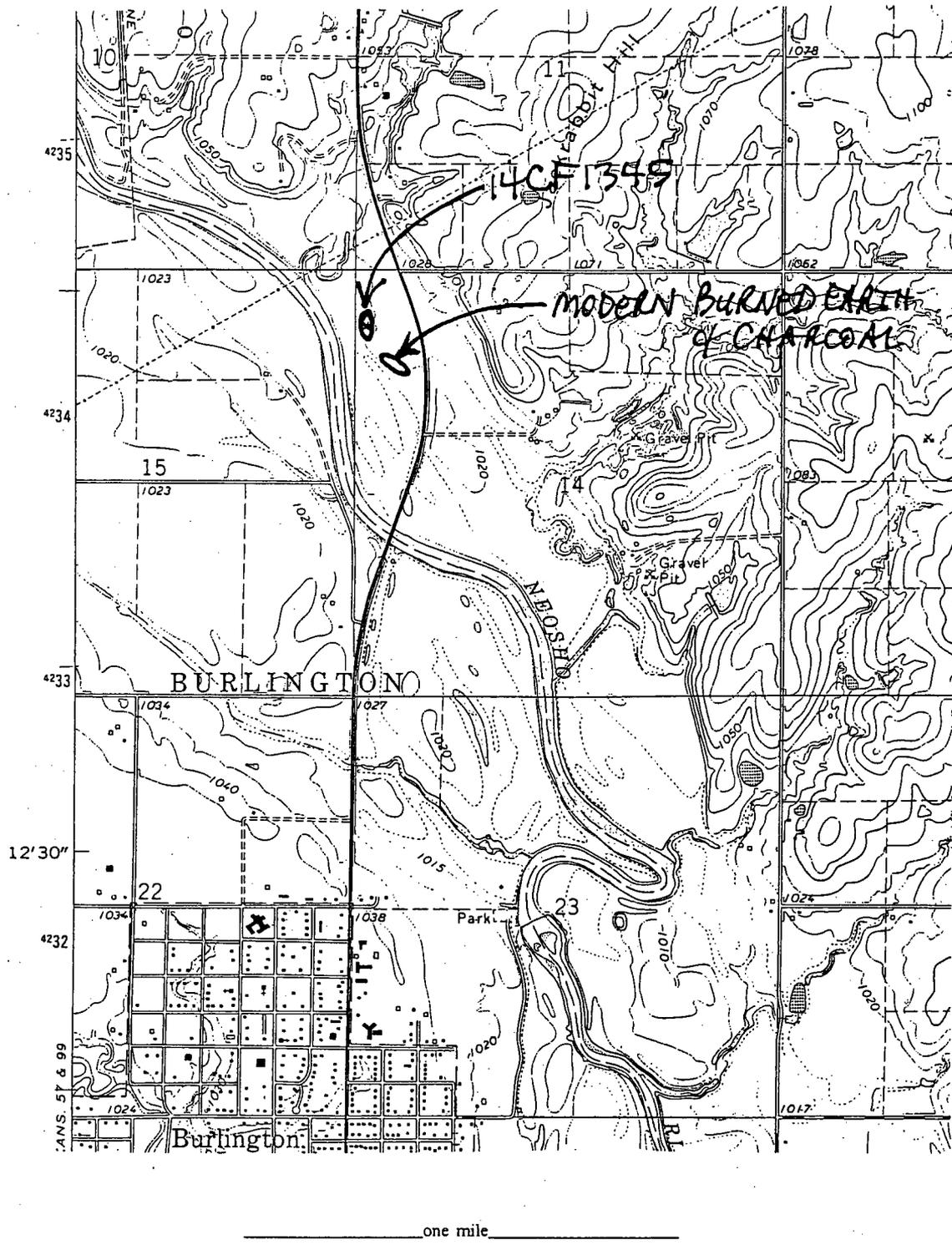


FIGURE 4. Section of U.S.G.S. topographic map (Burlington, Kans. 1979 quadrangle), showing the location of archeological site 14CF1345 and an area of modern burned earth and charcoal.

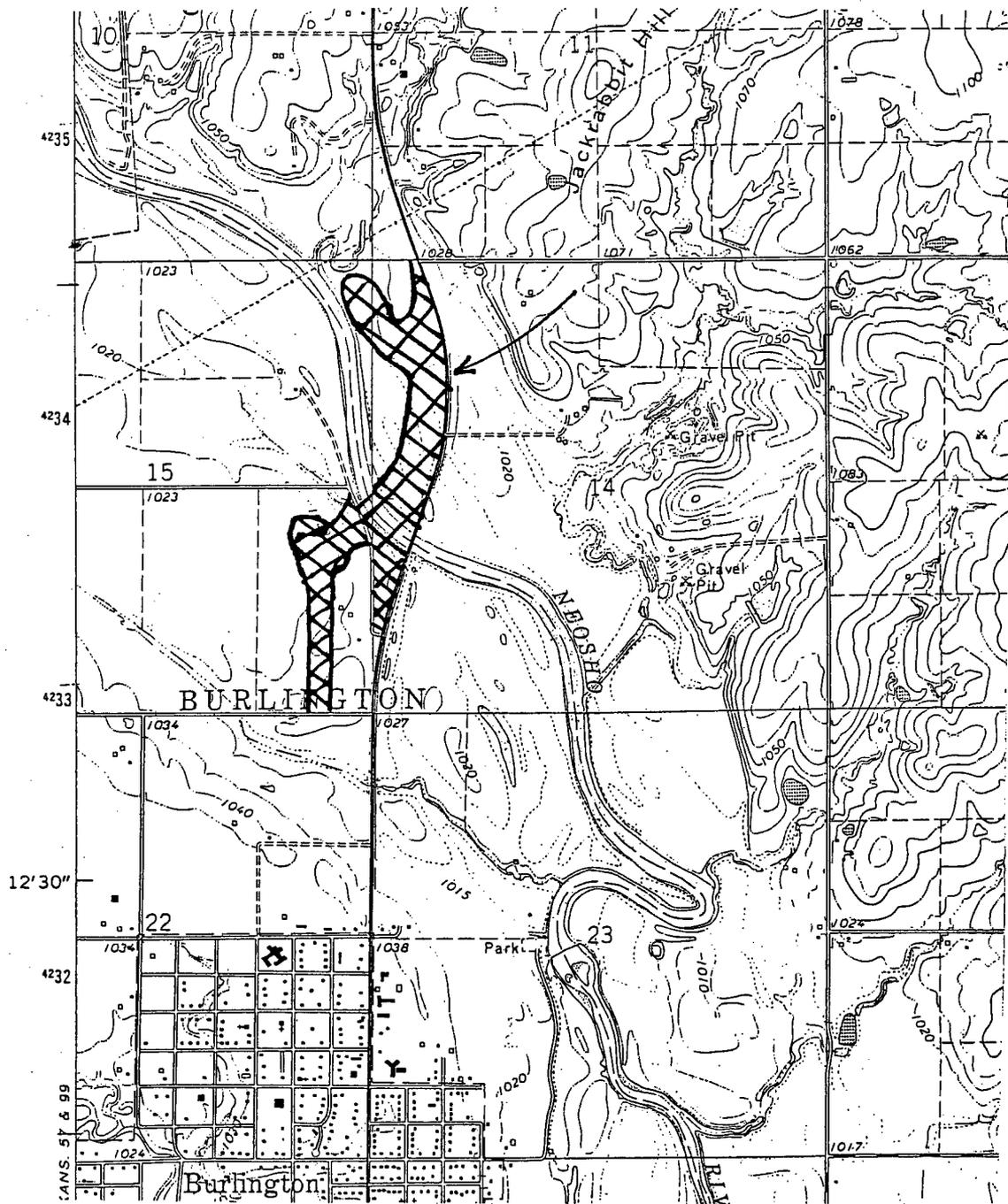


FIGURE 3. Section of U.S.G.S. topographic map (Burlington, Kans. 1979 quadrangle), showing the location and general extent of the areas subjected to pedestrian inspection during the Phase II survey, as indicated by hatching and arrow.

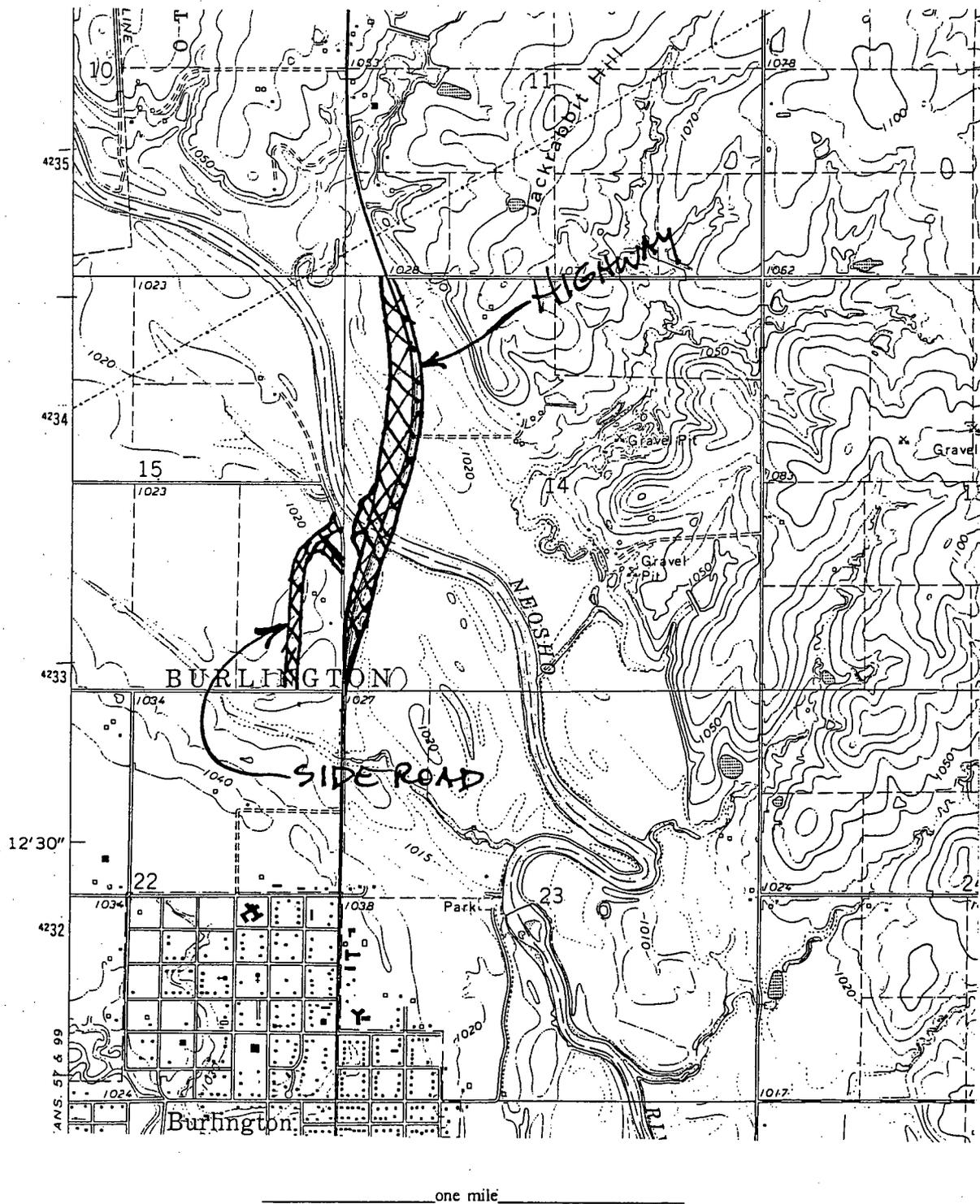


FIGURE 2. Section of U.S.G.S. topographic map ( Burlington, Kans. 1979 quadrangle), showing the location and general extent of the highway and side road portions of the project, as indicated by hatching and arrows.

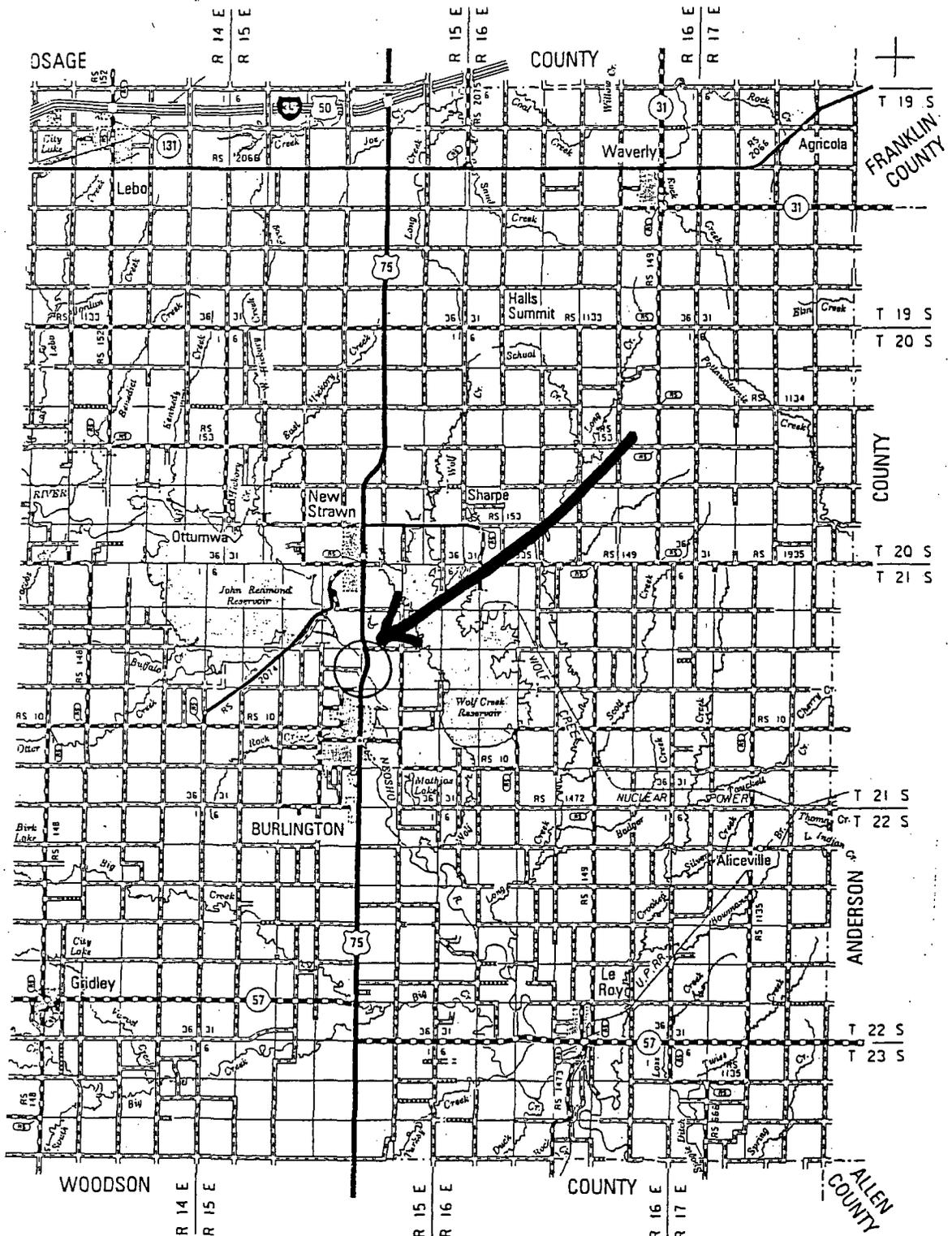


FIGURE 1. Section of Coffey County highway map, showing the location of KDOT road project K-7389, as indicated by circle and arrow.



Kansas State Historical Society Archeological Site Form

Revision: original

Site Number: 14CF01345 Site Name:

UBS Number: Not assigned County: Coffey

Location:

Legal Description

- NW,NW,NW of Section 14, T 21S, R 15E
- SW,NW,NW of Section 14, T 21S, R 15E

Site Topographical Location: Terrace

Drainage: Neosho River

**Site Description:** Cultural debris scattered over surface of prominent terrace formation on left or east bank of river. Site occupies tip of ridge; a swale curves around the north, west, and south sides of the landform and site, while the terrace continues to the SSE.

**Artifacts Collected:** 1 piece of burned bone; 1 piece ground stone (grinding slab?); 1 rim sherd & 4 body sherds (shale/sherd tempering; smooth, cord-marked, and smoothed-over cord-marked surfaces; rim has incised cross-hatching); 3 projectile points (one very small, thin, narrow, side-notched with convex base; other 2 are medium sized--one with straight-sided stem with round base, the other is a contracting stemmed specimen of the Gary type); 5 crude bifaces; 3 retouched flakes; 2 cores; 26 pieces of debitage. Chipped stone is Permian and Pennsylvanian, with approximately 30% being heat treated.

**Location of Artifacts:** KSHS

**Artifacts Observed, Not Collected:** Chert flakes, burned limestone (presumably hearth rock).

**Location of Other Artifacts:** John Decker provided information about past finds (apparently points and knives) and has collection from this and other sites in Coffey County but does not know which items came from 14CF1345. Other (unspecified) local collectors also have artifacts from this site.

**Time Period:**

General period	Specific period
Prehistoric American Indian	Early Ceramic, Middle Ceramic

**Specific Cultural Affiliation:** Greenwood Phase, Pomona Focus

**Site Type:** Camp

**Area of the Site:** 1 acres **Component:** Multicomponent Vertical

**Present Condition:** Cultivated

**Disturbance to the site:** Cultivation; tree grubbing/burning in area adjacent to site on southeast; years of collecting by local artifact collectors.

**Owner or Tenant:** John A. Decker, 1290 13th LN SW, Burlington, KS, 66839-, 620-364-21

**Historic Maps, References, or informants:** John Decker, longtime owner, provided information.

**Comments:** Greenwood Phase designation is somewhat tentative, based on presence of larger points. Since these points are often part of Pomona components, and the thinness of some of the pottery sherds presents compelling evidence for Pomona occupation, the site could be wholly a Pomona manifestation.

**Recommendations for further work:** Resurvey; obtain further information from local collectors if possible; conduct subsurface testing to determine presence/absence of intact remains, especially features such as storage pits or hearths.

**Recorded by:** Thies, Randall, 6425 SW 6th Ave, Topeka, KS, 66615-1099, 785-272-86, rthies@kshs.org

**Record date:** 06/17/2003

**Affiliation of Recorder:** Kansas State Historical Society

**Company Name:** KSHS

## Site Location Map

Map not available  
USGS Map Name: Burlington, Kans. Map Date: 1979

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M. Steen  
B  
FY82  
B1305  
Site 14CF1323

PHASE II AND PHASE III ARCHEOLOGICAL  
FIELD INVESTIGATIONS AT SECONDARY ROAD  
PROJECT 16-RS-583(19), COFFEY COUNTY, KANSAS

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In accordance with the Cooperative Agreement for Highway Archeological Salvage Program, the Society has completed Phase II and Phase III archeological investigations at the above mentioned secondary road project. The project consists of constructing a new road and bridge that will span the Neosho river near Burlington, Kansas. Site 14CF1323 was located during the Phase II work and was subsequently investigated during the Phase III study. The Phase II survey activity was conducted on August 20, 1981 and the Phase III investigation on May 10 and 11, 1982. Both segments of the fieldwork were completed by William Brogan of the Kansas State Historical Society, Archeology Department.

Physiographically, essentially all of eastern Kansas, south of the Kansas river to as far west as Manhattan in Riley county and Cedar Vale in Chautauqua county, lie within the Osage Cuestas subdivision of the Central or Interior Lowlands physiographic province (Schoewe 1949:280-286). The Osage Cuestas are described by Schoewe (1949:282-284) as follows:

In general, the Osage Cuestas consist of a series of northeast-southwest irregularly trending east-facing escarpments between which are flat to gently rolling plains. The underlying strata are made up of unequally resistant alternating hard and soft Pennsylvanian formations of limestone and shale which are gently inclined to the west and northwest. The cuestas are due to differential erosion in these alternating hard and soft gently westward dipping shales and limestones. Each cuesta consists of a steep bold east-facing front or escarpment and a gentler inclined surface or vale sloping in the direction of the dip of the strata. The crest of each escarpment is capped by a resistant limestone usually underlain by weak shales or sandstones. The dip-slope surface or gentler slope of the cuesta although controlled largely by the resistant limestone is nevertheless mostly developed in weaker shales or sandstones. The escarpment fronts range in height from 50 feet or less to more than 200 feet.

The Kansas, Marais des Cygnes, Neosho and Verdigris rivers, as well as several smaller rivers, drain the Osage Cuestas. The proposed project is adjacent to the Neosho river which is a tributary of the Arkansas river in eastern Oklahoma.

Archeologically, the Osage Cuestas has yielded evidence of continuous and, in some cases, outstanding archeological remains. While the full extent of the archeological resources of this region are not as yet completely known, it is evident the area contains representative materials from all of the major cultural periods thus far identified in Kansas:

#### Major Cultural Periods

Paleo-Indian	circa 12,000 B.C. to 6,000 B.C.
Archaic	circa 6,000 B.C. to A.D. 1
Early Ceramic	circa A.D. 1 to A.D. 900
Middle Ceramic	circa A.D. 850 to A.D. 1600
Late Ceramic	circa A.D. 1500 to A.D. 1800
Historic	A.D. 1541 to present

These are broad and somewhat artificial categories and there is obvious temporal overlap between periods. In some areas of Kansas and adjacent states, specific cultural periods can be divided into more precise temporal divisions and numerous individual archeological cultures have been recognized.

The earliest recognized and least known group of aboriginal people is termed the Paleo-Indian period, which began at least 14,000 years ago and perhaps even longer. This period is represented by the occurrence of distinctively chipped stone projectile points normally found in association with remains of large mammals that are now extinct, e.g., mammoth and older species of Bison. The evidence gathered from states surrounding Kansas indicate these people subsisted by hunting large game animals and probably by supplementing their diet with the collection of wild plant foods. They lived a nomadic type of existence and probably traveled about in small bands. Their sites consist primarily of "kill" locations where the animals were slain and then butchered. The manifestations of the Paleo-Indian period in the Osage Cuestas have been limited to occasional isolated surface finds of projectile points associated with this period. No significant Paleo-Indian site warranting excavation has yet been identified within Kansas.

Climatic fluctuations probably brought an end to the Paleo-Indian period. A great number of animal species became extinct and those that did remain represent our present-day species. The people

inhabiting the Osage Cuestas continued to be hunters and gatherers. This era is referred to as the Archaic period and dates from circa 6,000 B.C. into the early part of the Christian era. There are a larger number of sites during the Archaic period indicating a larger population than the preceding Paleo-Indian period.

The artifact assemblage during the Archaic period consists of a larger variety of chipped stone tools. Evidence of grinding slabs and other implements indicate adaptation and an increase in dependence upon the gathering of wild edible plant foods. Polished and chipped stone axes and celts also appear during this period. The Archaic sites are still small in comparison to later groups and generally represent temporary camps and sometimes burial sites. Archaic sites are most often found buried in the higher and older terrace deposits and are sometimes located in alluvial terraces along major drainages.

Archaic period sites have been excavated in the Osage Cuestas in conjunction with several major reservoir projects as well as in watershed areas. Excavations by the Kansas State Historical Society in the John Redmond reservoir area identified and dated an Archaic site component related to the El Dorado phase (Schmits 1980). This site yielded projectile points similar to those found in the Lamoka phase (Ritchie 1969) and to the Table Rock type (Perino 1968:96-97). This site also yielded human and dog burials. Radiocarbon dates of 1,550 B.C. and 1,650 B.C. were obtained from the occupation zone (Witty 1963, 1980). This locale is a couple miles northwest of the proposed project.

The Cow-Killer site, 140S347, located in the Melvern reservoir vicinity along the Marais des Cygnes drainage, yielded an Archaic site component similar to remains excavated in Council Grove reservoir by Witty (Reynolds 1976; Witty 1964). Finds from this site included a stratified and deeply buried Archaic component that yielded a variety of stemmed projectile points and the distinctive Munkers Creek knives or blades.

At approximately the beginning of the Christian era, the Archaic period came to a close in Kansas. This is probably the result of the diffusion of technologies into Kansas from the eastern woodland areas, i.e., Ohio and Illinois river valley. This is generally referred to as the Early Ceramic period in Kansas. Initially, the most important changes consisted of the introduction of ceramic manufacturing and possibly domesticated plants. Later in this period, the lithic tool assemblages include a much smaller and lighter stemmed triangular projectile point, indicating that the bow and arrow was then being utilized.

Wedel (1959:542-557) realized that at least two different Woodland (Early Ceramic) cultural complexes were in part coeval in

the Central Plains. The earliest and more complex of the two has been termed the Hopewellian phase due to its obvious relationship to Middle Woodland manifestations in the Lower Illinois river valley. The other, more technologically simpler group, is referred to as the Plains Woodland phase (Wedel 1959:535).

In the Osage Cuestas, the Early Ceramic period is marked by Plains Woodland and Hopewellian related complexes. The Kansas City focus of the Hopewell phase (Early Ceramic period) is situated primarily along the Kansas river drainage and its tributaries in northeast Kansas and along the Missouri river. Sites yielding characteristic Kansas City Hopewell artifacts have been recovered from John Redmond reservoir. Another Hopewellian variant, the Cuesta phase, has been identified in the Lower Verdigris, Fall and Elk river drainages of southeast Kansas (Marshall 1972; Brogan 1980) as well as along Big Hill creek in Labette and Montgomery counties (Rowlison 1977, 1980; Brogan 1981).

Plains Woodland complexes have also been identified in the Osage Cuestas. The Greenwood phase of the Plains Woodland has thus far been recognized at four excavated sites that occur along the Upper Verdigris river in the Council Grove vicinity, in Melvern reservoir and in John Redmond reservoir. A similar complex, the Butler phase (Grosser 1973), has also been identified at El Dorado reservoir. Thus, the Osage Cuestas and a portion of the Flint Hills Upland contain a significant number of Early Ceramic period sites.

By approximately A.D. 850, cultural changes through adaptation and diffusion brought about a cultural grouping defined as the Middle Ceramic period. The Middle Ceramic period is represented in the Osage Cuestas by numerous sites along most of the major drainages and tributaries of these streams. This is also sometimes referred to as the Plains Farmer period due to the archeologically documented presence of domesticated plants (corn, beans and squash) at some of the sites. Tools associated with horticulture, i.e., bone digging stick tips and scapula hoes, have also been recovered from some of the deposits.

The Middle Ceramic period complex most relevant to the present discussion is the Pomona focus (Witty 1967). Pomona focus sites are concentrated in the eastern portion of Kansas, primarily in the Osage Cuestas and the eastern Flint Hills, but they also occur in the Dissected Till Plains north of the Kansas river. A major determinant of Pomona focus sites are the remains of one or more structures that were typically covered with thatch and plastered over with clay. The post mold pattern at some sites indicate these were relatively lightweight structures, roughly oval in shape and usually about 25 ft long and 15 ft wide (Thies 1981:18). Structural

indicators also include irregularly and sometimes widely spaced post mold patterns as well as abundant fired, grass and pole impressed clay daub.

In terms of settlement pattern, Witty suggests that extended communities are indicated, with single or paired houses, occasionally up to four houses, situated along low terraces or on natural levees on the valley floor, from a few hundred yards to almost a mile apart (Witty 1978:60). The basic settlement pattern also includes small campsites located on the floodplain as well as on the ridge tops overlooking the valleys.

The Late Ceramic period represents the bridging of the pre-historic period with the advent of written history, i.e., the arrival of Europeans and Euro-American exploration and settlement (Witty 1980:11). The temporal dates for the Late Ceramic period range from approximately A.D. 1500 to A.D. 1800 and both proto-historic and historic groups are represented. In central Kansas, this period is represented by sites of the Great Bend aspect which have been identified as settlements of protohistoric Wichita bands (Witty 1980:11). Great Bend aspect materials have been recovered from the Osage Cuestas although the area, by and large, appears to lack the large village complexes like those recorded in central Kansas. In the middle or latter part of the seventeenth century, Siouan-speaking peoples from the east had established villages on the Osage, Missouri, and Kansas rivers (Witty 1980:11). Historically, these people are known as the Osage and Kansa.

In Kansas, the Historic period begins in A.D. 1541 with Coronado's journey to the "Quivira" villages, identified archeologically as the Great Bend aspect and identified culturally as the protohistoric Wichita. In A.D. 1825, the reservation era began in Kansas with the signing of treaties between the United States government and the Kansa and Osage tribes (Abel 1904). With the placement of the Osage on a diminished reservation in southeast Kansas in 1825, the United States government established reservations in Kansas for displaced eastern tribes.

#### Methodology

The survey methodology (Phase II) was initially one of the study of topographic maps and aerial photographs to determine the archeological potential of the area. Once established, the actual field investigations consist of a pedestrian inspection of exposed areas for materials that could represent an archeological site. Site 14CF1323 was located in this manner, and is on a prominent terrace a short distance west of the right bank of the Neosho river (Map 1).

The Phase III field investigations at 14CF1323 consisted primarily of utilizing an Oakfield soil sampling tool to extract soil cores from the site. This tool extracts a one inch in diameter soil core, one foot long. If utilized with the proper extensions, it can take samples as deep as three feet. By inspecting the soil core for burned earth, charcoal, chert flakes, etc., these materials, if located, could indicate the presence of a buried archeological component.

#### Survey Findings

The proposed project is primarily in Sections 26 and 35, T21S, R15E. The land use in this area is set aside for agricultural purposes, especially the growing of row crops. At the time of our Phase II investigations, the fields were either recently plowed or else they contained mature soybeans or alfalfa. One previously unrecorded archeological site was located during our survey. This site, 14CS1323, is within the proposed right-of-way on the western side of the Neosho river, between stations 712 and 714. Therefore, we recommended a Phase III investigation to determine whether the site had potential of yielding significant archeological information.

The recovered cultural materials from 14CF1323 includes a sizable amount of chert flakes, one dart point, one dart point base, one blade section, one large grinding stone section, a small amount of recent historic debitage and a few freshwater mussel shells. The observed material included chunks of limestone and sandstone, some of which was burned, probably from a hearth associated with the component at 14CF1323. The one complete dart point suggests that site 14CF1323 is a prehistoric site from the Archaic period. The large amount of burned rock indicates it is probably a campsite.

#### Phase III Findings

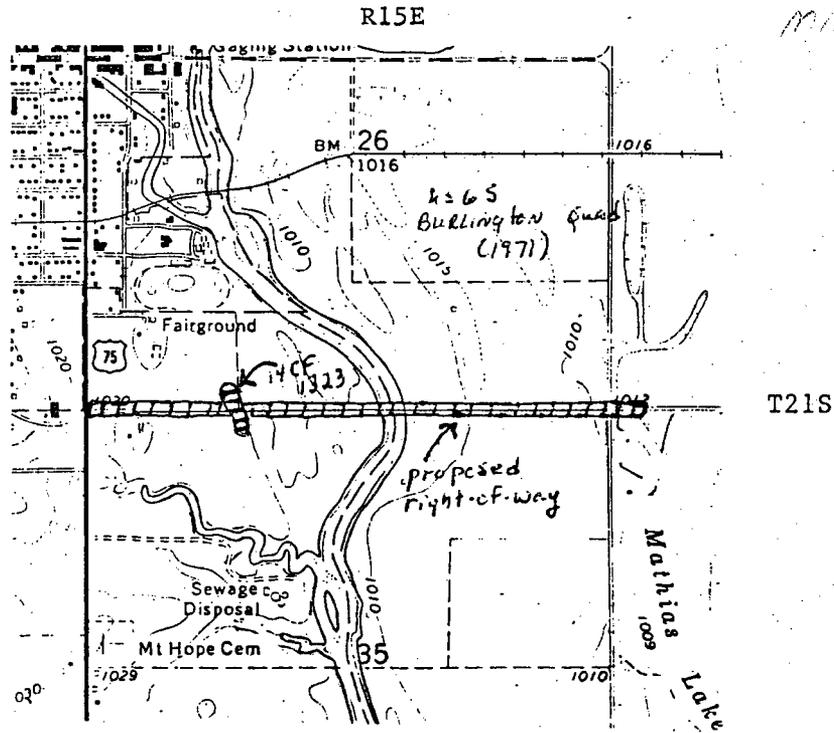
Approximately 40 soil cores were extracted from site 14CF1323. The majority of these were from the top of the terrace upon which the site is located. There was no evidence observed that would indicate the presence of an intact cultural stratum. All of the soil cores were devoid of burned earth, flecks of charcoal, tiny chert flakes and other material that would indicate a buried cultural zone. The site appears to represent a thin cultural deposit, limited to the disturbed plowzone. Therefore, its potential for yielding significant archeological information has virtually been destroyed.

### Conclusions

In conclusion, one previously unrecorded archeological site was located during our pedestrian survey. This site, 14CF1323, is within the proposed right-of-way in the vicinity of stations 712-714. The site was investigated at the Phase III level and its potential for yielding significant archeological information has been destroyed by modern land use. No additional archeological sites were located within the right-of-way. The project, as planned now, should have no adverse effect on significant archeological remains. Accordingly, no additional archeological work there by our staff is recommended at the present time.

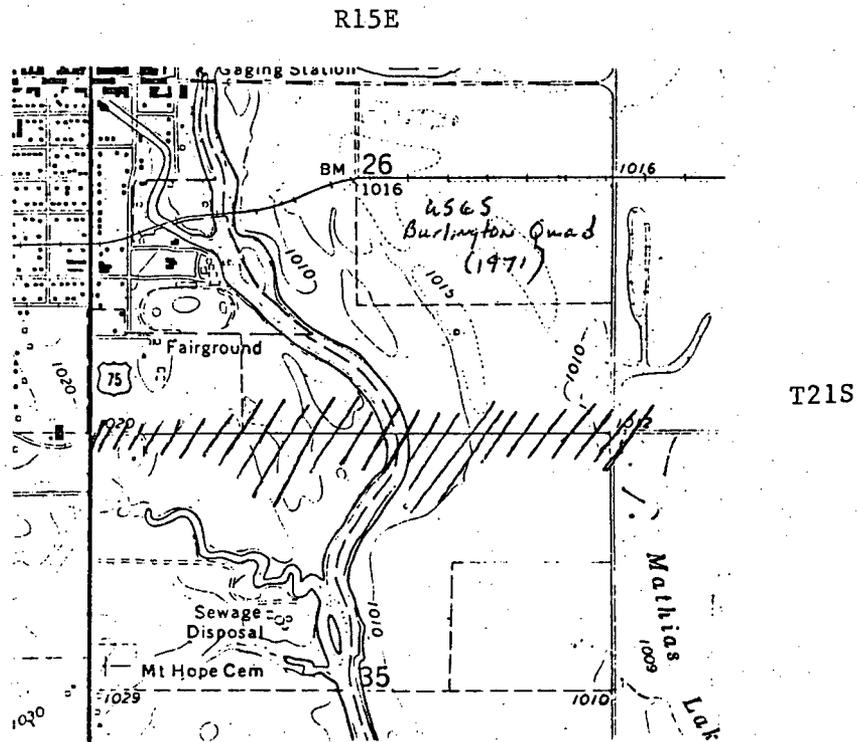
William T. Brogan  
Archeology Department  
Kansas State Historical Society  
May, 1982

Secondary Road Project 16-RS-583 (19), Coffey County, Kansas



Map 1. Approximate proposed right-of-way and location of site 14CF1323.

North



Map 2. Approximate area encompassed by the archeological survey.

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ARCHEOLOGICAL FIELD INVESTIGATION  
OF THE LEBO CREEK BRIDGE PROJECT  
FLINT HILLS NATIONAL WILDLIFE REFUGE, COFFEY COUNTY, KANSAS  
by  
Randall M. Thies

In accordance with purchase order no. 63520-0165-80, from Mr. Michael J. Long, dated August 4, 1980, the Kansas State Historical Society has completed an archeological investigation of a proposed bridge project over Lebo creek. The project area lies within the boundaries of the Flint Hills National Wildlife Refuge, in Coffey county, Kansas, and is located within the flood control pool area of John Redmond reservoir. The actual field investigation was carried out by the writer on September 25 and 26, 1980. The purpose of the investigation was to determine whether the project would have any adverse effects upon significant areal archeological resources.

Physiographically, the project is located within the Osage Cuestas division of the Osage Plains section of the Central Lowland physiographic province (Schoewe 1949:280). The Osage Cuestas themselves are broad, shingle-like escarpments formed by the differential erosion of westward-dipping limestone and shale formations. Each cuesta consists of a steep, bold east-facing front or escarpment and a gentler inclined surface or vale sloping in the direction of the dip of the strata. The crest of each escarpment is capped by a resistant limestone usually underlain by weak shales or sandstones (Schoewe 1949:283-284).

The flora of the region in the prehistoric and early historic periods was one of open prairie penetrated by thin ribbons of riparian forest. Kuchler (1974) lists the Osage Cuestas as part of the tall grass prairies, and describes it more specifically as an area with extensive interspersions of forest and prairie. Soil survey data indicate that within the John Redmond reservoir area, trees were confined to the bottomland and floodplains of the Neosho river and its tributaries. Forestation was apparently not pervasive even in those locations, since the common streamcourse soils are regarded as developing under a native vegetation of both tall grasses and hardwood trees. As described by Wedel (1959:14), in their original state the forested belts and nearby prairies of the Osage Plains provided shelter and food for an abundant mammalian fauna, and the streams yielded an abundance of edible fish and shellfish.

Archeologically, work carried out in eastern Kansas by various institutions, including the Kansas State Historical Society, has resulted in the establishment of a tentative cultural sequence for the region, i.e.,

Paleo-Indian	circa 12,000 B.C. to 8,000 B.C.
Archaic	circa 8,000 B.C. to A.D. 1
Early Ceramic	circa A.D. 1 to A.D. 1000
Middle Woodland	
Plains Woodland	
Middle Ceramic	circa A.D. 1000 to A.D. 1500
Pomona focus	
Late Ceramic	circa A.D. 1500 to A.D. 1800
Historic	circa A.D. 1541 to present

These sites occur as habitations, workshops, and rarely, as mounds.

Several archeological investigations have been carried out in the John Redmond reservoir. The area first received serious archeological attention in 1953, when a short survey of the proposed Strawn reservoir area was conducted by E. H. Moorman as a part of the River Basin Surveys program of the National Park Service. Seven prehistoric archeological sites were located as a result of the investigation (Moorman 1953). A more extensive survey, along with testing of selected sites, was carried out in 1959 and 1960 by the Kansas State Historical Society. This investigation focused on the John Redmond reservoir area proper, and resulted in the locating of 36 prehistoric sites, nine of which were tested (Witty 1961). The first intensive archeological investigations were carried out in 1963. The 1963 fieldwork resulted in the partial to extensive excavation of four prehistoric sites representative of cultures spanning some 2,500 years from 1,500 B.C. to approximately A.D. 1100 (Witty 1973:1). Following the impoundment of the reservoir waters in 1964, no further work was undertaken until 1974, when the Museum of Anthropology of the University of Kansas, funded by the Heritage Conservation and Recreation Service, conducted a shoreline survey of the reservoir and intensively tested one prehistoric site. Thirty-seven previously undocumented sites were reported during the course of the survey (Rogers 1979). In 1979, additional survey and testing was carried out by the present writer and a crew of five, as the result of a contractual agreement between the Kansas State Historical Society and the Tulsa District, U.S. Army Corps of Engineers. A total of 85 previously unknown sites were identified and 28 sites designated in earlier surveys were revisited. Limited testing was conducted at 29 sites and extensive test excavations were carried out at four others (Thies 1980). The efforts of the regular crew were supplemented by the survey and testing activities of some 70 Kansas Archeological Training Program enrollees, directed by Society archeologists over a two week period.

Surface finds of a few fluted projectile points in the John Redmond reservoir area (Rogers 1979:6) suggest that Paleo-Indian groups were in the vicinity, at least to some degree. Archaic occupations are represented more securely by excavated evidence, particularly that from the stratified Williamson site, reported by Witty (1963:8) and Schmits et al (1980:13-66). Evidence of Early Ceramic occupations has also been forthcoming, particularly from the excavated Gilligan site, which provided evidence of a cultural manifestation known archeologically as the Greenwood phase (Schmits et al 1980:67-125). Pottery at the Gilligan site suggests contact as well as contemporaneity with other Middle Woodland and Plains Woodland groups to the north and south. Middle Ceramic remains, however, constitute the most commonly encountered prehistoric evidence in the reservoir, and several such sites have been excavated. Almost all of these sites are clearly attributable to the Pomona focus, an archeological entity presently regarded as ... "a late survival of ... Plains Woodland folks" ..., representing a ... "late Plains Woodland manifestation with some shared traits from the adjacent Central Plains" (Witty 1978:62). Artifacts displaying Late Ceramic characteristics have occasionally been found at Pomona focus sites, both in the John Redmond area and in other areas of eastern Kansas, suggesting that Pomona focus may extend into the Late Ceramic period.

Thus, the Osage Cuestas division of Kansas in general, and the John Redmond reservoir area in particular, have yielded a significant quantity of archeological data which indicates that the reservoir as well as the overall region does bear potential of yielding additional significant archeological information.

#### Methodology

The survey methodology was initially one of the study of topographic maps and aerial photographs to determine the potential of the area. Once established, the actual field survey consisted of a pedestrian inspection of exposed areas for archeological materials. Archeological sites thus located were then tested for surviving evidence and archeological potential by the excavation of small test pits. Each test pit was circular, approximately 45 cm in diameter, and 25-30 cm deep. Four such test pits were dug, by shovel, at each site, with at least one of the test pits being located in the presumed center of the site. The pits were dug in a circular shape, rather than square, due to the extreme dryness and friability of the soil.

### Survey Findings

One previously unrecorded archeological site, 14CF1322, was located, and two previously reported sites, 14CF24 and 14CF49, were relocated during the course of the survey (see map). All three sites are on fairly prominent upland ridges overlooking the left bank of Lebo creek. Soils in the immediate area of the sites are mapped as Dennis silt loam, which is described as an upland soil formed under a native vegetation of tall prairie grasses. The sites, and in fact the entire general area, have been subject to extensive cultivation in recent years and probably since the earliest days of the historic period. At present, they are covered by a thick growth of Johnson grass and scattered weeds. A dirt road passes by somewhat to the north of 14CF24 and cuts directly through 14CF1322 and 14CF49. Due to the vegetational conditions, during the course of the survey most of the surficial archeological evidence was found in the exposed surface of the roadway.

#### 14CF24

At 14CF24, no archeological evidence at all was found, despite the presence of a few small exposed areas of ground in the area. Inspection of the roadway to the immediate north of the site likewise produced no surficial evidence. The four test pits which were excavated at the site revealed a plowzone underlain by a sterile, clayey subsoil. No cultural evidence was encountered in the test pits. Previous investigations of the site produced no culturally diagnostic artifacts, and Rogers notes that the site was apparently heavily exploited by artifact collectors when it was under cultivation (1979:13). Judging from Roger's comments and the results of the present writer's investigation, it would appear that 14CF24 has little or no potential for the finding of significant archeological remains. The site has apparently been extensively damaged, if not destroyed, by cultivation and the deprivations of private collectors. Roadwork along the north edge of the site should have little or no adverse effect upon areal cultural resources.

#### 14CF1322

At 14CF1322, the dirt road curves through the apparent center of the site, and an abandoned, partially gravelled road, ditched in places, lies along the northern and eastern edges of the road. A variety of artifactual material was found in the more recent roadway. The prehistoric inventory consists of a chipped stone cutting tool and several pieces of chipped stone debitage, none of which is culturally diagnostic. Two pieces of burned limestone, possibly the remains of a prehistoric hearth, were also found, along

with one unburned bone fragment and a few pieces of historic debris. A few pieces of brick were present a few meters south of the road, suggesting the possibility of a former historic structure. No prehistoric cultural evidence was produced in the four test pits. A minor amount of historic debris was encountered in the plowzone, which overlay a culturally sterile, clayey subsoil. It is presumed from this investigation that 14CF1322 has little or no potential for the finding of significant archeological remains. The site has apparently been extensively damaged, if not destroyed, by cultivation and roadwork in the past. Roadwork undertaken in conjunction with the proposed bridge construction should have little or no adverse effect upon areal cultural resources.

#### 14CF49

At 14CF49, the dirt road passes through the north edge of the site. Remains of an old roadway lie immediately north of the dirt road, along the edge of steep cut banks which overlook the creek several meters below. Erosion has severely affected the old roadway, portions of which have fallen off into the creek. No archeological evidence was observed in either the cut banks or the old roadway. In the newer road, however, prehistoric artifacts were present. Inspection of the road resulted in the finding of one chipped stone cutting tool and approximately 50 pieces of chipped stone debitage, none of which is culturally diagnostic. Two pieces of burned limestone, possibly representing the remains of a prehistoric hearth, were also encountered. Excavation of the four test pits, however, revealed no evidence of intact subsurface cultural manifestations. One piece of chipped stone debitage was found in the plowzone, which overlay a culturally sterile, clayey subsoil. It is presumed from this investigation that 14CF49 has little or no potential for the finding of significant archeological remains. The site has apparently been extensively damaged, if not destroyed, by cultivation and roadwork in the past. Roadwork undertaken in conjunction with the proposed bridge construction should have little or no adverse effect upon areal cultural resources.

#### Adjacent Areas

A pedestrian inspection was also undertaken of the remainder of the roadway on the left bank of the creek, and the left bank site of the proposed bridge construction. No archeological evidence was found. One prehistoric archeological site, 14CF323, is located on a high ridge a short distance to the south of the bridge site, but will presumably not be affected by the proposed construction. It should be noted that 14CF323 has previously

been tested for subsurface remains, with negative results, according to field notes in the Society's site files. If the proposed bridge construction does affect 14CF323, it should have little or no adverse effect upon area cultural resources.

Inspection of the west (right) bank of the creek, in and around the proposed bridge site, failed to result in the discovery of any prehistoric archeological materials. Judging from the negative results of this investigation and more particularly from the lowlying topographical situation of the right bank area, little or no potential exists for the finding of prehistorical remains. The proposed roadwork and bridge construction should have no adverse effect on areal cultural resources.

#### Conclusions

In conclusion, the Lebo Creek Bridge project was investigated and three archeological sites were found to be present in or closely adjacent to the project area. However, all three sites appear to have been heavily damaged or destroyed by cultivation and/or roadwork in the past. Limited testing of the sites produced no evidence of undisturbed cultural remains. The bridge project, as planned now, should have no adverse effect on significant archeological remains, and for that reason no further archeological work or preservational alternatives are recommended for the project at the present time. Despite the negative findings of the investigation, however, due to the buried nature of archeological remains it is always possible that randomly located archeological features could be encountered during the course of the project construction. If such features are located, construction should be temporarily halted or diverted and the State Archeologist contacted so that appropriate salvage action can be taken.

Kansas State Historical Society  
Archeology Department  
October, 1980

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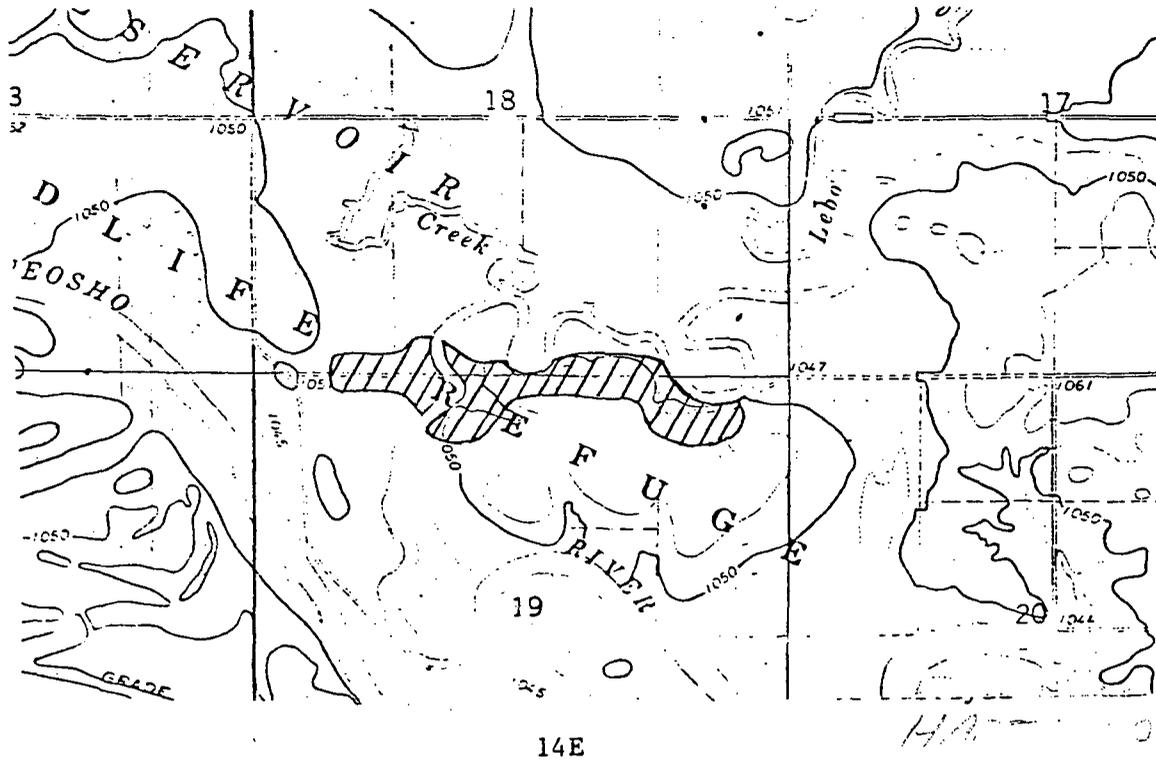
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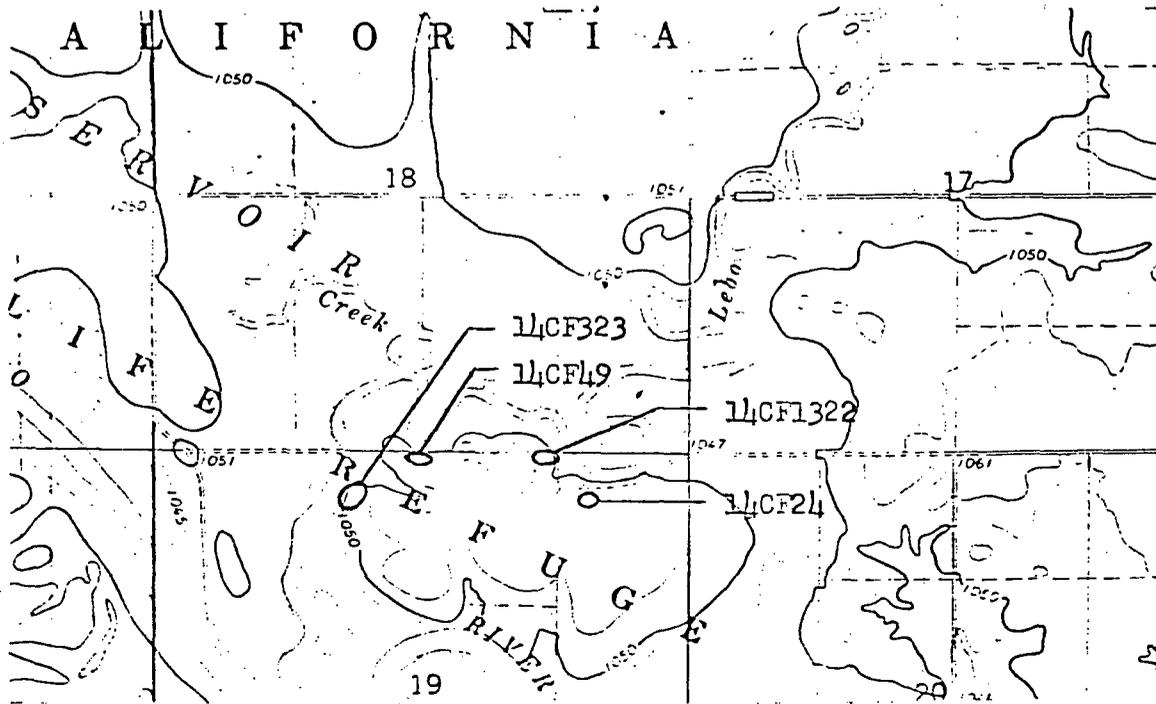
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Lebo Creek Bridge Project, Flint Hills National Wildlife Refuge



Map showing general project area and limits of area surveyed



Map showing location of archeological sites in the project area

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THE LONG CREEK BRIDGE EAST OF CENTER HILL CEMETERY:  
RESULTS OF AN ARCHEOLOGICAL SURVEY OF ROAD PROJECT C-2019,  
COFFEY COUNTY, KANSAS

INTRODUCTION

In accordance with the goals and procedures of the Cooperative Agreement for Highway Archeological Salvage Program, the Society recently completed a Phase II archeological field survey investigation of secondary road project number 16-C-2019-01, BRO-554(1) as authorized by the Kansas Department of Transportation (KDOT) in a letter dated February 16, 1984. The investigation was initiated by earlier correspondence between the Society and KDOT relating to the potential impact of the project on cultural resources. A Phase I review was requested by KDOT in a letter dated December 20, 1983. The Society subsequently submitted a Phase I report, dated December 29, 1983, in which it was recommended that a Phase II field survey investigation be performed. The recommended fieldwork was thereby carried out by Society staff archeologist Randall M. Thies on August 7, 1984. The purpose of the investigation was to determine whether any significant archeological resources would be affected by the proposed project.

As planned now, the project will involve the replacement of a bridge over Long Creek, approximately two miles south and four miles east of Burlington in Coffey County, east central Kansas (Figure 1). Present plans call for the existing bridge to be removed and a new bridge to be built, in approximately the same location but with the west end of the new bridge to be a few feet north of the existing bridge location. The roadway will be straightened so as to remove an existing jog in the road and new bridge approaches will be built as well, on both banks of the creek. The creek channel will be left as it is. The project area to be affected by the construction activities is shown in Figure 2.

ENVIRONMENTAL SETTING

In physiographic terms, the project area is located within the Osage Cuestas division of the Osage Plains section of the Central Lowland province of the Interior Plains division of North America (Schoewe 1949:283-286). The bedrock of the region consists of interbedded limestone, shale, and sandstone formations of Pennsylvanian age. Exposure and differential erosion of the unequally resistant, westward sloping strata at the ground surface has created a series of low parallel ridges or "cuestas" with steep, rugged, east facing escarpments fronting on broad, gently inclined, westward sloping vales. The topography is thus one of long, low, rolling hills and wide, shallow valleys. In general, the escarpments run in a north-east-southwest irregularly trending direction. The major stream courses flow to the east and southeast, however, transverse to the direction of the escarpments and against the westward dip of the rock formations.

The prehistoric vegetation of the Osage Cuestas was apparently one of open prairie penetrated by thin ribbons of riverine forest. Kuchler (1974) lists the Cuestas as part of the tall grass bluestem prairies, and describes it more specifically as an area with extensive interspersions of forest and prairie. Soil survey data and early historical accounts indicate that the forested areas were confined to the floodplains and valley edges of the major stream courses and their tributaries. The timber consisted of medium tall to tall broadleaf deciduous forests, often with dense undergrowth and many lianas. Oak, black walnut, hickory, hackberry, cottonwood, willow, and elm were common along with a variety of smaller species such as persimmon, papaw, elderberry, serviceberry, chokecherry, and wild grape. Forestation was apparently not pervasive even in bottomland locations, however, since many of the common streamcourse soils have characteristics indicating that they developed under a native vegetation of both tall grasses and hardwood trees. At any rate, the forest belts and nearby prairies of the Osage Plains provided shelter and food for an abundant mammalian fauna, including bison, elk, deer, antelope, and bear, while the streams yielded an abundance of edible fish and shellfish. Wild turkey, prairie chicken, ruffed grouse, and quail were also available, and ducks and geese were present on a seasonal basis (Wedel 1959:14).

The ecology of the region has, of course, been greatly altered by modern land-use practices. Today, most of the lands within Coffey County and the rest of the Osage Cuestas region are used for agricultural purposes, primarily the pasturing of cattle and the cultivation of crops such as wheat, corn, milo, and soybeans. Within the project area itself, cultivated fields and timbered areas are present. Timber covers all of the lowlying area northwest of the bridge and extends as a belt along both banks of the creek. All other areas are cultivated fields. The small area had been recently disced at the time of the survey and had no ground cover whatsoever. Conditions there were thus excellent for the finding of archeological materials on the ground surface. Lands on the east side of the creek were less conducive to survey. The field to the southeast of the bridge contained disced-over wheat which obscured portions of the ground surface. The field to the northeast of the bridge contained nearly mature milo. No weeds were present between the milo rows, fortunately, but ground conditions were still far from optimal due to the advanced maturity of the crop.

#### CULTURE-HISTORIC SETTING

Archeologically, the Osage Cuestas region of Kansas has yielded evidence of prehistoric human occupation dating from around 14,000 years ago and extending up to the modern era, and certainly has the potential for yielding more such evidence even though much has already been destroyed. Sites in the region usually represent habitation areas or small workshops and more rarely occur as villages or burial mounds. While the full extent of the area's archeological resources

has yet to be determined, it is clear that the region contains materials deriving from all of the major cultural periods thus far identified in Kansas, i.e.,

Paleo-Indian	circa 20,000 B.C. to 6,000 B.C.
Archaic	circa 8,000 B.C. to A.D. 1
Early Ceramic	circa A.D. 1 to A.D. 1000
Middle Ceramic	circa A.D. 1000 to A.D. 1500
Late Ceramic	circa A.D. 1500 to A.D. 1800
Historic	A.D. 1541 to present

The list consists of broad and somewhat artificial categories, and there is some temporal overlap between periods. As might be expected, more is known about the most recent inhabitants than is known about the earliest.

Our Phase I review noted that no archeological sites have been reported in or near the project area. However, the topographic setting suggested potential for sites and the project area had never been subjected to a professional, systematic archeological inspection. A Phase II survey was therefore recommended.

#### RESEARCH METHODOLOGY

The Phase II investigation initially involved background research consisting of a review of project plans, topographic maps, soil survey maps, and various archeological records pertinent to the project area. Work carried out thereafter consisted of a field inspection including an intensive survey of the specified project area and a reconnaissance survey of surrounding lands. All lands of moderate to good topographic potential located in or near the project area were specifically inspected by means of systematic pedestrian transects (see Figure 3). The inspecting archeologist was assisted in his efforts by a local amateur archeologist and Kansas Anthropological Association member, Mr. Bob Rainbolt of Burlington.

#### SURVEY FINDINGS AND CONCLUSIONS

Despite the relative intensity of the survey and the presumed high topographic potential of the area, no significant archeological sites or remains were found within the specified project area during the course of the survey. One site, however, was discovered just outside the project area on a slight rise, east of the creek and north of the existing bridge (Figure 4). Project plans indicate that this site area will not be affected by the proposed construction, hence no further work will be necessary under the guidelines of the Cooperative Agreement. The site, 14CF1334, is a small prehistoric campsite of indeterminate cultural affiliation. Its scientific potential and status with regard to satisfying the criteria for nomination to the National Register of Historic Places are uncertain at present due to

the lack of subsurface testing. The site was rather minimally evidenced at the time of the survey, but this may be due to adverse ground conditions and the depredations of local collectors more than anything else. Artifacts found during the survey include a muller (hand grinding stone) made of Sioux quartzite (presumably brought in from the glaciated area of northeastern Kansas), and sections of two chipped stone tools, a biface and a uniface. The latter may be part of an endscraper used in hideworking. No hearth rock or structural remains were observed; again, however, this may be due to the obscuring effect of the milo. The site has obviously been adversely affected by plowing, but undisturbed remains could still be present beneath the plow zone. For this reason, Phase III testing will be necessary if plans change and the site area is affected by construction or borrow activities. Please advise us if this becomes the case. At any rate, it is presently concluded that the project as it is now planned will have no effect on any significant archeological resources. Accordingly, no additional archeological investigations are recommended for the project at the present time. It can be considered to be cleared with regard to anticipated impact on archeological resources.

Of course, due to the buried nature of most archeological manifestations, it is always possible that cultural deposits could be encountered during the course of the project, especially in the field to the northeast. If that occurs, especially in deeply buried context, the remains should be left in place and the state archeologist contacted immediately so that the appropriate mitigative measures can be carried out as soon as possible.

Randall M. Thies  
Archeology Department  
Kansas State Historical Society  
October 8, 1984

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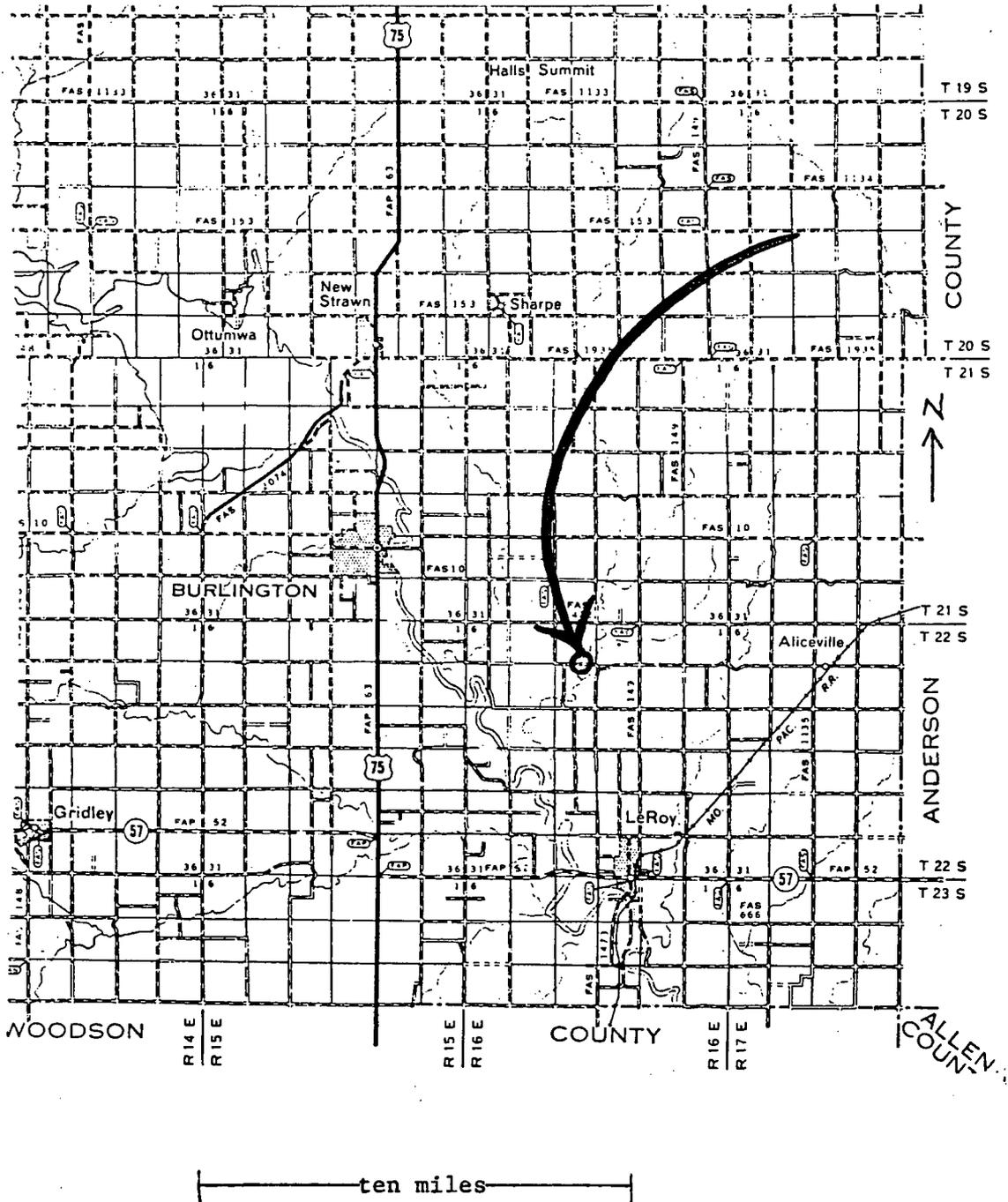


FIGURE 1. Section of Coffey County highway map, showing the location of secondary road project 16-C-2019-01, as indicated by circle and arrow.

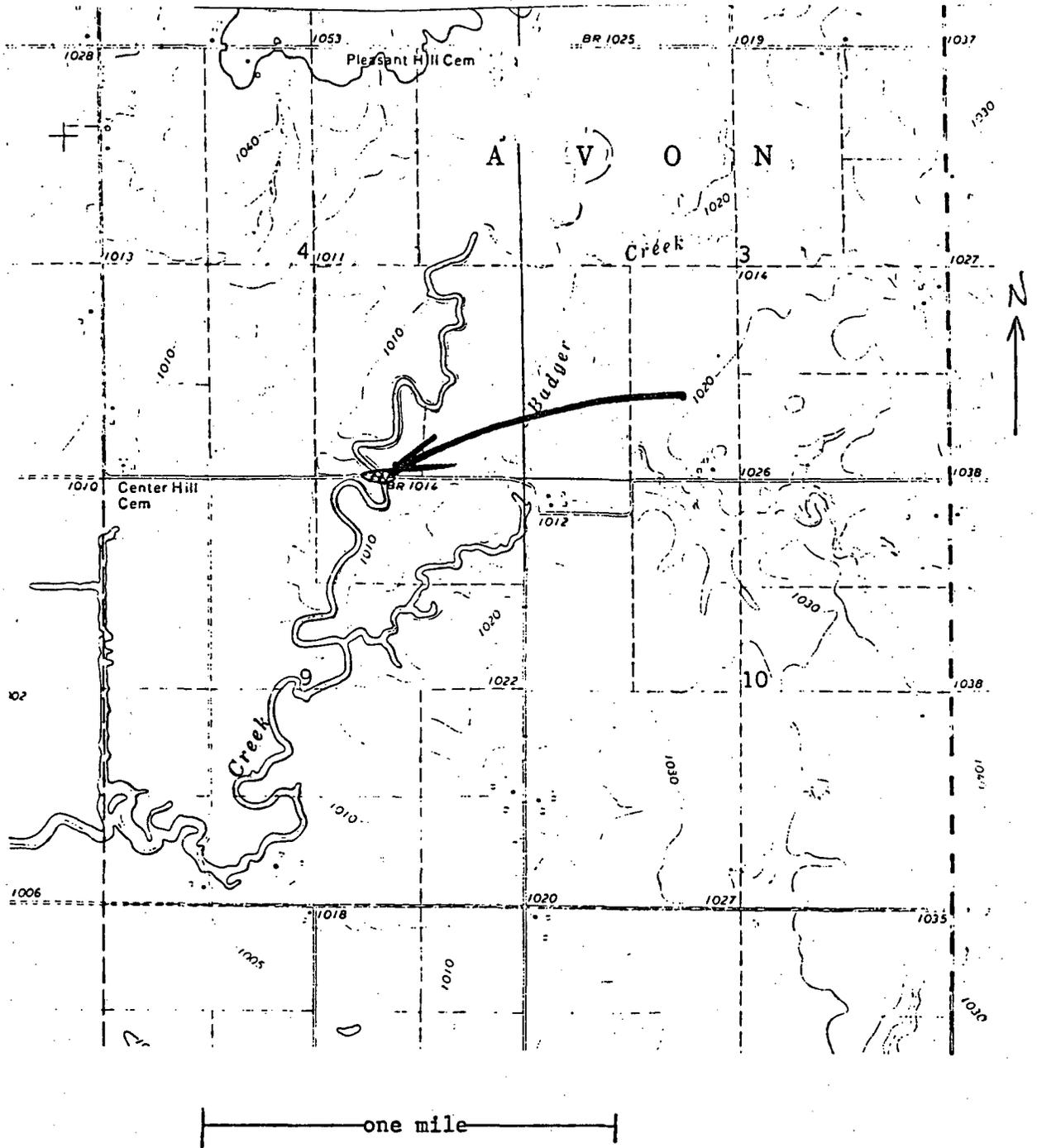


FIGURE 2. Section of U.S.G.S. topographic map (Burlington quadrangle), showing the location and general extent of the project, as indicated by cross-hatching and arrow.

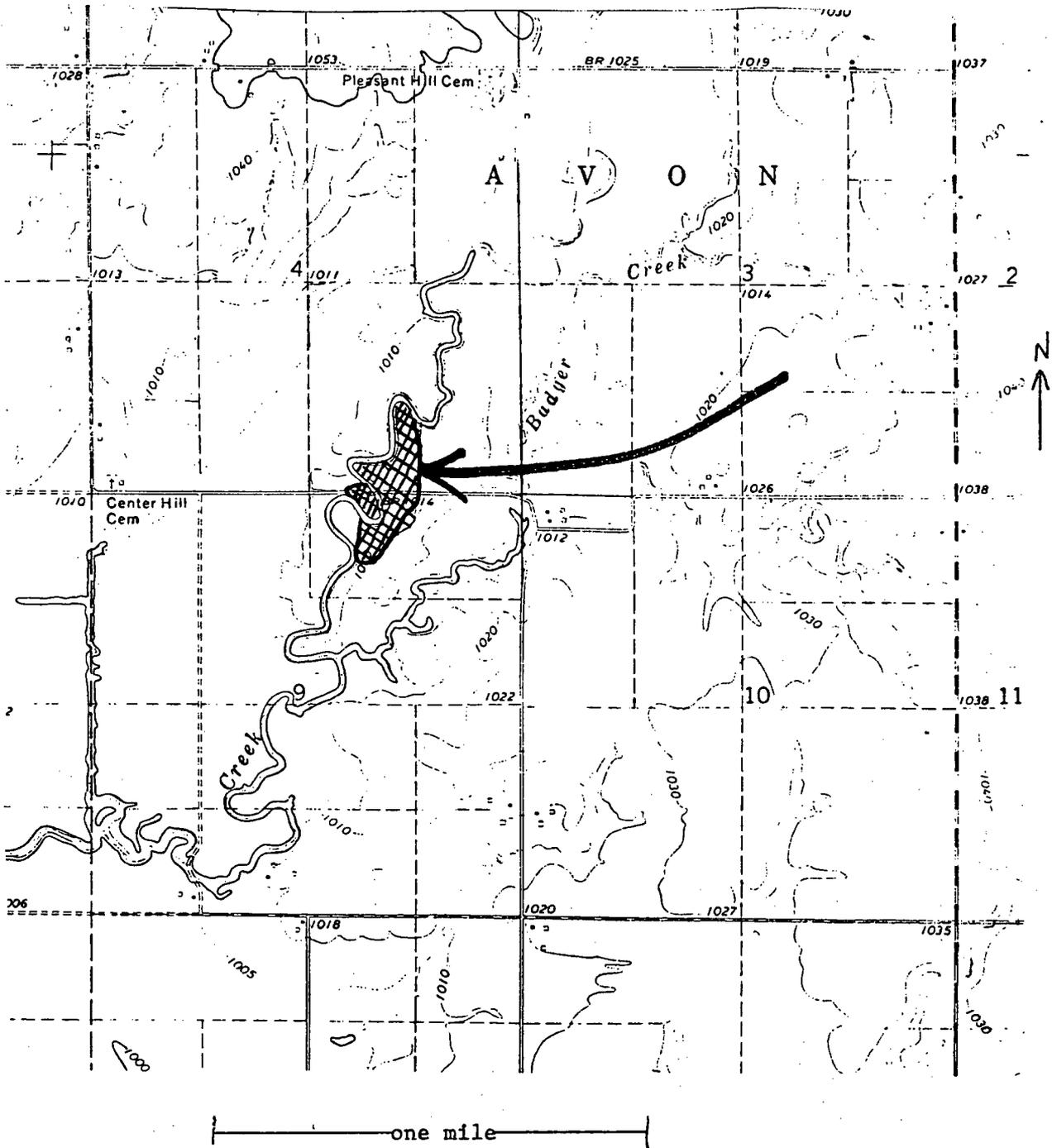


FIGURE 3. Section of U.S.G.S. topographic map (Burlington quadrangle), showing the location and general extent of the areas subjected to pedestrian inspection during the Phase II survey, as indicated by cross-hatching and arrow.

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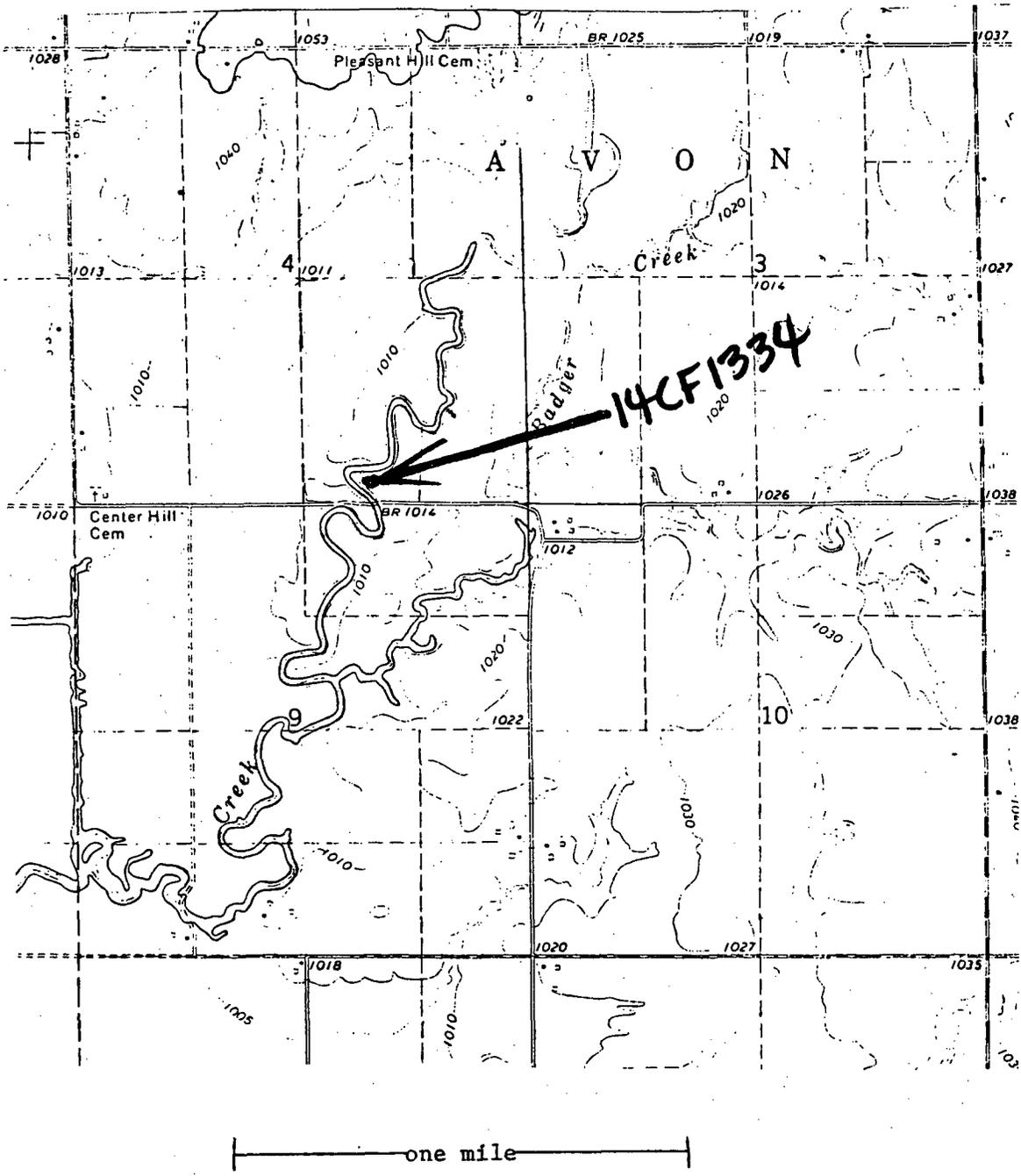
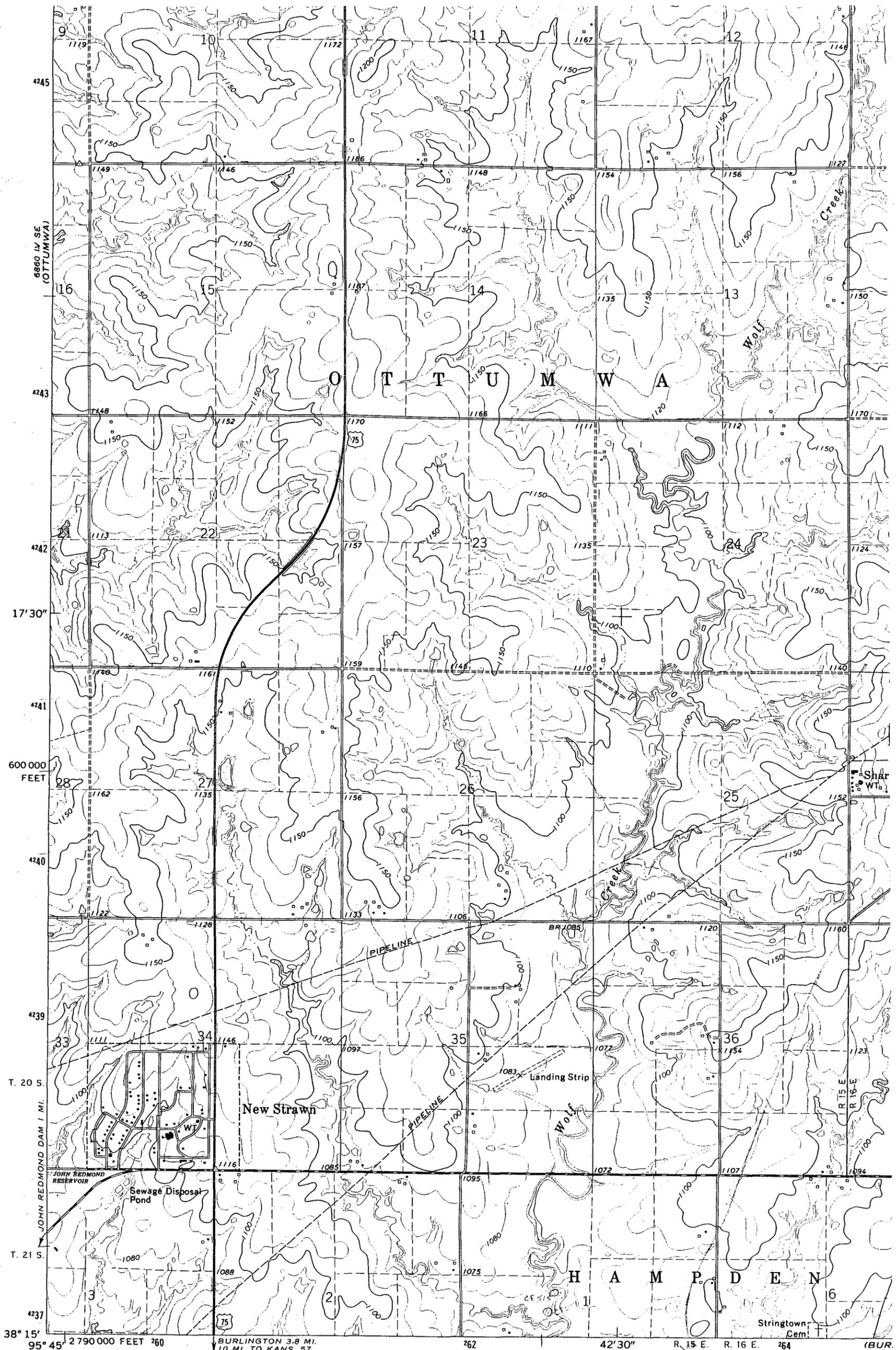


FIGURE 4. Section of U.S.G.S. topographic map (Burlington quadrangle), showing the location of archeological site 14CF1334, as indicated by cross-hatching and arrow.

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T21 R15  
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(JOHN REDMOND DAM)  
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Mapped, edited, and published by the Geological Survey  
in cooperation with State of Kansas agencies

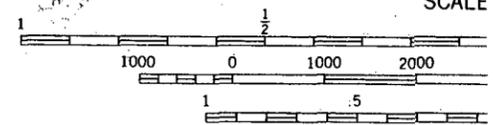
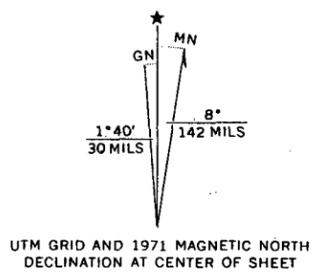
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1000-meter Universal Transverse Mercator grid ticks,  
zone 15, shown in blue

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is subject to controlled inundation

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generally visible on aerial photographs. This information is unchecked



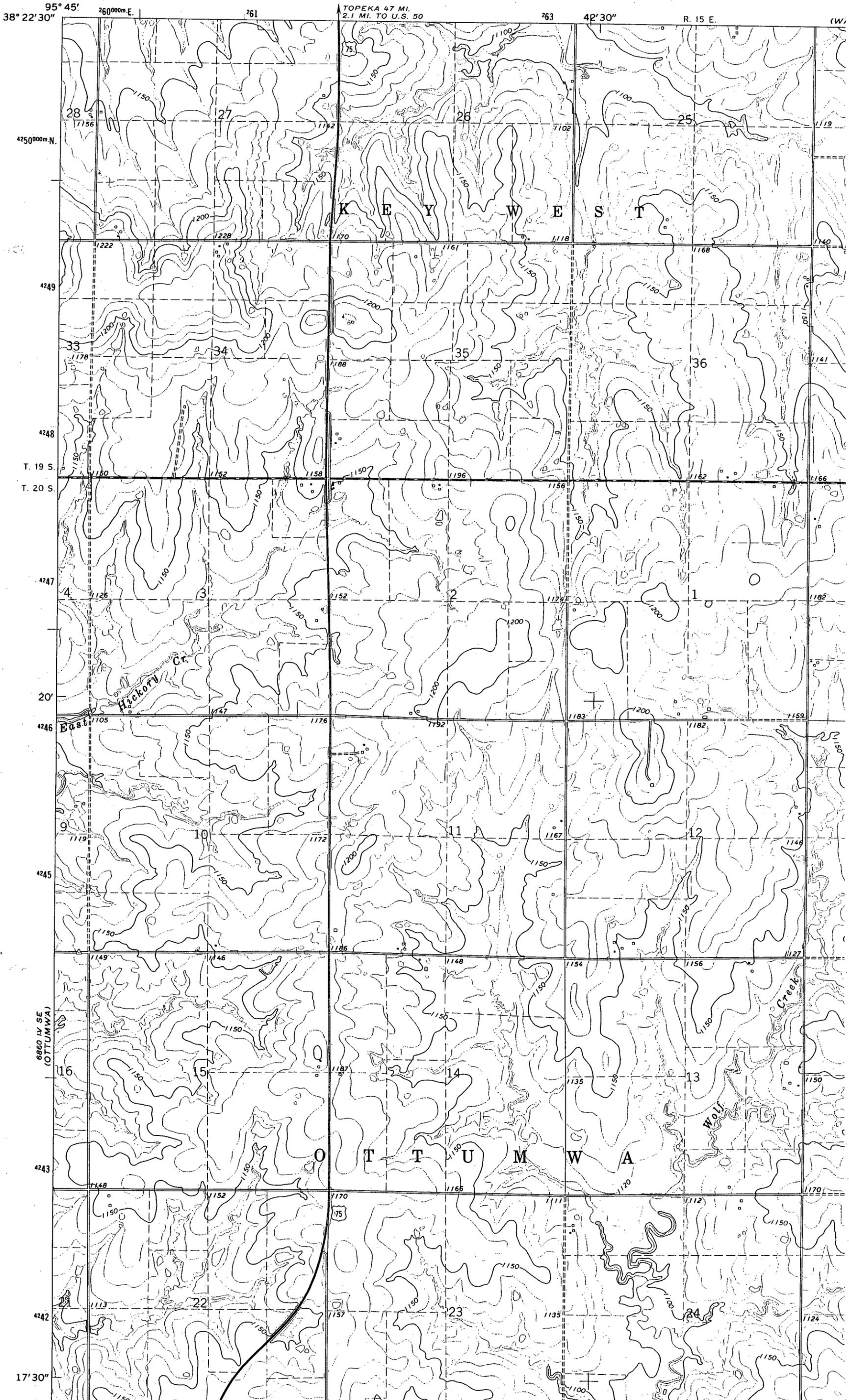
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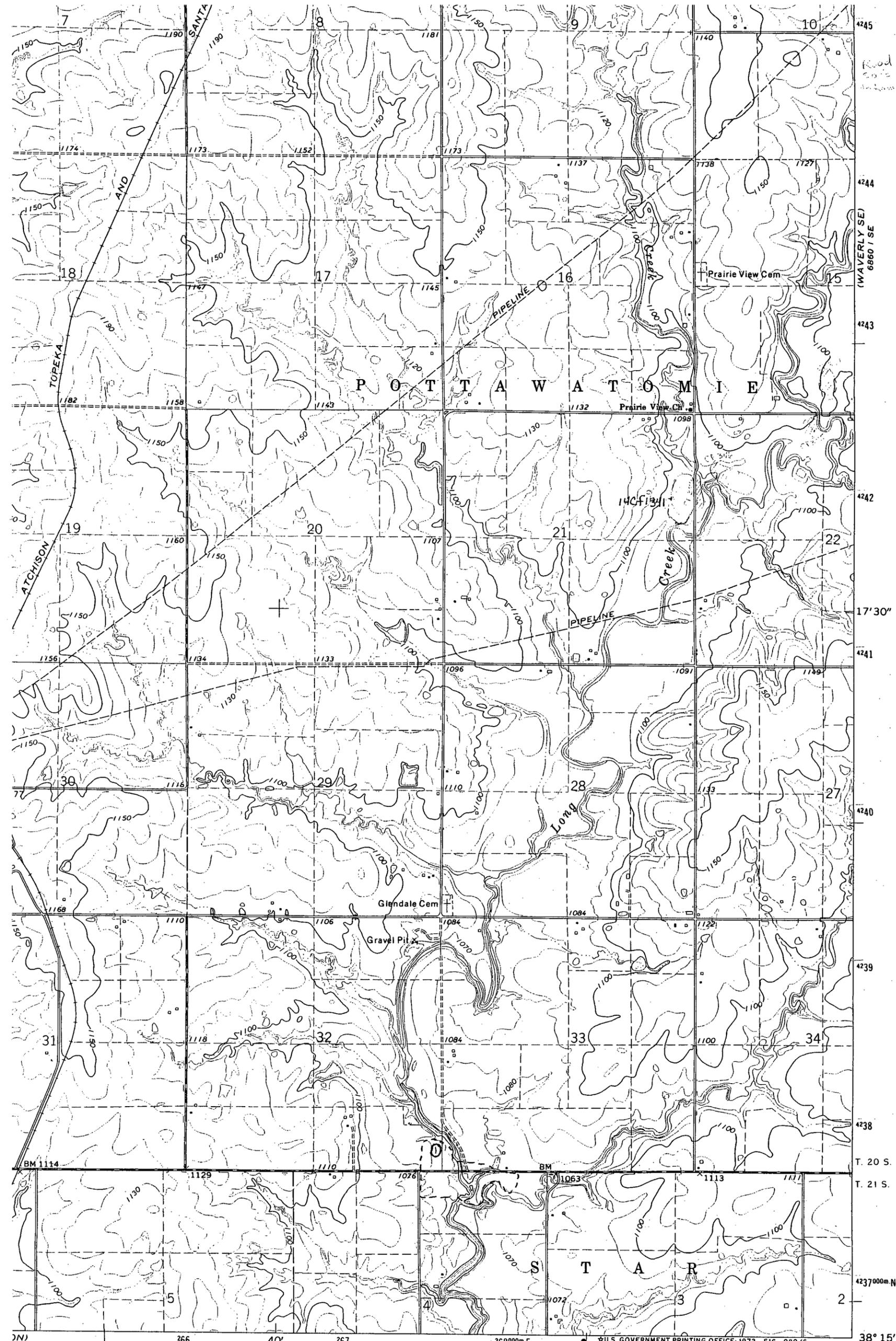
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Road from  
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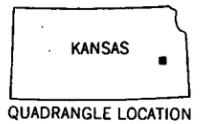
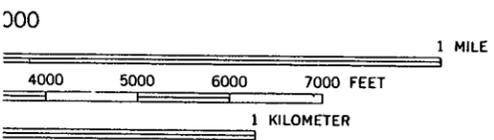
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ROAD CLASSIFICATION

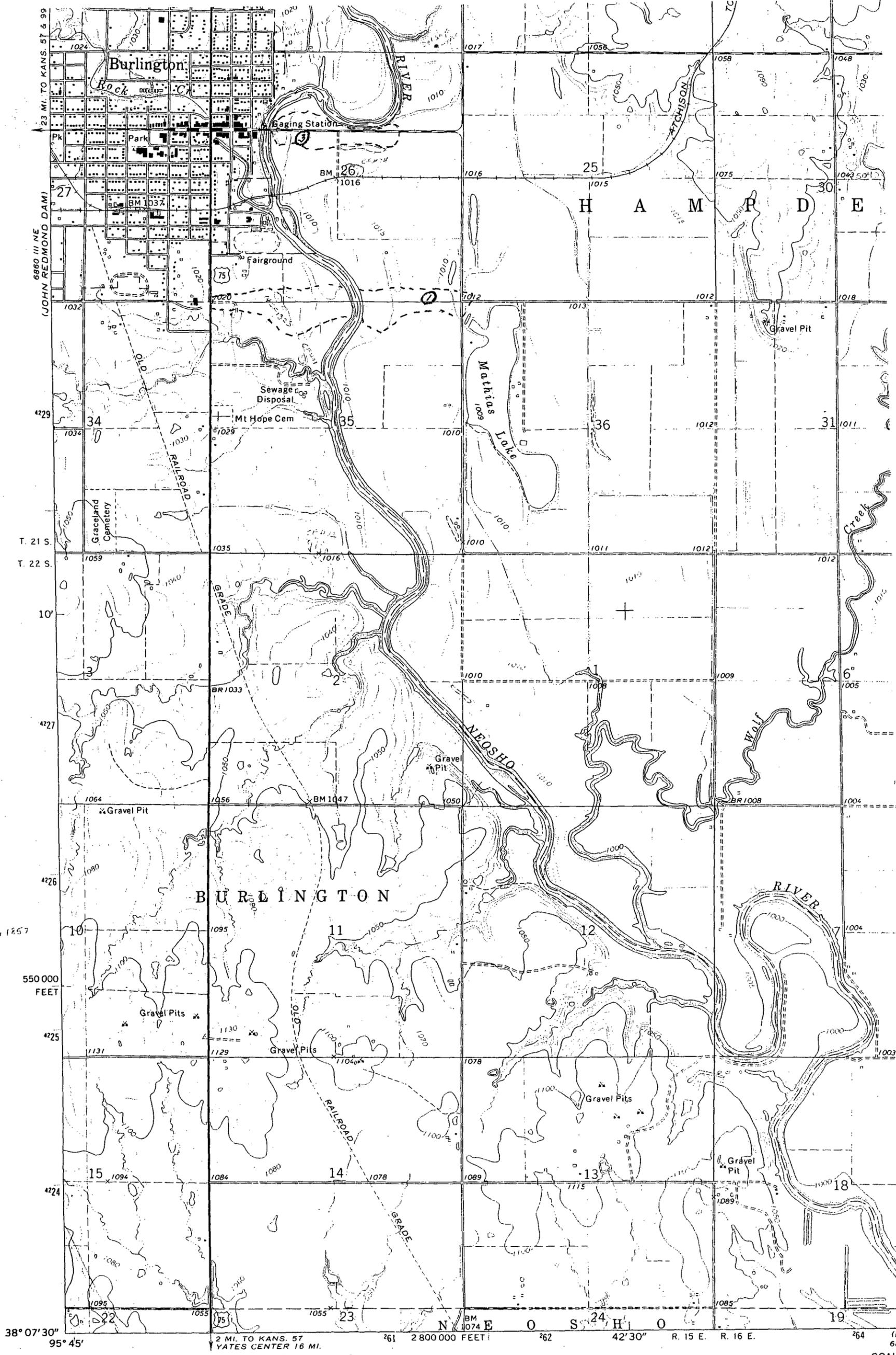
- Primary highway, hard surface
- Secondary highway, hard surface
- Light-duty road, hard or improved surface
- Unimproved road
- Interstate Route
- U. S. Route
- State Route

MAP ACCURACY STANDARDS  
ORADO 80225, OR WASHINGTON, D. C. 20242  
EY, LAWRENCE, KANSAS 66044  
SYMBOLS IS AVAILABLE ON REQUEST

NEW STRAWN, KANS.  
N3815-W9537.5/7.5

1971  
AMS 6860 1 SW-SERIES V878

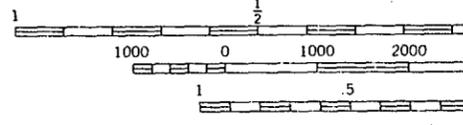
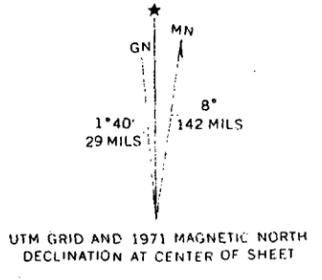
**A16**



T22 R15  
secs 1-24  
GLO map Mar 1957

(GRIDLEY SE)  
6860 III SE

Mapped, edited, and published by the Geological Survey  
in cooperation with State of Kansas agencies  
Control by USGS and USC&GS  
Topography by photogrammetric methods from aerial  
photographs taken 1969. Field checked 1971  
Polyconic projection. 1927 North American datum  
10,000-foot grid based on Kansas coordinate system, south zone  
1000-meter Universal Transverse Mercator grid ticks,  
zone 15, shown in blue  
Fine red dashed lines indicate selected fence and field lines where  
generally visible on aerial photographs. This information is unchecked

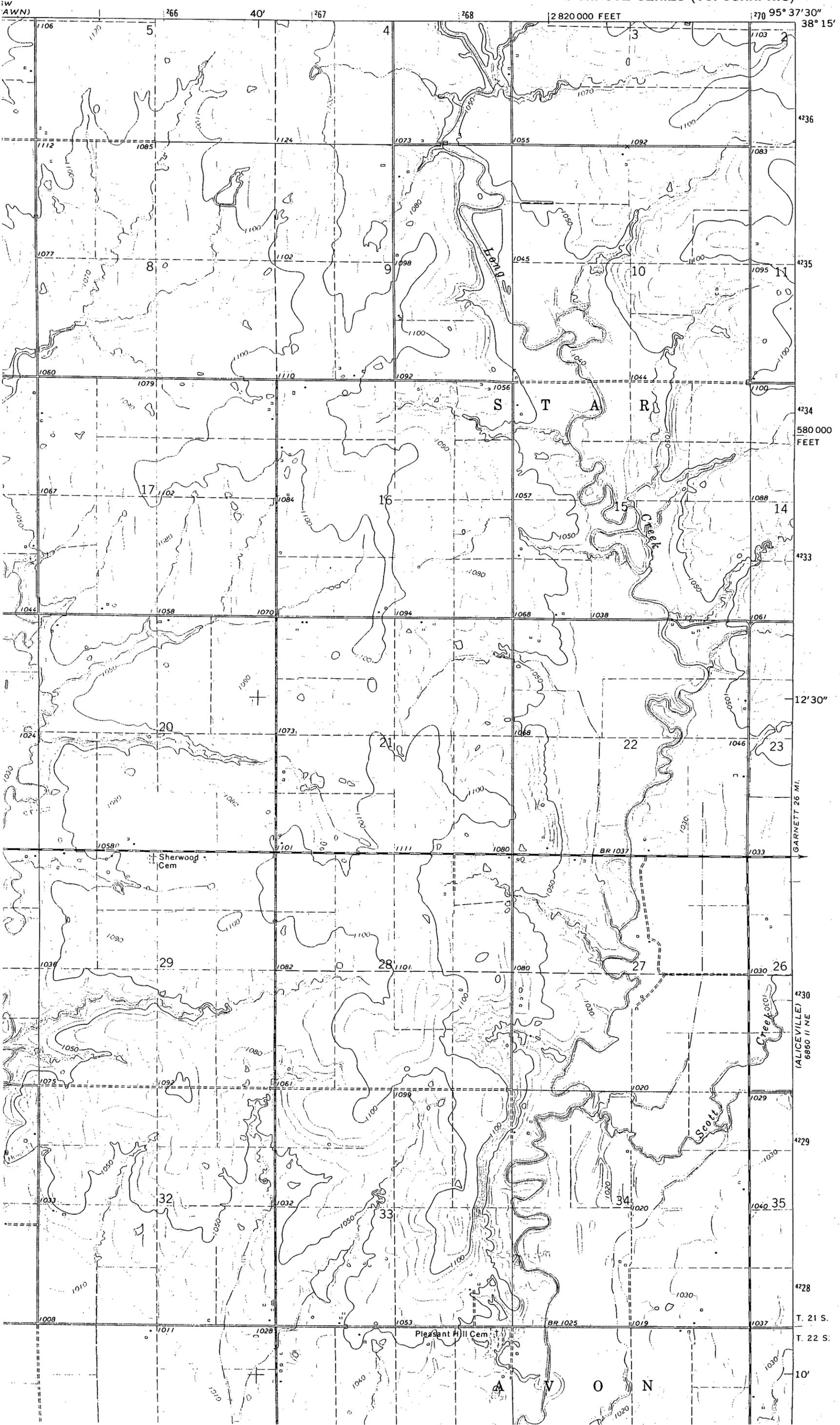


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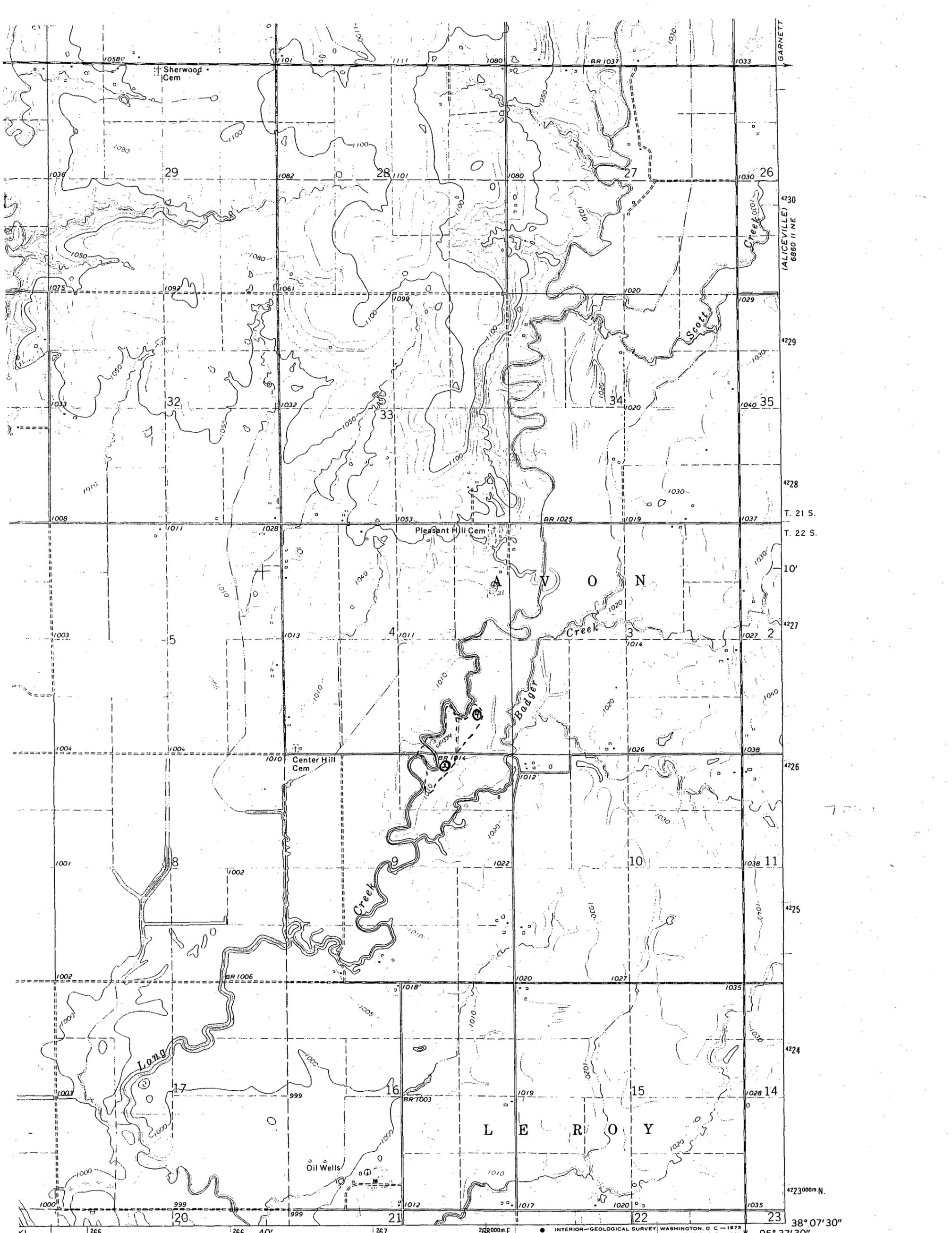


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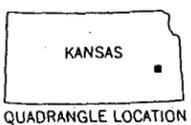
(ALICEVILLE)  
6860 11 NE

T. 21 S.  
T. 22 S.

10'



4 000  
1 MILE  
4000 5000 6000 7000 FEET  
1 KILOMETER  
1/4" = 10 FEET  
5-FOOT CONTOURS  
SEA LEVEL



**ROAD CLASSIFICATION**  
 Primary highway, hard surface \_\_\_\_\_  
 Secondary highway, hard surface \_\_\_\_\_  
 Light-duty road, hard or improved surface \_\_\_\_\_  
 Unimproved road \_\_\_\_\_  
 Interstate Route (thick dashed line)  
 U. S. Route (dashed line)  
 State Route (thin solid line)

L MAP ACCURACY STANDARDS  
 COLORADO 80225, OR WASHINGTON, D. C. 20242  
 DEWEY, LAWRENCE, KANSAS 66044  
 ADDITIONAL INFORMATION IS AVAILABLE ON REQUEST

**BURLINGTON, KANS.**  
 N3807.5—W9537.5/7.5

1971

AMS 6860 II NW—SERIES V878

(NEOSHO FALLS)  
 6860 II SE

**A17**

Section V

ONSITE GROUNDWATER MONITORING

Basis

The onsite groundwater monitoring sample results are being reported in the Radioactive Effluent Release Report per guidance received in association with the Nuclear Energy Institute (NEI) Groundwater Protection Industry Initiative.

Program Description

In March of 2006, Wolf Creek Generating Station (WCGS) established an onsite groundwater monitoring program. This program was implemented via procedure AI 07-007, *Onsite Groundwater Monitoring Program*. The onsite groundwater samples were collected by the WCGS Environmental Management group and were analyzed by Environmental, Inc., Midwest Laboratory. The vendor lab participated in an interlaboratory comparison program. Onsite groundwater samples were analyzed by gamma isotopic analysis, radiochemical analysis for I-131 and tritium analysis. Quarterly grab samples were obtained from three wells: ESW-W-NE, ESW-W-NW and AUX. During 2006, three other locations were sampled once: ESW-E-NW, LSP and OW-002. The following tables describe the sample locations, the program required lower limits of detection and the reporting levels for radioactivity detected.

Sample Location	Sample Location Description
ESW-W-NE	Essential Service Water Dewatering Well, West Group, Northeast, located south of the reactor
ESW-W-NW	Essential Service Water Dewatering Well, West Group, Northwest, located south of the reactor
AUX	Dewatering Well located near the Auxiliary Building, on West Side
ESW-E-NW	Essential Service Water Dewatering Well, East Group, Northwest, located southeast of the reactor
LSP	Lime Sludge Pond, located northeast of the reactor
OW-002	Oily Waste Outfall 002, located south of the reactor

Onsite Groundwater Lower Limits of Detection

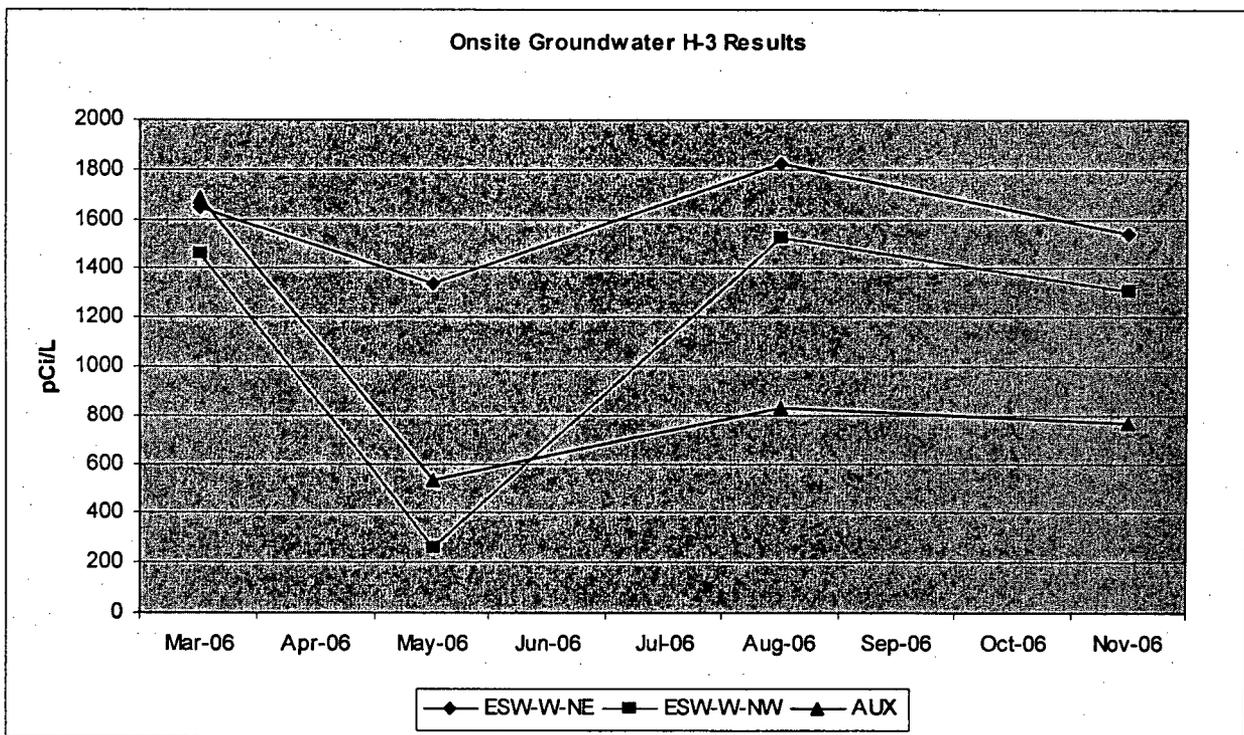
Analysis	(pCi/l)	Analysis	(pCi/l)
H-3	2,000	Zr-Nb-95	15
Mn-54	15	I-131	1
Co-58	15	Cs-134	15
Fe-59	30	Cs-137	18
Co-60	15	Ba-La-140	15
Zn-65	30		

## Reporting Levels for Radioactivity Detected in Onsite Groundwater

Analysis	(pCi/l)	Analysis	(pCi/l)
H-3	20,000	Zr-Nb-95	400
Mn-54	1,000	I-131	2
Co-58	1,000	Cs-134	30
Fe-59	400	Cs-137	50
Co-60	300	Ba-La-140	200
Zn-65	300		

### Discussion of Results

As expected, low levels of tritium were detected in all of the onsite groundwater samples. The location with the highest level of tritium detected was OW-002 (2,280 +/- 152 pCi/L). The measured level is significantly lower than the tritium levels routinely detected in surface water collected from Coffey County Lake (2006 range was 8,624 to 14,267 pCi/L). The location with the lowest level of tritium detected was location ESW-E-NW (197 +/- 87 pCi/L). The tritium activity was the only activity detected in the onsite groundwater samples. Required lower limits of detection were met. The individual sample results follow.



**A18**

A18



AI 07-007

ONSITE GROUNDWATER MONITORING PROGRAM

Responsible Manager

MANAGER REGULATORY AFFAIRS

Revision Number	2
Use Category	Reference
Administrative Controls Procedure	No
Management Oversight Evolution	No
Program Number	07

DC38 11/17/2006

Revision: 2	ONSITE GROUNDWATER MONITORING PROGRAM	AI 07-007
Reference Use		Page 1 of 11

TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE</u>
1.0	PURPOSE	2
2.0	SCOPE	2
3.0	REFERENCES AND COMMITMENTS	2
4.0	DEFINITIONS	3
5.0	RESPONSIBILITIES	3
6.0	PROCEDURE	4
7.0	RECORDS	10
8.0	FORMS	10
<b>ATTACHMENT A</b>	<b>ONSITE GROUNDWATER MONITORING LOCATION MAP</b>	<b>11</b>

Revision: 2	ONSITE GROUNDWATER MONITORING PROGRAM	AI 07-007
Reference Use		Page 2 of 11

**1.0 PURPOSE**

1.1 To provide instructions for the implementation of the Onsite Groundwater Monitoring Program.

**2.0 SCOPE**

2.1 This procedure is applicable to Environmental Management personnel responsible for onsite groundwater monitoring.

**3.0 REFERENCES AND COMMITMENTS**

**3.1 References**

- 3.1.1 OE21833, OFFSITE RELEASES OF TRITIUM AT BRAIDWOOD STATION
- 3.1.2 GROUNDWATER MONITORING GUIDANCE FOR NUCLEAR POWER PLANTS, EPRI REPORT 1011730, DATED SEPTEMBER 2005
- 3.1.3 PIR 20053036, RECOMMEND GROUNDWATER SAMPLING IN THE OWNER-CONTROLLED AREA
- 3.1.4 AP 28A-001, PERFORMANCE IMPROVEMENT REQUEST (PIR)
- 3.1.5 Work Request 6205-91, Temporary Dewatering Wells
- 3.1.6 06-00288, Nuclear Energy Institute (NEI) Industry Initiative on Groundwater Protection
- 3.1.7 06-00331, NEI Groundwater Protection Initiative Interim Guidance Documents
- 3.1.8 06-00332, NEI Groundwater Protection - Additional Interim Reporting Protocol Guidance
- 3.1.9 AP 07B-004, OFFSITE DOSE CALCULATION MANUAL (RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM)
- 3.1.10 AP 28A-100, PIR CONDITIONS IN PILOT

**3.2 Commitments**

- 3.2.1 None

Revision: 2	ONSITE GROUNDWATER MONITORING PROGRAM	AI 07-007
Reference Use		Page 3 of 11

#### 4.0 DEFINITIONS

##### 4.1 Informal (Reference Step 3.1.7)

4.1.1 Is intended to mean a communication between the station and the State/Local officials. It is not intended to mean a "notification" that would require a 4-hour 10 CFR 50.72 notification to the NRC. The NRC has been asked to clarify this issue and will contact NEI prior to July 31, 2006. However, this guidance does not take the place of any existing State requirements or regulations. If a station makes a "formal" communication to a State because of a regulatory requirement, then a 4-hour 10 CFR 50.72 NRC notification needs to be considered.

##### 4.2 Significant (Reference Step 3.1.7)

4.2.1 As used in the Industry Initiative is intended to be defined in part as what is of interest to the public. It is not intended to imply or refer back to regulatory terminology nor is it intended to indicate that the leak or spill has public health and safety or environmental protection consequences.

#### 5.0 RESPONSIBILITIES

##### 5.1 Supervisor Regulatory Support

5.1.1 Is responsible for the implementation of the Onsite Groundwater Monitoring Program.

##### 5.2 Environmental Management

5.2.1 Ensures the quarterly collection, preparation and shipment of onsite groundwater samples for radiological analysis.

5.2.2 Ensures that the onsite groundwater sample analysis results are reviewed.

Revision: 2	ONSITE GROUNDWATER MONITORING PROGRAM	AI 07-007
Reference Use		Page 4 of 11

## 6.0 PROCEDURE

### 6.1 General Information

- 6.1.1 Before a sample is taken, rinse the sample container three times with the sample water to remove any debris.
- 6.1.2 Approximately one gallon of water is collected at each location.
- 6.1.3 Label the one gallon polyethylene bottle with the following:
1. Onsite Groundwater
  2. Sample Location
  3. Date
  4. WCNOG
- 6.1.4 AIF 07-007-01, WCNOG ONSITE GROUNDWATER SAMPLE SHIPPING FORM is to accompany samples submitted to the vendor laboratory. The following information is provided for its completion:
1. Sample Description
    - a. Onsite Groundwater
  2. Sample Type
    - a. GW
  3. Parameters
    - a. Gamma Spec, I-131 & Tritium
- 6.1.5 The preparer signs and dates the AIF 07-007-01, WCNOG ONSITE GROUNDWATER SAMPLE SHIPPING FORM.
- 6.1.6 Place the AIF 07-007-01, WCNOG ONSITE GROUNDWATER SAMPLE SHIPPING FORM in a plastic bag and ensure it is shipped with the samples. To avoid displacement, packing material may be used.
- 6.1.7 Samples should be sent to the vendor laboratory via an express service, i.e., Federal Express.
- 6.1.8 The sender ensures the samples were delivered to the vendor laboratory by using the tracking mechanism at [www.fedex.com](http://www.fedex.com) or other means.

Revision: 2	ONSITE GROUNDWATER MONITORING PROGRAM	AI 07-007
Reference Use		Page 5 of 11

6.1.9 The sender ensures the Onsite Groundwater Monitoring Log located on K:\ENVIRON\Groundwater Monitoring - Onsite is updated accordingly.

6.2 Onsite Groundwater Samples

6.2.1 Onsite groundwater sample locations are (see ATTACHMENT A for Map):

1. ESW-W-NE (Sample location selected based upon information contained in Reference Step 3.1.5)
2. ESW-W-NW (Sample location selected based upon information contained in Reference Step 3.1.5)
3. AUX (Sample location selected based upon its close proximity to the plant.)

6.2.2 Remove the wellhead cover, if necessary.

6.2.3 Lower the weighted collection bottle down the well until it comes in contact with the groundwater.

6.2.4 Withdraw the collection bottle and dump contents on the ground. Repeat step two additional times.

6.2.5 Using collected water from the third sample, triple-rinse the sample bottle.

**NOTE**

**It will take several tries to collect a gallon of groundwater from the well to fill the sample bottle.**

6.2.6 Fill the sample bottle with water from the collection sample bottle and secure the lid.

6.2.7 Ship the collected onsite groundwater samples to a vendor laboratory. See the necessary and required information to ship the onsite groundwater sample bottle(s) off-site under Step 6.1.

6.3 Evaluation of Onsite Groundwater Analysis

6.3.1 Laboratory reports should be received within 30 days of sample receipt by the vendor laboratory.

6.3.2 Onsite Groundwater Monitoring Results are tracked in a file located at K:\ENVIRON\Groundwater Monitoring - Onsite.

Revision: 2	ONSITE GROUNDWATER MONITORING PROGRAM	AI 07-007
Reference Use		Page 6 of 11

6.3.3 Groundwater sample analysis results received from the vendor laboratory shall be reviewed. The elements of the review can be documented on the analysis reports and may include the following:

1. Correctness of sample identification.
2. Comparison for acceptability against established Lower Limits of Detection (LLDs) listed in Step 6.4.2.
3. Radioactivity concentrations compared to the investigation levels listed in Step 6.4.7.
4. Results are consistent when compared to similar samples or samples previously taken.

6.3.4 IF Reporting Levels are exceeded, THEN notify the Supervisor Regulatory Support, or designee.

1. Follow the guidance established in section 6.5 for reporting and communication requirements.
2. Initiate a corrective action document per AP 28A-100, PIR CONDITIONS IN PILOT.

6.3.5 IF LLDs are not met, THEN contact the vendor laboratory to resolve LLDs not being met AND initiate a corrective action document per AP 28A-100, PIR CONDITIONS IN PILOT.

6.3.6 IF an isotope is detected for the first time, THEN request the vendor laboratory to re-analyze the sample for verification purposes.

6.3.7 Periodic trending should be conducted on analysis results.

6.3.8 The Onsite Groundwater Monitoring Log located on K:\ENVIRON\Groundwater Monitoring - Onsite should be periodically reviewed to ensure that results are received in a timely manner.

#### 6.4 Groundwater Monitoring Protocols

6.4.1 This section contains the protocols for the Onsite Groundwater Monitoring Program.

6.4.2 Groundwater Lower Limits of Detection (LLD) (Reference Step 3.1.9)

Analysis	(pCi/l)	Analysis	(pCi/l)
H-3	2,000	Zr-Nb-95	15
Mn-54	15	I-131	1
Co-58	15	Cs-134	15
Fe-59	30	Cs-137	18
Co-60	15	Ba-La-140	15
Zn-65	30		

6.4.3 This list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported.

6.4.4 The LLD is defined, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

6.4.5 For a particular measurement system:

$$LLD = \frac{4.66 s_b}{E \cdot V \cdot 2.22 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

Where:

- LLD = the "a priori" lower limit of detection (picoCuries per unit mass or volume),
- S<sub>b</sub> = the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (counts per minute),
- E = the counting efficiency (counts per disintegration),
- V = the sample size (units of mass or volume),
- 2.22 = the number of disintegrations per minute per picoCurie,
- Y = the fractional radiochemical yield, when applicable,
- λ = the radioactive decay constant for the particular radionuclide (sec<sup>-1</sup>), and

$\Delta t$  = the elapsed time between sample collection, or end of the sample collection period, and time of counting (sec).

Typical values of E, V, Y, and  $\Delta t$  should be used in the calculation.

6.4.6 It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable.

6.4.7 Reporting Levels for Radioactivity Detected in Onsite Groundwater (Reference Step 3.1.9)

Analysis	(pCi/l)	Analysis	(pCi/l)
H-3	20,000	Zr-Nb-95	400
Mn-54	1,000	I-131	2
Co-58	1,000	Cs-134	30
Fe-59	400	Cs-137	50
Co-60	300	Ba-La-140	200
Zn-65	300		

## 6.5 NEI Industry Initiative on Groundwater Protection

6.5.1 Document all onsite groundwater sample results and a description of any significant onsite leaks/spills into groundwater for each calendar year in the Radioactive Effluent Release Report for the RETS as contained in the appropriate Site level reporting procedure, beginning with the report covering the calendar year 2006.

6.5.2 Submit a written 30-day report to the NRC for any water sample result for onsite groundwater that is or may be used as a source of drinking water that exceeds the step 6.4.7 criteria. Copies of the written 30-day report will also be provided to the appropriate State/Local officials.

Revision: 2	ONSITE GROUNDWATER MONITORING PROGRAM	AI 07-007
Reference Use		Page 9 of 11

1. A written 30-day NRC report is required for all sample results that exceed the step 6.4.7 criterion and could potentially reach the groundwater that is or could be in the future used as a source of drinking water.
2. If the groundwater is not currently used for drinking water but is potable, each station should consider the groundwater as a potential source of drinking water.
3. The initial discovery of groundwater contamination greater than the step 6.4.7 criterion is the event documented in a written 30-day report.
4. It is not expected that a written 30-day report will be generated each time a subsequent sample(s) from the same "plume" identifies concentrations greater than the step 6.4.7 criterion.
5. For conditions that existed prior to July 31, 2006, it is not necessary to generate a 30-day report if the condition has been reported previously and communicated to State/Local officials.
6. All written 30-day NRC reports generated by step 6.5.2 are to be concurrently forwarded to the designated State/Local officials.

6.5.3 Make informal (Reference Step 4.1) communication as soon as practicable to appropriate State/Local officials, with follow-up notification to the NRC, as appropriate, regarding significant (Reference Step 4.2) onsite leaks/spills into groundwater and onsite water sample results exceeding the criteria in step 6.4.7.

1. This guidance provides a maximum threshold for reporting. Some States may require lower reporting thresholds. Also, as described in step 6.5.2-1, the criteria apply to groundwater that is used for drinking water or could be used for drinking water.
  - a. Communication to the designated State/Local officials will be made before the end of the next business day if an inadvertent unmonitored leak or spill to the environment has or can potentially get into the groundwater and exceeds any of the following criterion:
    - 1) If a spill or leak from a radiologically contaminated source exceeds 100 gallons; or

Revision: 2	ONSITE GROUNDWATER MONITORING PROGRAM	AI 07-007
Reference Use		Page 10 of 11

2) If a spill or leak volume cannot be quantified.

b. All leaks, regardless of volume or activity from a higher risk system or component (e.g. spent fuel pool or outdoor refueling water storage tank) and can potentially get into groundwater will be communicated to the appropriate State/Local officials before the end of the next business day.

c. Communication with the designated State/Local officials will be made before the end of the next business day for water sample results if:

1) A water sample from an onsite groundwater monitoring well or surface water that is hydrologically connected to groundwater exceeds the reporting criterion for water in the REMP/ODCM.

d. When communicating to the State/Local officials, be clear and precise on quantifying the actual release information as it applies to the appropriate regulatory criteria (i.e. put it in perspective).

## 7.0 RECORDS

7.1 The following QA records are generated by this procedure:

7.1.1 AIF 07-007-01, WCNOC ONSITE GROUNDWATER SAMPLE SHIPPING FORM

7.1.2 Onsite groundwater monitoring laboratory reports

## 8.0 FORMS

8.1 AIF 07-007-01, WCNOC ONSITE GROUNDWATER SAMPLE SHIPPING FORM

**A19** - 22

<u>Supplied</u>	<u>DocId</u>	<u>Sufficient</u>	<u>Action</u>
Wolf Creek Environmental Report Volume I-IV	Yes	Yes	None

- Some sections missing in report supplied in meeting room. We need sections 2.4-2.5 especially

<u>Supplied</u>	<u>DocId</u>	<u>Sufficient</u>	<u>Action</u>
WCGS Unit I Environmental Report Operating License Stage (OLS) Volume 1 and 2	Yes	Yes	None

<u>Supplied</u>	<u>DocId</u>	<u>Sufficient</u>	<u>Action</u>
WCGS <del>OR</del> Unit 1 Final Env. Statement NUREG-75/096 October - 1975	Yes - if not already in ADAMS	Yes	None

<u>Supplied</u>	<u>DocId</u>	<u>Sufficient</u>	<u>Action</u>
WCGS Unit 1 Final Env. Statement NUREG - 0878 June 1982	Yes - if not already in ADAMS	Yes	None

**A23**

IMAGED 10/03/2005



05-00473

A23

# KANSAS

RODERICK L. BREMBY, SECRETARY

KATHLEEN SEBELIUS, GOVERNOR

DEPARTMENT OF HEALTH AND ENVIRONMENT

September 8, 2005

Source ID No. 0310021

Robert Hammond  
P.O. Box 411, CC-EM  
Wolf Creek Nuclear Operating Corporation  
Burlington, Kansas 66839

RE: Class II Air Emission Source Operating Permit

Dear Mr. Hammond:

Enclosed is the Class II Air Emission Source Operating Permit and sample inspection form for the Wolf Creek Nuclear Operating Corporation. The inspection form is enclosed for information purposes only and is not to be completed and returned to KDHE.

**Please review the permit carefully since it obligates the Wolf Creek Nuclear Operating Corporation to certain requirements.**

As provided for in K.S.A. 65-3008b(e), an owner or operator may request a hearing within 15 days after affirmation, modification or reversal of a permit decision pursuant to subsection (b) of K.S.A. 65-3008a. In the Request for Hearing, the owner or operator shall specify the provision of this act or rule and regulation allegedly violated, the facts constituting the alleged violation and secretary's intended action. Such request must be submitted to Mr. Mark S. Braun, Director, Office of Administrative Hearings, 1020 S. Kansas Avenue, Topeka, Kansas 66612-1327. Failure to submit a timely request shall result in a waiver of the right to hearing.

Include source ID number listed above in all communications with the KDHE regarding this facility.

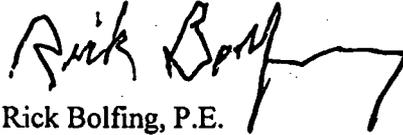
DIVISION OF ENVIRONMENT  
Bureau of Air & Radiation  
Air Construction/Operating Permits & Compliance Section  
CURTIS STATE OFFICE BUILDING, 1000 SW JACKSON ST., STE 310, TOPEKA, KS 66612-1366  
Voice 785-296-1570 Fax 785-291-3953 <http://www.kdhe.state.ks.us>

10/03/2005 10:01 AM

Page 2  
Mr. Robert Hammond  
September 8, 2005

If you have any questions regarding this permit, please contact me at (785) 296-1576.

Sincerely,



Rick Bolfig, P.E.  
Environmental Engineer  
Air Construction/Operating Permits & Compliance Section

RJB:saw  
Enclosure  
c: SEDO  
O-6098

IMAGED  
10/03/2005



# K A N S A S

RODERICK L. BREMBY, SECRETARY

KATHLEEN SEBELIUS, GOVERNOR

## DEPARTMENT OF HEALTH AND ENVIRONMENT

### AIR EMISSION SOURCE CLASS II OPERATING PERMIT

**Source ID No.:** 0310021

**Effective Date:** September 8, 2005

**Expiration Date:** Valid until modified, revoked, or otherwise determined invalid.

**Source Name:** Wolf Creek Nuclear Operating Corporation

**SIC:** 4911, Electric Services

**NAICS:** 221113, Nuclear electric power generation

**Source Location:** 1550 Oxen Lane, N. E.  
Burlington, Kansas 66839

**Mailing Address:** P. O. Box 411, CC-EM  
Burlington, Kansas 66839

**Contact Person:** Robert Hammond  
Telephone No. (620) 364-4059

**This permit is issued pursuant to K.S.A. 65-3008 as amended.**

#### **Description of Activity Subject to Air Pollution Control Regulations**

Wolf Creek Nuclear Operating Corporation operates an auxiliary boiler, an emergency fire pump, and a series of engine/generator sets used to produce electricity during emergency conditions only. Temporary<sup>1</sup> boilers and internal combustion engines are operated at the facility on an "as needed" basis.

<sup>1</sup> Temporary means, in relation to the emissions from a source, that the emissions will not occur at a particular location for a period of more than two years unless a longer time is approved by the secretary or an authorized representative of the secretary.

IMAGED  
10/03/2005

**Permit Intent**

The purpose of this permit is to limit potential-to-emit to below major source thresholds in accordance with K.A.R. 28-19-540. For this facility, emissions of nitrogen oxides (NO<sub>x</sub>) and sulfur dioxide (SO<sub>2</sub>) were evaluated in determining the potential-to-emit. This permit includes restrictions that will limit the potential-to-emit of these pollutants to below major source thresholds.

Conditions of all previous air permits not in conflict with this permit and all relevant, applicable regulations remain in effect.

**This permit supercedes the Class II Operating Permit with the effective date of May 20, 1998.**

**Air Emission Estimates From the Facility**

Pollutants	Potential to Emit <sup>2</sup> (tons per year)
	Post Permit
Nitrogen Oxides (NO <sub>x</sub> )	<99
Sulfur Dioxide (SO <sub>2</sub> )	<99

**Permit Limitations Requirements**

**For the duration of this permit:**

**For the term of this permit, the following limitations supersede the Permit Conditions set out by the Air Emission Permit dated December 13, 1984.**

1. Operating hours of the reciprocating engines are limited such that the following inequality is satisfied:

<sup>2</sup> Potential-to-emit means the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is federally enforceable.



IMAGED  
10/03/2005

**Reporting Requirements**

**For the term of this permit, this reporting supersedes the quarterly reporting required as a condition of the Air Emission Permit issued December 13, 1984.**

1. In accordance with K.A.R. 28-19-546(a), the owner or operator shall submit all operating or relevant information to estimate actual air emissions for the source for the preceding calendar year to KDHE. This information shall be submitted on forms provided or approved by KDHE. If forms and instructions have not been received 30 days prior to the date specified under K.A.R. 28-19-546(a), the owner or operator should contact KDHE.
2. In accordance with K.A.R. 28-19-501(c), if at the end of any calendar quarter, the total combined hours of operation of all engines is such that Permit Limitation Item No.1 exceeds 79 tons of NO<sub>x</sub> for the preceding 12-month period or the combined fuel consumption for all boilers exceed 510,000 gallons of diesel fuel for the preceding 12-month period, the owner or operator shall report the exceedance to the department for that period of time. This report shall be submitted to KDHE within 45 days of the last day of the month following the conclusion of the calendar quarter.
3. If, at any time, the facility's actual operations exceed the operational limitations of this permit, the owner or operator shall:
  - a. notify KDHE in writing of any operational exceedance. This notification shall be mailed or delivered the first working day following discovery of the exceedance.
  - b. submit to KDHE a compliance plan stating those actions being taken by the owner or operator to assure future compliance with the operational limitations. This plan shall be submitted within 60 days of discovering the exceedance. This plan will clearly state if an application for a Class II permit modification or if an application for a Class I operating permit will be submitted. Any such application will be filed within 180 days of discovering the exceedance.
4. Within ten (10) working days of installing a temporary boiler or engine that doesn't otherwise require a construction permit or approval as specified in K.A.R. 28-19-300, the owner or operator is required to notify the department in writing.

Submitting any or all of these reports does not shield the owner or operator from enforcement action for exceeding the permit limitations or for other violations of the Kansas Air Quality Act or Regulations.

HEAVEN  
HONOR  
WOMEN  
UNION

### **Permit Modification**

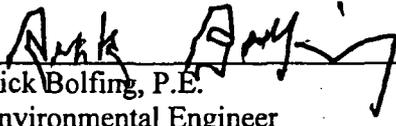
1. The owner or operator must submit a complete application for modification of this permit if there is any increase of the potential-to-emit (PTE) for the pollutants limited in this permit or if there is an increase in PTE for any regulated pollutant above the major source threshold. This application for modification must be submitted within 180 days of the initial startup of the modification.
2. A construction permit or approval must be issued by KDHE prior to commencing any construction or modification of equipment or processes which results in potential emission increases equal to or greater than the thresholds specified in K.A.R. 28-19-300.

### **General Provisions**

1. Upon presentation of credentials and other documents as may be required by law, representatives of KDHE (including authorized contractors of the KDHE) shall be allowed by the permittee to:
  - a. enter upon the premises where a regulated facility or activity is located or conducted or where records must be kept under conditions of this document;
  - b. have access to and copies of, at reasonable times, any records that must be kept under conditions of this document;
  - c. inspect at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this document; and
  - d. sample or monitor, at reasonable times, for the purposes of assuring compliance with this document or as otherwise authorized by the Secretary of the KDHE, any substances or parameters at any location.
2. The emission unit or stationary source which is the subject of this document shall be operated in compliance with all applicable requirements of the Kansas Air Quality Act and the Federal Clean Air Act, and all applicable regulations promulgated under the Kansas Air Quality Act and the Federal Clean Air Act.
3. This document is subject to periodic review and amending as deemed necessary to fulfill the intent and purpose of the Kansas Air Quality Statutes and the Kansas Air Quality Regulations.
4. This document does not relieve the permittee of the obligation to obtain other approvals, permits, licenses, or documents of sanction which may be required by other federal, state, or local government agencies.

IMAGED  
10/03/2005

**Permit Engineer**

  
\_\_\_\_\_  
Rick Bolfin, P.E.

9-8-5  
\_\_\_\_\_  
Date

Environmental Engineer  
Air Construction/Operating Permits & Compliance Section

RJB:saw  
c: SEDO  
O-6098

1010302005

### Permit Addendum

The following equipment was evaluated to calculate the potential to emit for the facility:

1. One Colt Pielstick Model PC2.5V, rated 8600 HP at 514 rpm, driving a 6201 kW generator (Unit "A"; plant complex, east unit). The engine burns diesel.
2. One Colt Pielstick Model PC2.5V, rated 8600 HP at 514 rpm, driving a 6201 kW generator (Unit "B"; plant complex, west unit). The engine burns diesel.
3. One Detroit Diesel Model 8V-71T, rated 350 HP at 2100 rpm, driving a fire pump (Unit "C"; screen house). The engine burns diesel.
4. One Cummins Model NTA-855-G engine, rated 425 HP at 1800 rpm, driving a 250 kW generator (Unit "D"; security building). The engine burns diesel.
5. One Cummins Model KTA-1150-GS1 engine, rated 565 HP at 1800 rpm, driving a 365 kW generator (Unit "E"; education center/offsite). The engine burns diesel.
6. One Cummins Model NTA-855-GS engine, rated 355 HP at 1800 rpm, driving a 175 kW generator (Unit "F"; technical support center). The engine burns diesel.
7. One Cummins Model 6CTA8.3-G engine, rated 252 HP at 1800 rpm, driving a 150 kW generator (Unit "G"; switchyard). The engine burns diesel.
8. One 25 kW Generac engine/generator set (Unit "K"; near meteorological tower site). The engine burns propane.
9. One ABB-CE Model 18-A-13 boiler, rated 122,728,700 Btu/hour. The boiler burns diesel.

IMAGED 10/03/2005

# Kansas Department of Health and Environment

## Air Pollution Source Inspection

Source ID Number	Source Type	Applicable Regulations
0310021	Class II, SIP	28-19-650(a), 28-19-31(b), 28-19-540

**Company Name:** Wolf Creek Nuclear Operating Corporation

Source Location	City	State	Zip	Phone
1550 Oxen Lane, N. E.	Burlington	KS	66839	(620) 364-4059

**Mailing Address:** P.O. Box 411, CC-EM

**Plant Contact:** Robert Hammond

Persons Interviewed	Inspection Level			Type of Inspection
	Name	Title	L1 L2 Other	
1)				AI RI EI Other
2)				
3)				Date of Inspection: / /

### Routine Questions:

- 1) Any modifications made since last inspection? \_\_\_\_\_ If yes, were they reported? \_\_\_\_\_
- 2) Any plan to modify the facility next year? \_\_\_\_\_
- 3) Any major malfunctions last year? \_\_\_\_\_  
If yes, were they reported within 10 days? \_\_\_\_\_
- 4) Does the facility have and follow regularly scheduled maintenance plan? \_\_\_\_\_
- 5) Has the production rate changed? \_\_\_\_\_

**Comments:**

**Inspector:** \_\_\_\_\_

This draft inspection form is provided for the benefit of the facility. DO NOT COMPLETE OR SUBMIT THIS FORM TO KDHE. Failure of this draft inspection form to include an applicable air quality regulation or air quality permit requirement does not waive the facility's responsibility to be aware of and comply with all applicable regulatory and permit requirements.

IMAGED 10/03/2005

Source ID Number: 0310021

Facility Name: Wolf Creek Nuclear Operating Corporation

### Air Pollution Source Inspection (Opacity)

Item No.	Source Description & Emission Control	Operating Conditions	Applicable Regulations	Opacity Limit	Opacity Observation
1	Auxiliary Boiler ABB-CE Model 18-A-13, rated 122.73 MMBtu/hr diesel fuel		28-19-31(b)	20%	
2	Stand-by Generator Engine Unit A (1979) Colt Pielstick Model PC2.5V, rated 8600 hp diesel fuel; Generator: 6201 kW: Plant complex/east unit		28-19-650(a)(3)	20%	
3	Stand-by Generator Engine Unit B (1979) Colt Pielstick Model PC2.5V, rated 8600 hp diesel fuel; Generator: 6201 kW: Plant complex/east unit		28-19-650(a)(3)	20%	
4	Emergency Fire Pump Engine Unit C (1978) Detroit Diesel Model 8V-71T, rated 350 hp diesel fuel: Screen house		28-19-650(a)(3)	20%	
5	Stand-by Generator Engine Unit D (1981) Cummins Model NTA-855-G, rated 425 hp diesel fuel; Generator: 250 kW: Security Building		28-19-650(a)(3)	20%	
6	Stand-by Generator Engine Unit E (1982) Cummins Model KTA-1150-GS1, rated 565 hp diesel fuel; Generator: 365 kW: Education center/offsite		28-19-650(a)(3)	20%	
7	Stand-by Generator Engine Unit F (1981) Cummins Model NTA-855-GS, rated 355 hp diesel fuel; Generator: 175 kW: Technical support center		28-19-650(a)(3)	20%	
8	Stand-by Generator Engine Unit G (1998) Cummins Model 6CTA8.3-G, rated 252 hp diesel fuel; Generator: 150 kW: Switchyard		28-19-650(a)(3)	20%	
9	Stand-by Generator Engine Unit K (1998) Generac Model propane fuel; Generator: 25 kW: Meteorological tower site		28-19-650(a)(3)	20%	

IMAGE  
10/03/2005

**OPERATING LIMITATIONS**

YES

NO

Does the facility limit the operating hours of the reciprocating engines such that the following inequality is satisfied:  $A(.09519 \text{ tons/hr}) + B(.09519 \text{ tons/hr}) + C(.013292 \text{ tons/hr}) + D(.005438 \text{ tons/hr}) + E(.008458 \text{ tons/hr}) + F(.00574 \text{ tons/hr}) + G(.0031 \text{ tons/hr}) + H * J(7.6 \times 10^{-6} \text{ tons/hp-hr.}) + I * J(9.25 \times 10^{-6} \text{ tons/hp-hr.}) + K(.00028 \text{ tons/hr}) \leq 93 \text{ tons NOx produced in each consecutive 12 month period? (Class II Operating Permit dated 08/??/05, K.A.R. 28-19-540))$

\_\_\_\_\_

- H represents temporary engines  $\leq 100$  hp
- I represents temporary engines  $> 100$  hp
- J represents horsepower rating of a temporary engine

Does the facility limit the combined fuel consumption of all boilers to 600,000 gallons or less in each consecutive 12 month period? (Class II Operating Permit dated 08/??/05, K.A.R. 28-19-540)

\_\_\_\_\_

**RECORDKEEPING**

YES

NO

N/A

Does the owner or operator keep records demonstrating the operating hours of each reciprocating engine? (Class II Operating Permit dated 08/??/05, K.A.R. 28-19-501(c))

Does the owner or operator keep records demonstrating combined fuel consumption for all boilers? (Class II Operating Permit dated 08/??/05, K.A.R. 28-19-501(c))

Are all records updated monthly, no later than the last day of the month following the month to which the records relate? (Class II Operating Permit dated 08/??/05, K.A.R. 28-19-501(c))

\_\_\_\_\_

IMAGED  
10/03/2005

Source ID Number: 0310021

Facility Name: Wolf Creek Nuclear Operating Corporation

**REPORTING**

YES

NO

N/A

Are all records kept on-site for a minimum of two (2) years from the date of record? (Class II Operating Permit dated 08/??/05)

\_\_\_\_\_

Has the operating hours of the reciprocating engines caused NOx emissions to exceed 79 tons in any four consecutive quarters? (Class II Operating Permit dated 08/??/05, K.A.R. 28-19-501(c)(1)) OR

\_\_\_\_\_

Has the combined fuel consumption in all boilers exceeded 510,000 gallons of diesel oil in any four consecutive quarters? (Class II Operating Permit dated 08/??/05, K.A.R. 28-19-501(c)(1))

\_\_\_\_\_

If yes to EITHER of the above questions, did the owner or operator report the actual operating hours or gallons of diesel fuel used? (Class II Operating Permit dated 08/??/05, K.A.R. 28-19-501(c)(1))

\_\_\_\_\_

If yes to EITHER, was the report submitted to KDHE within 45 days of the last day of the month following the conclusion of the calendar quarter? (Class II Operating Permit dated 08/??/05, K.A.R. 28-19-501(c)(1))

\_\_\_\_\_

Has the facility exceeded EITHER of its operational limitations in any consecutive 12 month period?

\_\_\_\_\_

If yes, did the owner or operator report to KDHE by the first working day following discovery of the exceedence? (Class II Operating Permit dated 08/??/05, K.A.R. 28-19-501(c)(2)(A))

\_\_\_\_\_

Have there been any temporary units brought into the facility since the last inspection which would not otherwise require a permit application or modification? (Class II Operating Permit dated 08/??/05)

\_\_\_\_\_

If yes, did the owner or operator submit a written notification within 10 working days of installation? (Class II Operating Permit dated

\_\_\_\_\_



5000/30/0101

## Air Permitting Survey Form

Please return within 30 days to:

**Brie Wilkins**

KDHE Bureau of Air and Radiation

1000 SW Jackson, Ste. 310 Topeka, KS 66612

Phone: (785) 296-6422 or Fax: (785) 291-3953

Facility (Optional):						
Source Id Number (Optional):						
Contact Person (Optional):						
1.	Thoroughness of the final permit.	<input type="checkbox"/> Poor	<input type="checkbox"/> Below Average	<input type="checkbox"/> Average	<input type="checkbox"/> Above Average	<input type="checkbox"/> Excellent
2.	Was your air permit application handled timely?	<input type="checkbox"/> Poor	<input type="checkbox"/> Below Average	<input type="checkbox"/> Average	<input type="checkbox"/> Above Average	<input type="checkbox"/> Excellent
3.	Permit writer discussed and explained conditions of final permit.	<input type="checkbox"/> Poor	<input type="checkbox"/> Below Average	<input checked="" type="checkbox"/> Average	<input type="checkbox"/> Above Average	<input type="checkbox"/> Excellent
4.	Knowledge level of permit writer.	<input type="checkbox"/> Poor	<input type="checkbox"/> Below Average	<input type="checkbox"/> Average	<input checked="" type="checkbox"/> Above Average	<input checked="" type="checkbox"/> Excellent
5.	Permit writer provided responses to questions asked timely.	<input type="checkbox"/> Poor	<input type="checkbox"/> Below Average	<input type="checkbox"/> Average	<input checked="" type="checkbox"/> Above Average	<input type="checkbox"/> Excellent
6.	If you were not satisfied with your permit, what suggestions do you have that would serve you better in the future?					
7.	Did permit writer conduct a site visit?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No			
8.	Comments (use additional pages if necessary)					