SECTION 3.0
AFFECTED ENVIRONMENT

3.0 AFFECTED ENVIRONMENT

This section of the EA describes the existing conditions of the natural and human resources that could potentially be affected by the proposed alternatives and provides a baseline for assessing environmental impacts. Where feasible, resources are described on a site-specific level (*e.g.*, land use, wildlife habitats, etc.). No direct or indirect impacts from the land conveyance are anticipated to geological resources (mineral rights and therefore oil and gas exploration would not be affected by the land conveyance), except potential indirect impacts to soils. Therefore geological resources are not described further. However, soils for the Candy Lake project area are described below. No unique or sensitive areas are located in the vicinity of the project area therefore they would not be discussed further.

3.1 LAND USE

The project area is located in Osage County, Oklahoma, south of the city of Bartlesville in northeastern Oklahoma. Osage County is the largest county in size in the state of Oklahoma and comprises 1,476,480 acres. The dominant land uses in Osage County are ranching and oil production with some limited agriculture.

The Candy Lake project area is primarily undeveloped. The entire project area is used as a WMA. Although there are no grazing leases for the Candy Lake area, some cattle grazing was observed during field surveys in a portion of the project area, suggesting that downed fences or a lack of infrastructure allows some limited illegal grazing to occur. There are existing and historic oil and gas wells and related infrastructure throughout the project area. Gravel and dirt roads, used for public and oil and gas access, are present within the project area. The surrounding areas are primarily rural with cattle grazing being the primary local land use.

3.1.1 Zoning

The entire project area is zoned Agricultural. This zoning level does not place any building restrictions or limits on future subdivisions of land. However, any future land use changes would require approval from the Osage County Planning and Zoning Department.

3.1.2 Recreation

Recreation opportunities within the Candy Lake project area include hunting, fishing, and wildlife viewing. The Bureau of Sport Fisheries and Wildlife, in a letter dated March 31, 1970 states that wildlife habitat in the area, including some of the Bird Creek floodplain, is suitable for sustaining huntable populations of whitetail deer (*Odocoileus virginainus*), squirrels (*Sciurus* sp.), eastern cottontail (*Sylvilagus floridanus*), mourning dove (*Zenaida macroura*), and northern bobwhite (*Colinus virginianus*). As of 1986, the Bureau estimated that the combined areas of Candy Creek and the floodplain of Bird Creek provide about 1,700 annual man-days of big-game hunting. Upland game hunting in this same area amounts to about 2,000 man-days annually. Sport hunting for other wildlife, primarily foxes, and raccoons, amounts to about 400 days annually and about 400 fur-animals pelts are taken on these lands. Washington County and Osage County together produced 5,653 whitetail deer in 2002 (ODWC 2004). Waterfowl hunting is insignificant. Candy Creek is a minor fishery resource for the area because it is intermittent and has limited access. In 1970, the quality of fish habitat was reported as extremely low and of insignificant value for fishing. Poor access to the area and the lack of infrastructure limits wildlife viewing, camping and hiking opportunities.

3.2 SOILS AND PRIME FARMLAND

The majority of the project area is overlain by nearly level to steep upland soils that have a very fine sandy loam surface layer and a silty clay subsoil (United States Department of Agriculture [USDA] 1979). Common soil series found in the project area are the Apperson, Barnsdall, Bates, Carytown, Cleora, Coweta, Darnell, Dennis, Foraker, Lightning, Niotaze, Norge, Osage, Parsons, Pawhuska, Prue, Shidler, Steedman, Stephenville, Verdigris, Wolco, and Wynona (Figure 3-1). The names of three of the soil series have changed since the original soil survey was classified in 1975 to bring about more consistency between adjoining counties (Ward and McWright 2004). The Cleora series has been renamed to the current Pocasset series, Dennis to Agra, and Mason to Braham. The Verdigris, Mason, Niotaze, Shidler, and Steedman series make up 75% or 2,864 acres of the total 3,658 acres within the project area. A summary of soil types within the project area is presented in Table 3-1. More detailed descriptions are presented in the following paragraphs.

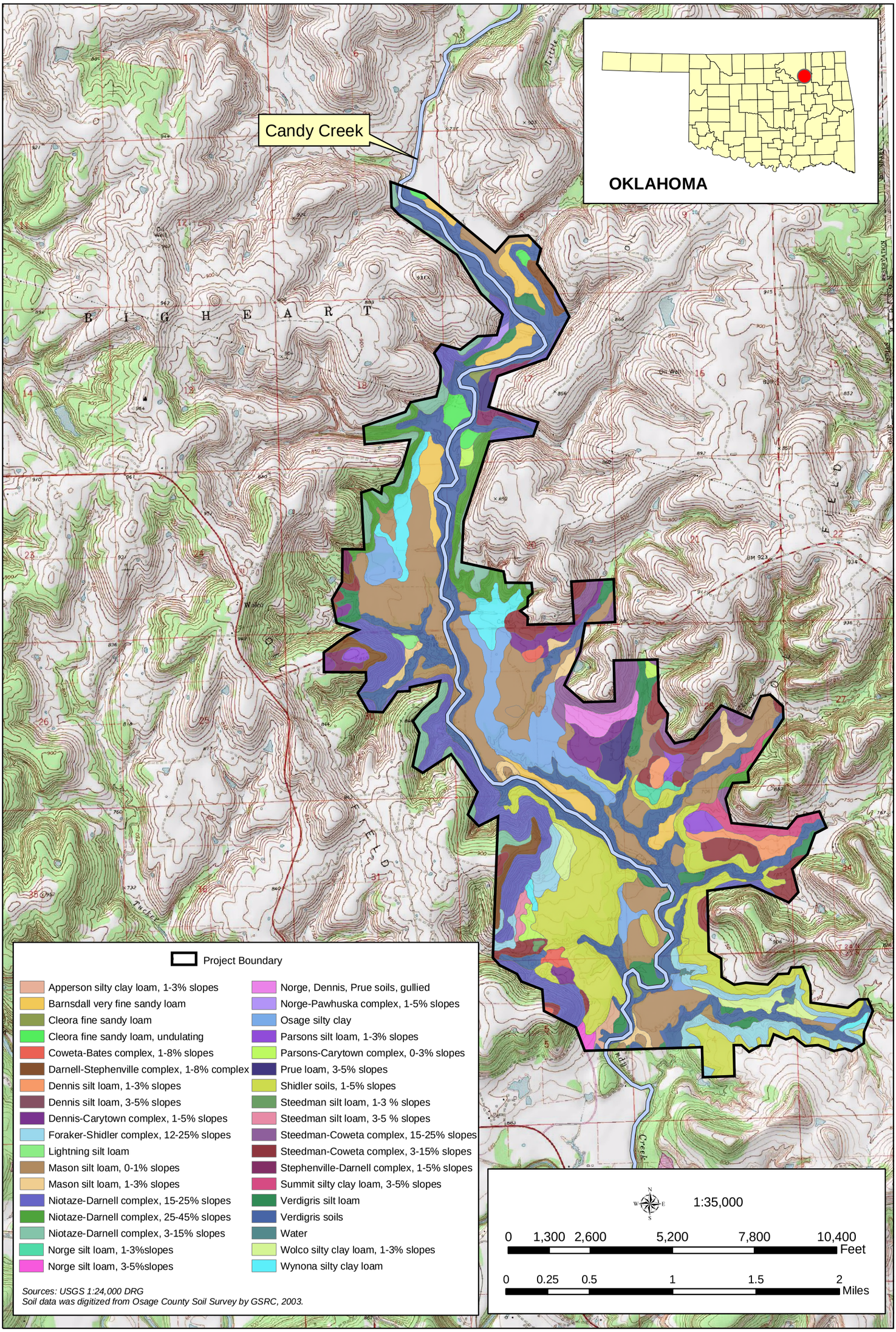

Figure 3-1: Soil Survey Classifications for the Candy Lake Project Area

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Table 3-1. Osage County, Oklahoma Soil Survey Descriptions For the Candy Lake Project Area

Soil	Percent Slope	USDA Texture
Apperson silty clay loam	1 to 3	Silty clay loam
Barnsdall very fine sandy loam	N/A	Very fine sandy loam to clay loam
Cleora fine sandy loam	N/A	Fine sandy loam to loamy fine sand
Cleora fine sandy loam, undulating	N/A	Fine sandy loam to loamy fine sand
Coweta-Bates complex	1 to 8	Loam to sandy clay loam
Darnell-Stephenville complex	1 to 8	Fine sandy loam to sandy clay loam
Dennis silt loam	1 to 3	Silt loam to silty clay loam
Dennis silt loam	3 to 5	Silt loam to silty clay loam
Dennis-Carytown complex	1 to 5	Silt loam to silty clay
Foraker-Shidler complex	12 to 25	Silty clay loam to shaly silty clay
Lightning silt loam	N/A	Silt loam to silty clay
Mason silt loam	0 to 1	Silt loam to silty clay loam
Mason silt loam	1 to 3	Silt loam to silty clay loam
Niotaze-Darnell complex	15 to 25	Fine sandy loam to silty clay
Niotaze-Darnell complex	25 to 45	Fine sandy loam to silty clay
Niotaze-Darnell complex	3 to 15	Fine sandy loam to silty clay
Norge silt loam	1 to 3	Silt loam to silty clay loam
Norge silt loam	3 to 5	Silt loam to silty clay loam
Norge, Dennis, Prue soils	gullied	Silt loam to silty clay
Norge-Pawhuska complex	1 to 5	Silt loam to silty clay loam
Osage silty clay	N/A	Silty clay
Parsons silt loam	1 to 3	Sily loam to silty clay
Parsons-Carytown complex	0 to 3	Silt loam to fine sandy loam
Prue loam	3 to 5	Loam to silty clay
Shidler soils	1 to 5	Silty clay loam
Steedman silt loam	1 to 3	Silt loam to silty clay
Steedman silt loam	3 to 5	Silt loam to silty clay
Steedman-Coweta complex	15 to 25	Silt loam to silty clay
Steedman-Coweta complex	3 to 15	Silt loam to silty clay
Stephenville-Darnell complex	1 to 5	Fine sandy loam to sandy loam
Summit silty clay loam	3 to 5	Silty clay loam to silty clay
Verdigris silt loam	N/A	Silt loam to silty clay
Verdigris soils	N/A	Silt loam to silty clay loam
Wolco silty clay loam	1 to 3	Silty clay loam to silty clay
Wynona silty clay loam	N/A	Silty clay

USDA 1979

The most common soil is the Verdigris series, which comprises 22% or 831 acres of the 3,658 acres of the project area. This soil series primarily occurs along Candy Creek, and its tributaries. This series consist of deep, nearly level through very gently sloping soils that are moderately well drained and have moderate permeability. These soils formed in loamy sediments under a cover of trees with an understory of grasses. Available water capacity is high. The Verdigris series is used mostly for tame pasture, range, or woodland. The main concerns of management are controlling flooding and maintaining fertility (USDA 1979).

The Mason series comprises 16% or 619 acres within the project area. Most of this soil series occur in the middle and southeastern portion of the project area. This series consist of deep, nearly level through very gently sloping soils that are moderately well drained and have moderately slow permeability. These soils formed in loamy sediments under a cover of trees with an understory of grasses. Available water capacity is high. The Mason series is used mostly for small grains, grain sorghum, corn, alfalfa, soybeans, tame pasture grasses, range grasses, and trees. Management is needed to maintain fertility and tilth (USDA 1979).

Approximately 14% or 530 acres within the project area consists of the Niotaze series. The Niotaze soils generally occur along the higher sloping outer edges of the project area. This series consist of moderately deep, gently sloping through steep soils that are somewhat poorly drained and have moderately slow permeability. These soils formed in material weathered from shales interbedded with thin layers of sandstone under a cover of trees with an understory of grasses. Available water capacity is medium. The Niotaze series is used mostly for range. The smoother, less stony areas are also suited for tame pastures and forests for firewood and posts. Management is needed to protect the soil from erosion and maintain fertility and tilth (USDA 1979).

The Shidler series encompasses 12% or 473 acres of the project area. All of the Shidler soils occur in the southern section of the project area. This series consist of very shallow, very gently sloping through gently sloping soils that are well drained and have moderate permeability. These soils formed in material weathered from limestone and thin layers of chert under a cover of grasses. Available water capacity is low. The Shidler series is used mostly for range. They are also suited for tame pasture grasses. The limestone contains in this series is mined for gravel, agricultural lime, and other uses. Management practices would include proper grazing and protection from fire (USDA 1979).

The Steedman series comprises 11% or 411 acres of the project area. These soils primarily occur on side slopes in the southern region alongside the Niotaze series. This series consist of moderately deep, very gently sloping through steep soils that are well drained to moderately well drained and have slow permeability. These soils formed in material weathered from shales interbedded with thin layers of sandstone under a cover of grasses. Available water capacity is medium. The Steedman series is used mostly for tame pasture and range. It is also suited for small grains and other crops. Management is needed to maintain tilth and fertility and to control erosion where this soil is used for cultivated crops (USDA 1979).

The remaining soil series (Apperson, Barnsdall, Bates, Carytown, Cleora, Coweta, Darnell, Dennis, Foraker, Lightning, Norge, Osage, Parsons, Pawhuska, Prue, Stephenville, Wolco, and Wynona) account for the other 25% or 1,027 acres of the project area. All of these soil series occur between the sloping Niotaze/Steedman series and the Verdigris series in the project area.

3.2.1 Prime and Unique Farmlands

According to 7 United States Code (U.S.C.) 4201(c)(1)(A), prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, labor, and without intolerable soil erosion. Unique farmland is defined as land, other than prime farmland, that is used for the production of specific high-value food and fiber crops, such as, citrus, nuts, olives, cranberries, fruits, and vegetables [(7 U.S.C. 4201(c)(1)(B)].

Areas with the potential to be prime farmland are present within the Candy Lake project area (Figure 3-2). In fact, 27.1% of the project area has soils considered to be prime farmland. The soils associated with the prime farmland designation include Apperson silty clay loam, 1-3% slopes, Barnsdall very fine sandy loam, 0-1% slopes, Pocasset fine sandy loam, 0-1% slopes, Pocasset fine sandy loam, 1-3% slopes, Agra silt loam 1-3% slopes, Agra silt loam, 3-5% slopes, Braman silt loam, 0-1% slopes, Norge silt loam, 1-3% slopes, and Osage silty loam, 0-1%slopes (Ward 2004, personal communication). No unique farmlands occur in the project area.

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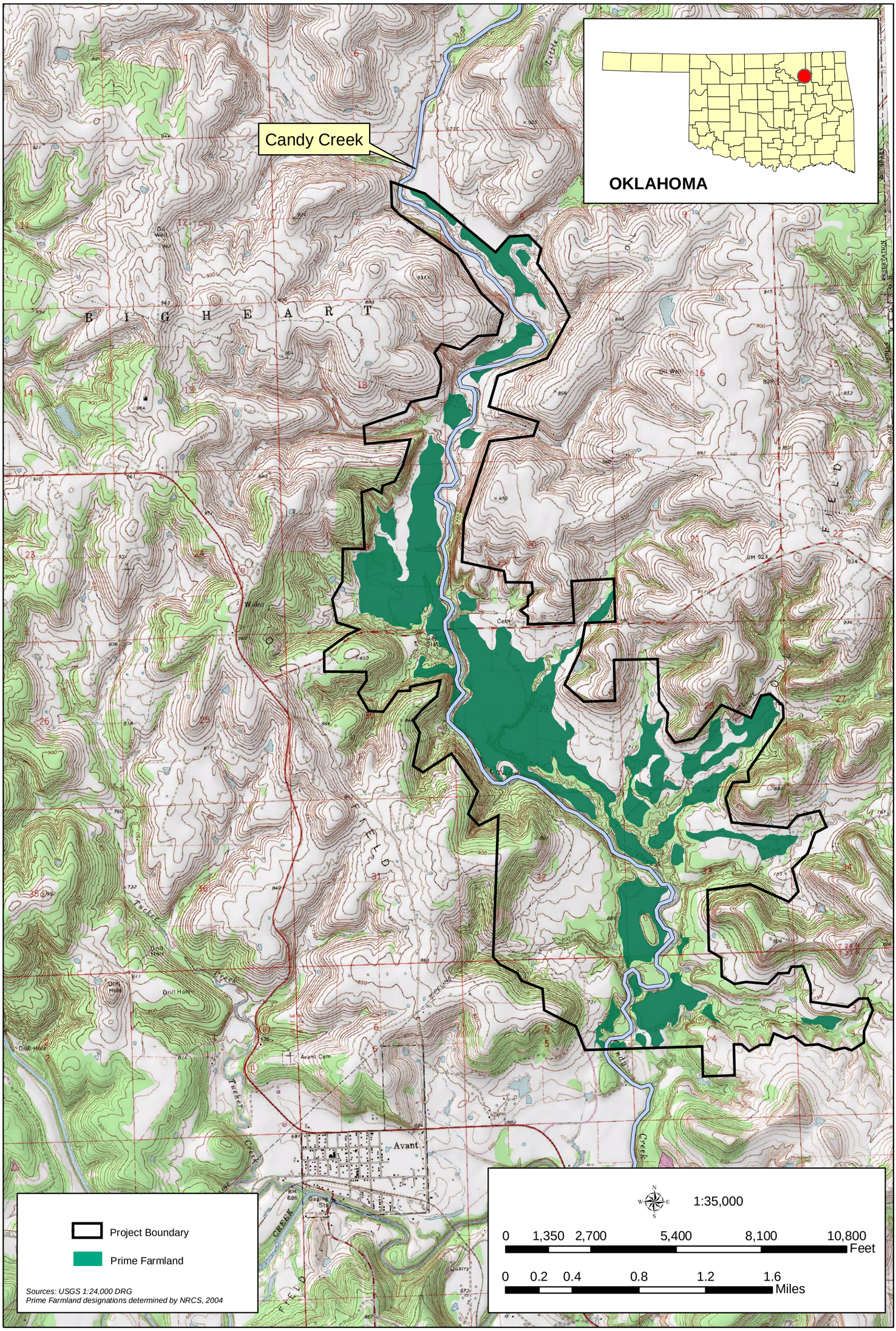

Figure 3-2: Prime Farmland for the Candy Lake Project Area

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3.3 VEGETATION

Candy Creek is located in an ecoregion known as the Cross Timbers. The Cross Timbers form an ecotone between the eastern deciduous forest and the grasslands of the southern Great Plains. This mosaic ecosystem consists of ancient post oak – blackjack forests along ridges grading into open canopied savannas, remnant prairies and glades in the bottomlands. The historic range of the Cross Timbers is believed to cover some 30,256 square miles extending from central Texas across Oklahoma and into southeastern Kansas.

3.3.1 Upland Forest

The upland forests of the area are generally dominated by either post oak (*Quercus stellata*) or blackjack oak (*Q. marilandica*) but the species composition may be quite varied. Species composition is influenced by a number of site characteristics, particularly slope, aspect and soil characteristics. Post oak reaches its greatest development on sites with moderately high levels of soil moisture and nutrients while blackjack is tolerant of the drier and more infertile sites (Johnson and Risser 1972). Other common canopy species of the uplands include black hickory (*Carya texana*), eastern red cedar (*Juniperus virginiana*), hackberry (*Celtis* spp.), Osage orange (*Maclura pomifera*), soapberry (*Sapindus drummondii*), winged elm (*Ulmus alata*), persimmon (*Diospyros virginiana*), live oak (*Q. virginiana*), and black walnut (*Juglans nigra*).

Fire and grazing, as well as the same factors that determine the composition of the overstory, also influence the composition of understory vegetation in the upland forest. Understory species of upland forest observed in the area include poison ivy (*Toxicodendron radicans*), greenbrier (*Smilax bona-nox*), smooth sumac (*Rhus glabra*), redbud (*Cercis canadensis*), winged sumac (*Rhus copallina*), goldenrod (*Solidago* spp.), sunflower (*Helianthus* spp.), tick trefoil (*Desmodium* spp.), and ragweed (*Ambrosia* spp.).

Upland forests of the region have been disturbed by grazing, fire, logging, and clearing for agriculture. The tree species, especially post oak and blackjack, are not seriously affected by fire and grazing, but the smaller vegetation may be altered considerably. Cut-over areas and abandoned fields are recolonized within a few years by post oak and blackjack, but since they are slow-growing trees it can take as long as 400 years for them to reach their maximum size (Johnson and Risser 1973).

3.3.2 Bottomland Forest

Deciduous, riparian forestland was observed along numerous intermittent and perennial streams. The floodplain forest is characterized by flat topography with high soil moisture and nutrients. Riparian forestland in the project area varied in age from less than 15 years of age to greater than 50 years of age, typically with a closed canopy, open to thick shrub layer, and scattered herbaceous and vine species. Common canopy species of the bottomlands include pecan (*Carya illinoensis*), black walnut, red mulberry *(Morus rubra*), sycamore (*Platanus occidentalis*), and American elm (*Ulmus americana*). Understory species typical of lower elevations include redbud (*Cercis canadensis*), rough-leaf dogwood (*Cornus drummondii*), Virginia creeper (*Parthenocissus quinquefolia*), and grape (*Vitis* spp.).

Much of the floodplain forest in the region has been cleared for farming and most of that remaining has been selectively logged for the more valuable timber trees such as walnut and oak. Since environmental conditions are more favorable for tree growth in the floodplain forest, a more rapid recovery might be expected than in the upland forest. Bellah and Hulbert (1974) showed that succession in the Republican River (Nebraska/Kansas) floodplain precedes at a rate such the timber attained a fairly stable composition after about 100 years.

3.3.3 Grasslands

Previously farmed, old-field communities dominated large portions of the project area at lower elevations. A dense herbaceous layer with numerous non-native herbaceous plants and scattered shrubs or colonies of shrubs typically characterized these old-field communities. Dominant herbaceous species observed include goldenrod (two species) (*Solidago* sp.), common ragweed (*Ambrosia artemisiifolia*), panic grass (*Panicum anceps*), giant ragweed (*Ambrosia trifida*), western ragweed (*Ambrosia psilostachya*), lespedeza (*Lezpedeza* sp.), Johnsongrass (*Sorghum halpense*), purple top (*Tridens flavus*), sneezeweed (*Helinium amarum*), crabgrass (*Digitaria* sp.), Bermuda grass (*Cynodon dactylon*), Mexican tea (*Chenopodium ambrosioides*), and rosin weed (*Grindella* sp.). Dominant woody species observed included pecan, hawthorn (*Crataegus* sp.), smooth sumac, winged sumac, and poison ivy.

Pastures and other areas having experienced recent grazing were also common in the study area. The flora of these areas is characterized by an herbaceous canopy of one or two species of ragweed and scattered grass species. The predominant ragweed observed was lanceleaf

ragweed (*Ambrosia bidentata*). Other ragweed species observed included western ragweed. Associate species observed included Johnson grass, purple top, and a few forage grass species.

Remnant prairies were found where soils consist of a higher proportion of heavy clay components, more numerous rocks, and limestone outcrops, cultivation was less common. These areas contained more characteristic prairie plants than previously described old-field communities and are characterized by dense herbaceous layer primarily composed of grasses and scattered clumps of woody shrubs. Dominant grass species observed include West Indian hairsedge (*Bulbostylis curassavica*), big bluestem (*Andropogon gerardii*), splitbeard bluestem (*Andropogon ternarius*), little bluestem (*Schizachyrium scoparium*), panic grass (*Panicum anceps*), and switchgrass (*Panicum virgatum*). Other grass species typical of uncultivated and non-grazed prairie include Indiangrass (*Sorghastrum nutans)*, sideoats grama (*Bouteloua curtipendula*), tall dropseed (*Sporobolus asper*), and buffalo grass (*Buchloe dactyloides*). Herbaceous and forb species observed include pickley-pear cactus (*Opuntia macrorhiza*), plains yucca (*Yucca glauca*), and blazing star (*Liatris* sp.). Woody species found in undisturbed, open areas include smooth sumac and sand plum (*Prunus angustifolia*).

3.4 WILDLIFE AND AQUATIC RESOURCES

Representative species of most of the major insect orders probably inhabit the general region of north central Oklahoma in which the project area is located. About 67 amphibian and reptilian species have a range overlapping with the Candy Creek area (Conant 1958). Five species of poisonous snakes can be found in the project area, including copperhead (*Agkistrodon contortrix*), western cottonmouth (*Agkistrodon piscivorus leucostoma*), massasauga (*Sistrurus catenatus*), pigmy rattlesnake (*Sistrurus miliarius*), and timber rattlesnake (*Crotalus horridus*).

A total of 266 bird species have a range overlapping the Candy Creek area (Sutton 1967), with morning dove, northern bobwhite, greater prairie chicken (*Tympanuchus cupido*), and wild turkey (*Meleagris gallopavo*) being the important game species in the region. Waterfowl numbers in the project area are insignificant.

Approximately 48 species of mammals have a range overlapping the Candy Creek area (Burt and Grossenhieder 1964). Whitetail deer are present in moderate numbers. Upland-game

species are fox squirrel (*Sciurus niger*), cottontail rabbit, and swamp rabbit (*Sylvilagus aquaticus*). Fur-animal species include mink (*Mustela vison)*, raccoon (*Procyon lotor*), skunk (*Mephitis mephitis*), gray fox (*Urocyon cinereoargenteus*), beaver (*Castor canadensis*), and Virginia opossum (*Didelphis virginiana*).

The aquatic habitat encountered in Candy Creek is one of an intermittent stream with permanent pool areas in the lower reaches. During periods of high flow, fishes migrating from Bird Creek influence population densities and fish species composition. The USACE (1973) reported that 16 species of fishes have been collected from Candy Creek, with the most common species being green sunfish (*Lepomis cyanellus*) and the longear sunfish (*Lepomis megalotis*). Other common species include logperch (*Percina caprodes*), stoneroller (*Campostoma anomalum*), and the bluntnose minnow (*Pimephales notatus*). The most common sport fish is the spotted bass (*Micropterus punctulatus*) with some largemouth bass (*Micropterus salmoides*) also present.

Very few fauna species were observed during the site visit in September 2003. Wildlife species observed at various locations in the project area include box turtle (*Terrapene carolina*), white-breasted nuthatch (*Sitta carolinensis*), Carolina chickadee (*Poecile carolinensis*), pileated woodpecker (*Dryocopus pileatus*), American goldfinch (*Carduelis tristis*), northern cardinal (*Cardinalis cardinalis*), red-tailed hawk (*Buteo jamaicensis*), blue jay (*Cyanocitta cristata*), whitetail deer, raccoon, beaver, and Asiatic clam (*Corbicula* sp.).

3.5 PROTECTED SPECIES AND CRITICAL HABITATS

The Endangered Species Act (ESA) [16 U.S.C. 1532 et. seq.] of 1973, as amended, was enacted to provide a program for the preservation of endangered and threatened species and to provide protection for the ecosystems upon which these species depend for their survival. All Federal agencies are required to implement protection programs for designated species and to use their authorities to further the purposes of the act. Responsibility for the identification of a threatened or endangered species and development of any potential recovery plans lies with the Secretary of the Interior and the Secretary of Commerce.

An endangered species is a species in danger of extinction throughout all or a significant portion of its range. A threatened species is a species likely to become endangered within the

foreseeable future throughout all or a significant portion of its range. Proposed species are those, which have been formally submitted to Congress for official listing as threatened or endangered. Species may be considered endangered or threatened when any of the five following criteria occurs: (1) the current/imminent destruction, modification, or curtailment of their habitat or range; (2) overuse of the species for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) the inadequacy of existing regulatory mechanisms; and (5) other natural or human-induced factors affect continued existence.

In addition, the USFWS has identified species that are candidates for listing as a result of identified threats to their continued existence. The candidate (C) designation includes those species for which the USFWS has sufficient information on hand to support proposals to list as endangered or threatened under the ESA. However, proposed rules have not yet been issued because such actions are precluded at present by other listing activity.

3.5.1 Federal

According to the USFWS Southwest Region's Internet site (USFWS 2004a) a total of five Federally protected or candidate species have the potential to occur in Osage County. Two of these species are listed as endangered, two as threatened and one as a candidate species. A letter (Appendix B) was submitted by the USACE to the USFWS, which, in turn, provided a list of only two species that could potentially occur in or near the project area. The list provided by the USFWS includes one endangered species, the American burying beetle (*Nicrophorus americanus*) that was not included on the Osage County list, and the bald eagle (*Haliaeetus leucocephalus*). Information pertaining to Federally protected species is included in Table 3-2.

3.5.1.1 Bald Eagle

The bald eagle is a member of the *Accipitridae* family and is in the sea or fish eagle group. Bald eagles are large for their group with a wingspan that varies from 79 to 90 inches and a body weight of 10 to 14 pounds. Adults have a blackish-brown back and breast and can be distinguished from other eagles by the adult plumage of white head, neck, and tail. Bald eagles tend to form breeding pairs and rear young in nests typically built in large trees near rivers or coasts, often returning to the same nest each breeding season.

Table 3-2. Federally Protected Species Known or Presumed to Occur Within or Near the Candy Lake Project Site

Species	Status	Habitat Requirements	Potential Occurrence
Birds			
Interior Least Tern (*Sterna antillarum*)	E	Sparsely vegetated sandbars along rivers, sand and gravel pits, or lake and reservoir shorelines	0
Whooping Crane (*Grus americana*)	E	Nesting in Wood Buffalo National Park in Canada; over-winters at Aransas National Wildlife Refuge on the Texas gulf coast. Traditional migratory stopover at Salt Plains National Wildlife Refuge in Oklahoma	0
Bald Eagle (*Haliaeetus leucocephalus*)	AD, T	Coastal areas, rivers or lake shores (including man-made lakes) with tall trees	1
Piping Plover (*Charadrius melodus*)	T	Shorelines and sandy beaches around lakes and reservoirs with little to no vegetation cover	0
Invertebrates			
American Burying Beetle (*Nicrophorus americanus*)	E	Generalist, found in various types of habitat including oak-pine woodlands, open fields, oak-hickory forest, open grasslands, and edge habitat	1
Neosho Mucket (*Lampsilis rafinesqueana*)	C	Stable runs, shoals and riffles with gravely bottoms and moderate currents. Historically found in the Verdigris River basin, however recent surveys indicate the mussel has been extirpated from the Verdigris River	0

Source: USFWS 2004
E = Endangered; T = Threatened; AD = Proposed Delisting; C = Candidate for Listing
Potential occurrence: 0= no potential; 1= potential to occur but not found during surveys

The breeding range of bald eagles extends from Alaska to central California inland to the Rocky Mountains and across Canada to the Great Lakes and the Atlantic Coast at northern latitudes. Bald eagles are also known to breed along the coast in the Gulf of Mexico from Louisiana to the southern tip of Florida and along the Atlantic coast in Florida and parts of New England.

Their wintering range extends along the Pacific coast from southern Alaska to Mexico, across the American southwest at middle latitudes, and most of the eastern U. S. Eagle numbers began to decline with the settlement of Europeans and in 1940, the Bald Eagle Act was passed. Numbers continued to decline due to hunting, habitat loss and use of DDT (a chlorinated organic insecticide) and in 1967, eagles were declared endangered in all areas south of the 40th parallel, under a law that preceded the ESA of 1973. On July 4, 1976, the USFWS officially listed the bald eagle as a national endangered species. The bald eagle has since been upgraded to threatened (1995) and is currently proposed for delisting.

Historical evidence suggests that bald eagles were common and known to nest in eastern Oklahoma through the 1800s and numbers began to decline in the early 1900s (Lish and Sherrod 1986). Between 1950 and 1986, only 13 "reproductive attempts" were reported in eastern Oklahoma, including Osage County along the Arkansas River. No nesting habitat is present at Candy Lake, but bald eagles may rarely forage in the project area.

3.5.1.2 American Burying Beetle (*Nicrophorus americanus*)

The American burying beetle is a member of the carrion guild. Carrion beetles are highly social and breed their young on vertebrate carcasses (primarily mammals and birds up to 300 grams) while providing biparental care (Wilson 1971). The American burying beetle is the largest member of its guild (up to 1.5 inches) and is shiny black with two distinctive, bright orange bands on each wing cover. It can be distinguished from other species of *Nicrophorus* by its orange pronotum, the shield-like area just behind the head.

The historic range of the American burying beetle included much of North America from the northern Great Plains to the Gulf coast and east to the Atlantic coast. During this century, it has disappeared from over 90% of its range. Existing populations are known to occur in six states: Nebraska, Rhode Island, Oklahoma, South Dakota, Kansas, and Arkansas. In 1989, the American burying beetle was listed as an endangered species by the USFWS.

It was first believed that a dependence on larger carcasses restricted American burying beetles to mature eastern deciduous woodlands with deep soils (Anderson 1982). However, recent studies have shown that it is found in both grassland and upland forest while avoiding bottomland forests (Creighton et al. 1993), and that it is a habitat generalist, searching over a range of habitats for a suitable carcass (Lomolino et al. 1995). Surveys of American burying beetles often produce minimal specimens, even when sampling locations of known populations. No surveys have been conducted at the project site. However, in the nine counties surrounding Osage County, a total of 1,205 trap nights at 13 locations produced only two beetles (USFWS 2004b). The study by Lomolino et al. (1995), conducted at Camp Gruber in Muskogee County where a known population has been surveyed extensively, was more efficient with 215 beetles caught over 2,081 trap nights. However, this population is located 78 miles southeast of the project site. Although it is unlikely that American burying beetles are present at the Candy Lake project site, protocol-level surveys for the burying beetle were not conducted because negative

results would not prove absence. Therefore, for the purposes of this EA, it is assumed that American burying beetles could occur, although rarely, at the project site.

3.5.2 Critical Habitat

The ESA also calls for the conservation/protection and management of critical habitat; defined as the areas of land, water, and air space that an endangered species requires for survival. Critical habitat also includes such things as food, breeding sites, cover or shelter, and sufficient habitat to provide for normal population growth and behavior. One of the primary threats to many species is the destruction or modification of essential habitat by uncontrolled land and water development. No critical habitat for any protected species is located within or near the proposed project location.

3.5.3 State

The ODWC maintains an annotated list of rare species. This list includes species whose occurrence in Oklahoma is Federally listed as endangered threatened, proposed endangered/threatened, and candidate for listing. The list also includes those species that are state endangered, threatened, or rare. The Federally protected species were previously discussed in Section 3.5.1. The state listed species with the potential to occur in Osage County are found in Appendix A.

3.6 AIR QUALITY

3.6.1 Applicable Air Quality Statutes

The US Environmental Protection Agency (EPA) is the agency responsible for enforcing the Clean Air Act (CAA) of 1970 and its 1977 and 1990 Clean Air Act Amendments (CAAA). The purpose of the CAAA is to establish National Ambient Air Quality Standards (NAAQS), to classify areas as to their attainment status relative to the NAAQS, to develop schedules and strategies to meet the NAAQS, and to regulate emissions of criteria pollutants and air toxics to protect the public health and welfare. Under the CAA, individual states are allowed to adopt air quality standards and other regulations provided that they are at least as stringent as the Federal standards.

3.6.2 Background in Air Quality Management

The EPA established NAAQS, for specific pollutants determined to be of concern with respect to the health and welfare of the general public. The EPA defines ambient air quality in 40 CFR 50 as "that portion of the atmosphere, external to buildings, to which the general public has

access." Ambient air quality standards are intended to protect public health and welfare and are classified as either "primary" or "secondary" standards. Primary standards define levels of air quality necessary to protect the public health. National secondary ambient air quality standards define levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. The major pollutants of concern, or criteria pollutants, are carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, suspended particulate matter less than ten microns, and lead. NAAQS represent the maximum levels of background pollution that are considered safe, with an adequate margin of safety, to protect the public health and welfare. Short-term standards (1-, 8- and 24-hour averaging periods) are established for pollutants contributing to acute health effects, while long-term standards (annual averages) are established for pollutants contributing to long-term health effects. The NAAQS are included in Table 3-3. Areas that do not meet these standards are called non-attainment areas; areas that meet both primary and secondary standards are known as attainment areas.

The EPA requires each state to develop a State Implementation Plan (SIP) that sets forth how the CAA provisions would be implemented within that state to obtain the NAAQS. The SIP is the primary means for the implementation, maintenance, and enforcement of the measures needed to attain and maintain compliance with the NAAQS within each state. To provide consistency in different state programs and ensure that a state program complies with the requirements of the CAA and EPA, approval of the SIP must be made by the EPA. The purpose of the SIP is twofold. First, it must provide a strategy that would result in the attainment and maintenance of the NAAQS. Second, it must demonstrate that progress is being made in attaining the standards in each nonattainment area.

The State of Oklahoma established the Oklahoma Clean Air Act (OCAA) under article 27A-2-5-101 in 1967. It is the purpose of the OCAA to provide the means to achieve and maintain atmospheric purity necessary for the protection and enjoyment of human, plant or animal life and property consistent with and limited by generally accepted social standards and requirements, desired employment and industrial development, area conditions, and the availability of economic and feasible controls. The Oklahoma Department of Environmental

Table 3-3. National Ambient Air Quality Standards

POLLUTANT	STANDARD VALUE*	STANDARD TYPE
Carbon Monoxide (CO)		
8-hour average	9ppm (10mg/m^3)	P
1-hour average	35ppm (40mg/m^3)	P
Nitrogen Dioxide (NO_2)		
Annual arithmetic mean	0.053ppm (100μ/m^3)	P and S
Ozone (O_3)		
1-hour average	0.12ppm (235μg/m^3)	P and S
8-hour average	0.08ppm (157μg/m^3)	P and S
Lead (Pb)		
Quarterly average	1.5μg/m^3	P and S
Particulate<10 micrometers (PM-10)		
Annual arithmetic mean	50μg/m^3	P and S
24-hour average	150μg/m^3	P and S
Particulate<2.5 micrometers (PM-2.5)		
Annual arithmetic mean	15μg/m^3	P and S
24-hour Average	65μg/m^3	P and S
Sulfur Dioxide (SO_2)		
Annual arithmetic mean	0.03ppm (80μg/m^3)	P
24-hour average	0.14ppm (365μg/m^3)	P
3-hour average	0.50ppm (1300μg/m^3)	S

Source: EPA, 2004a
Legend: P = Primary S = Secondary
ppm = parts per million mg/m^3 = milligrams per cubic meter
μg/m^3 = micrograms per cubic meter
*Parenthetical value is an approximately equivalent concentration.

Quality (ODEQ) is designated as the administrative agency for the OCAA and has established air quality standards consistent with, and not more stringent than NAAQS. The State of Oklahoma is currently in attainment of the NAAQS (EPA 2004b).

Sources of pollutants in Osage County include road traffic and construction, agriculture, petroleum refining, and wildfires. Air pollution in Osage County is equivalent to the national average for particulate matter, ammonia (NH_3), Hazardous Air Pollutants (HAP), and Acrolein, and better than average in all other pollutants. Oklahoma has established 17 air-monitoring stations, seven of which are considered permanent. The closest permanent station is in Skiatook, which is 12 miles south of the Candy Lake project area. Skiatook has had the highest 3-hour. (0.083 ppm) and 8-hour. (0.094 ppm) ozone readings in Oklahoma, but remains in compliance with the NAAQS and the OCAA.

3.7 WATER RESOURCES

3.7.1 Surface And Ground Water Resources

The Candy Creek Basin is located in northeastern Oklahoma within the Verdigris River Basin (a tributary to the Arkansas River) and is elliptical in shape from north to south. The Candy Creek drainage system's headwaters are located about five miles southwest of Bartlesville. Candy Creek is a dendritic system with a 12-mile long mainstem that flows south into Bird Creek near Avant. USACE used rainfall data and available flow records to estimate flow conditions in Candy Creek for a 36-year period, October 1935 through September 1969. Streamflows ranged from 0 cubic feet per second (cfs) to 11,800 cfs, with peak flow occurring in October of 1959, and average flows were 3,845 cfs (USACE 1986). The Candy Creek watershed is located in a region with relatively moderate winters and long summers characterized by high temperatures. The average annual precipitation is 34.7 inches (range 20 – 54 inches) with May typically being the wettest month and January the driest. Evaporation in the basin has been estimated to be 76.0 inches annually. The majority of the project area is in Flood Zone A according to the Federal Emergency Management Association Flood Insurance Rate Maps (FIRM) for the project site (FIRM map panels 4001460450C and 4001460535C).

3.7.2 Waters of the U.S. and Wetlands

Section 404 of the Clean Water Act (CWA) of 1977 (P.L. 95-217) authorizes the Secretary of the Army, acting through the USACE, to issue permits for the discharge of dredged or fill material into Waters of the United States (WUS), including wetlands. WUS (Section 328.3[2] of the CWA) are those waters used in interstate or foreign commerce, subject to ebb and flow of tide, and all interstate waters including interstate wetlands. WUS are further defined and may include waters such as intrastate lakes, rivers, streams, mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, natural ponds, or impoundments of waters, tributaries of waters, and territorial seas. Jurisdictional boundaries for WUS are defined in the field as the ordinary high water marks which is that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural lines impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

Wetlands are those areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (USACE 1987). Activities that result in the dredging or filling of jurisdictional wetlands are regulated under Section 404 of the CWA. The USACE has established Nationwide Permits (NWPs) to efficiently authorize common activities, which do not significantly impact WUS, including wetlands. The NWPs were modified and reissued by the USACE in the Federal Register on 15 January 2002, with an effective date of 18 March 2002. All NWPs have an expiration date of 19 March 2007. The USACE has the responsibility to authorize permitting under a NWP, or to require an Individual Permit.

Potential WUS within the project area include Candy Creek and its tributaries. Additionally, several potentially jurisdictional in-stream ponds and one potentially jurisdictional wetland were found within the project area during September 2003 surveys (Figure 3-3).

3.7.3 Water Quality

There is little information available concerning water quality of Candy Creek. Water samples were taken by the USACE in Candy Creek and its tributaries during August and September of 1973 (USACE 1986). These samples indicated that the proposed Candy Lake would have provided water acceptable for public water supply. Chloride concentrations were evaluated by the USGS in Candy Creek at two stations in 1999. At one station near Wolco, chloride concentrations were relatively high at 30.0 milligrams per liter (mg/L) in February and 28.0 mg/L in August. At one station near Avant, chloride concentrations were 15.0 mg/L (USGS 2004b).

3.8 SOCIOECONOMICS

3.8.1 Population

The Region of Influence (ROI) on socioeconomics for the proposed project is Osage County, Oklahoma. Osage County is in the Tulsa Metropolitan Statistical Area (MSA). Oklahoma's total population in 2001 was 3,460,097 while the Tulsa MSA's total population in 2001 was 812,507, which ranked 71st in the nation among other MSAs (U.S. Census Bureau [USCB] 2004; Bureau of Economic Analysis [BEA] 2004). The estimated total population of Oklahoma in 2002 was 3,493,714 (USCB 2004). The 2000 population of Osage County was 44,437, which ranked 18th in the state (USCB 2004; BEA 2004). The racial mix of Osage County of the 2000 population consisted predominantly of Caucasians (67%) followed by Native American (14%) and African

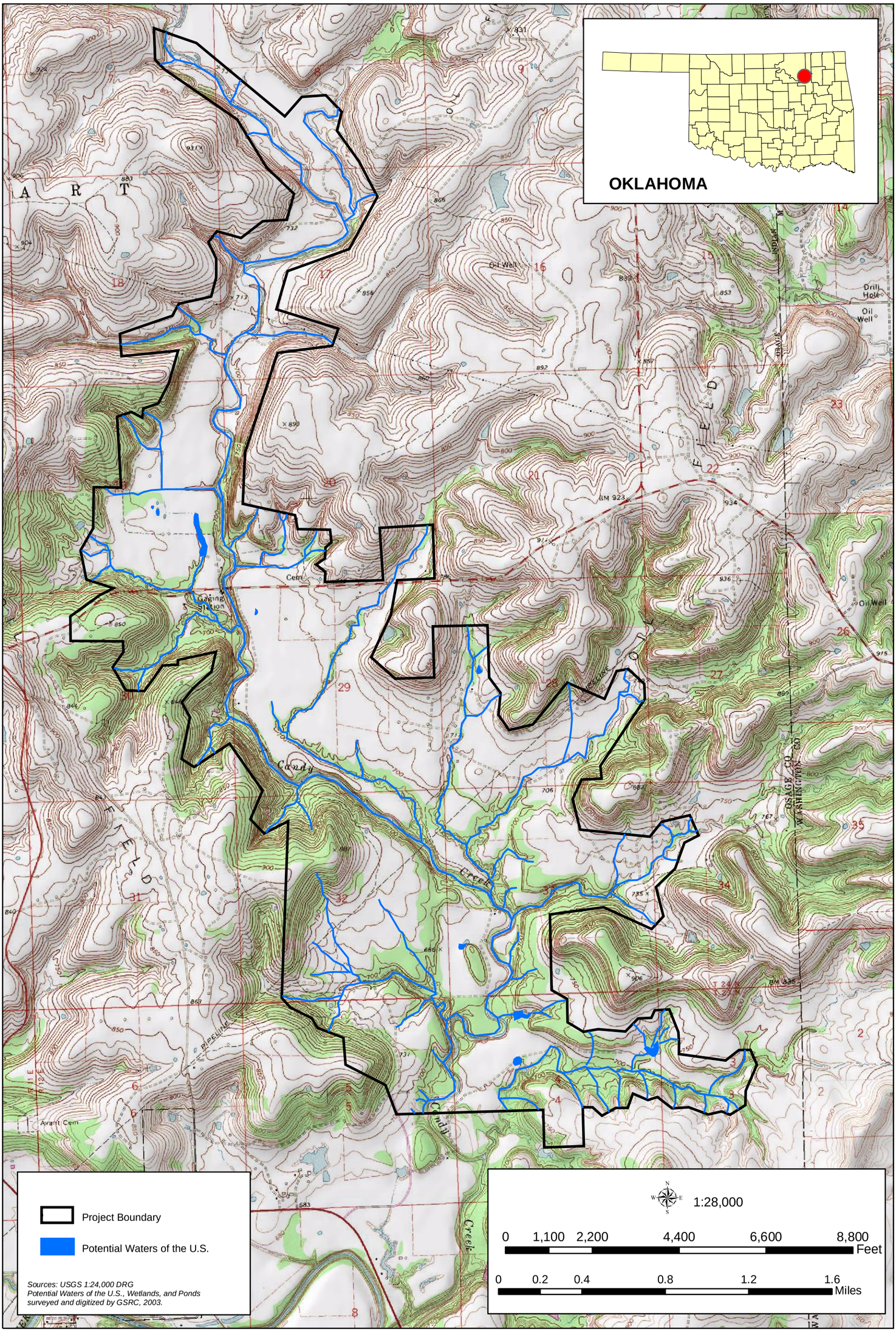

Figure 3-3: Potential Waters of the U.S. for the Candy Lake Project Area

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American (11%). The remaining 8% is divided among Asians, Native Hawaiians and other Pacific Islanders, and people claiming to be two or more races or race other than those listed above (U.S. Census Bureau 2004). Only about 2% of the total population of Osage County claim to be of Hispanic origin (U.S. Census Bureau 2002). The average annual growth rate between 1990 and 2000 was 0.65%. The estimated 2002 total population of Osage County is 45,166 (USCB 2004). Racial breakdowns of this estimated population were not available at the time of this report.

3.8.2 Employment and Income

The total number of jobs in Osage County in 2001 was 12,224, an increase of 14% over the 1991 number of jobs of 10,688 (BEA 2004). Job breakdowns by industry for 2001 were not available at the time of this report. The November 2003 unemployment rate for Osage County was 5.7%. This is slightly higher than the November 2003 unemployment rate for the state of Oklahoma of 5.1% (Oklahoma Employment Security Commission 2004).

The 2001 annual total personal income (TPI) for Osage County was $8.8 million. This TPI ranked 18th in the state of Oklahoma and accounted for 1.0% of the state total (BEA 2004). Over the past 10 years, the average annual growth rate of TPI was 4.5%. This is lower than the annual growth rate for the state (5.0%) and lower than that for the nation (5.5%) (BEA 2004). Per capita personal income (PCPI) for Osage County was $19,701 in 2001. This PCPI ranked 41st in the state, and was 79% of the state average ($24,945) and 65% of the national average of ($30,413) (BEA 2004). The average annual growth rate of PCPI over the past 10 years was 3.7%, which is lower than the state's growth rate of 4.1% and the national growth rate of 4.3% (BEA 2004). The estimated number of people of all ages in poverty for Osage County was 5,501. This represented 12.7% of the county, which is lower than the percentage of state population (13.9%) that lives in poverty (USCB 2004).

3.8.3 Housing Analysis

The total number of housing units in Osage County was 18,826 in 2000 (USCB 2004). This represents 1% of the total housing units reported for the State of Oklahoma. Of the housing units within Osage County, 16,617 (88%) are occupied and the remaining 2,209 (12%) are vacant. Approximately 81% (13,401) of the occupied housing units are owner occupied, while 19% (3,216) are renter occupied (U.S. Census Bureau 2004). The number of housing units within Osage County was 18,196 in 1990. This represents an average annual growth rate of

0.34% for Osage County (U.S. Census Bureau 2004). The number of new private housing units by authorized building permits in 2000 was 46 (U.S. Census Bureau 2004).

3.8.4 Executive Order (EO) 12898, Environmental Justice

The fair treatment of all races has been assuming an increasingly prominent role in environmental legislation and implementation of environmental statutes. In February 1994, President Clinton signed EO 12898 titled, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. This action requires all Federal agencies to identify and address disproportionately high and adverse effect of its programs, policies, and activities on minority and low-income populations.

3.8.5 Executive Order 13045, Protection of Children

EO 13045 requires each Federal Agency "to identify and assess environmental health risks and safety risks that may disproportionately affect children"; and "ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks." This EO was prompted by the recognition that children, still undergoing physiological growth and development, are more sensitive to adverse environmental health and safety risks than adults.

3.9 NOISE

Noise is generally described as unwanted sound, which can be based either on objective effects (hearing loss, damage to structures, etc.) or subjective judgments (community annoyance). Sound is usually represented on a logarithmic scale with a unit called the decibel (dB). Sound on the decibel scale is referred to as a sound level. The threshold of human hearing is approximately 0 dB, and the threshold of discomfort or pain is around 120 dB.

Noise levels are computed over a 24-hour period and adjusted for nighttime annoyances to produce the day-night average sound level (DNL). DNL is the community noise metric recommended by the EPA (EPA 1974) and has been adopted by most Federal agencies (Federal Interagency Committee on Noise [FICON] 1992).

A DNL of 65 dB is the level most commonly used for noise planning purposes and represents a compromise between community impact and the need for activities like construction, which do

cause noise. Areas exposed to DNL above 65 dB are generally not considered suitable for residential use. A DNL of 55 dB was identified by EPA as a level below which there is effectively no adverse impact (EPA 1974). The lowest level at which adverse health effects could be credible is a DNL of 75 dB (EPA 1974).

Noise levels are very low within the Candy Lake project area. For the most part, noise is limited to some small generators and power supplies for oil wells scattered throughout the project area and occasional vehicle noise on nearby rural roads. During hunting season, very limited gunfire sounds can be heard. Furthermore, the site is mostly undeveloped and there are only a few nearby rural residences.

3.10 CULTURAL RESOURCES

The land parcel with which this survey is concerned is part of what was the Osage Reservation, established in 1875 for the residence of the remnants of the Osage Tribe, who had been living in Kansas after their removal from Missouri. The boundaries of current Osage County correspond with the boundaries of the former reservation. In 1907, just prior to Oklahoma statehood, the reservation land was allotted to tribal members according to a numbered lottery system, like that used for other tribes in the former Indian Territory. Each tribe member received a portion of the reservation land, and assumed rights and responsibilities of private ownership. Several of the original homestead allotments, as well as surplus land allotments, are located within the project area (Proctor 2004).

3.10.1 Cultural History

3.10.1.1 Paleo-Indian

Physical evidence, and perhaps more importantly, a change of mindset, have been mounting to substantiate the presence of pre-Clovis material in North America, and in Oklahoma (Table 3-4). Although most evidence is ambiguous and remains to be substantiated, the Clovis is a cultural stage pre-dating the earliest Paleo-Indian stage, and is likely to be assimilated into most culture histories in the near future. Evidence for human occupation prior to 11,500 years before present (B.P.) may have been located at sites such as Burnham, northwestern Oklahoma, and the Cooperton Site, in Kiowa County. Clovis sites, belonging to the first firmly accepted stage of the Paleo-Indian, are almost as difficult to locate as pre-Clovis material. For these early periods, there is a substantial amount of geomorphological activity that has affected site visibility

and integrity. Sites may be very deeply buried in alluvium, and thus difficult to locate, or erosional processes and later occupations may have seriously affected them, making them less pristine in terms of physical integrity. Both the Clovis and Folsom (Table 3-4), along with the more diverse Late Paleo-Indian complexes, are characterized by the use of distinctive fluted and later, lanceolate, projectile points, elaborate and fine-quality flaking techniques, and some emphasis on the use of extinct large herd animals. The spectacular nature of "megafauna" kill sites and the beautiful fluted points led to an initial emphasis by archeologists on big-game hunting by the Paleo-Indian people. In recent decades, the increase in numbers and types of Paleo-Indian sites being investigated has allowed researchers to recognize greater diversity in the toolkit and in the subsistence strategy, which was fairly broad-based and utilized many types of animal and plant resources (Proctor 2004).

Table 3-4. Chronological Scheme for Northeastern Oklahoma

Cultural/Temporal Stage	Dates
Paleo-Indian	11,500-9500 B.P.
Clovis	
Folsom	
Archaic	9500-2300? B.P.
Early	9500-6000 B.P.
Middle	6000-4000? B.P.
Late	3400?-2300? B.P.
Woodland	?1900-1200 B.P.
Plains Village	1200-500 B.P.
Protohistoric	A.D. 1540 to ~1700
Historic	After A.D. 1700

(Proctor 2004)

3.10.1.2 Archaic

The significantly greater number of sites known for the succeeding Archaic period suggests an increase in Native American populations in the time from approximately 8500 to 2000 years B.P. This period may have been characterized by utilization of a larger variety of resources (floral and faunal), and a greater diversity of equipment for processing these resources. The presence of plant processing equipment suggests more long-term occupations, possibly seasonal rounds in specific areas. The diet of the Archaic people seems to have diversified to include more small animals, possibly in response to dwindling populations of large species. Projectile points

are generally smaller, typically notched and stemmed points, and differ significantly from preceding Paleo-Indian fluted points. The archaic period is generally divided into three different periods, Early, Middle and Late Archaic (Proctor 2004).

3.10.1.3 Woodland

By 2000 years B.P., a number of technological changes in the plains and forests of what is now Oklahoma signaled a transition to the Woodland Period (ca. 2000-1250 B.P.) or Plains Woodland (ca. 2000-1000 B.P.). The most visible change was the appearance of smaller projectile points, thought to indicate a shift from the use of atlatls and darts to bow and arrow (Proctor 2004). Second, and also highly important technologically, was the introduction of ceramic technology, which seems to have occurred in this region some time between 2500-2100 B.P. The intensely important shift to full-scale agriculture is ongoing during the Woodland, a process still not clearly understood and probably quite variable in different areas (Proctor 2004).

3.10.1.4 Plains Village/Village Farmer

After about 1250 B.P., much of eastern Oklahoma was occupied by sedentary or semi-sedentary agricultural societies, as part of a tradition of village societies in the Great Plains and Midwest. The term Plains Village is typically applied to sites of this time period in western and central Oklahoma. In eastern Oklahoma, the evolving cultural traits of the prior Woodland period had, by approximately 1100-1200 B.P., coalesced into a single dynamic expression known as the “Caddo” or “Caddoan”, which would last until the historic period in the Arkansas and Red River basins. The Caddoan culture is characterized by an assemblage of traits that includes mound construction, maize and squash agriculture, and differential treatment of the dead. This period of relative cultural continuity marked the apex of social complexity in the Arkansas and Red River basins, and produced some of the largest mounded earthen works, as well as some of the finest examples of prehistoric ceramic technology and art, to be found in North America (Proctor 2004).

Sometime after 1200 B.P., the Woodland adaptations appear to expand in diversity of cultural traits and in density of population. The new cultural expression is known collectively as the Plains Village or Village Farmer period, with numerous local variants recognized on the Southern Plains and its periphery. On the eastern margin of the region, including eastern Kansas and Oklahoma, the Plains Villagers exhibit some traits more associated with the

Eastern Woodlands-type Mississippi tradition (Proctor 2004). Caddoan influence can be seen in some cultural traits in northeastern Oklahoma, but the sites generally resemble Plains manifestations more closely (Proctor 2004). The "classic" Plains Village expression includes traits such as permanent houses, more dependence on horticulture, and development of a strong tradition of bison hunting (Proctor 2004). This basic adaptation continues in north-central Oklahoma into the historic period, as documented in historic Wichita villages (Proctor 2004).

The nearby Caddoan archeological area (Proctor 2004) extends from northeast Texas and northwest Louisiana, northward through eastern Oklahoma and western Arkansas, and ends in southwestern Missouri. The Caddoan Archeological Area is divided into three distinct subareas, classified as the Northern, Western, and Central Caddoan. These divisions are based primarily upon "a set of longstanding and distinctive cultural, social, and political elements that have temporal, spatial, and geographic connotations" (Proctor 2004). Caddo culture bears strong similarities to societies of the Mississippi period (1100-300 B.P.), which originated in the western Ozarks, themselves apparently a localized western expression of the larger Mississippian societies to the east. Mississippi people of the Ozarks seem to have had frequent interaction with the Arkansas and Mississippi River valleys (Proctor 2004).

Sites of the Plains Village period in Oklahoma are typically found along major drainages, with smaller settlements on smaller streams. They may occur as small "villages" in closely spaced clusters, or larger communities near stream mouths, with smaller settlements in the higher reaches of the drainages. Domestic structures have been documented, with storage pits, scattered sheet middens, and sometimes, isolated burials or definitive cemeteries (Proctor 2004). In addition to horticulture, the economy appears to have been supported by bison hunting. Diverse wild plant and animal resources no doubt continued to be significant, regardless of the visibility of bison remains in the domestic refuse of this period (Proctor 2004).

3.10.1.5 Protohistoric and Early Historic

The beginning of the Protohistoric period in the southern Plains is marked by Coronado's initial explorations into the North American continent from Spanish territory in Mexico (Proctor 2004). It encompasses time between the 16th and 17th centuries when there were limited European contacts with the area and only brief journeys into or through the area (Proctor 2004). The Europeans coming into the southern Plains were mostly explorers looking for new territory, or fur trappers (Proctor 2004). In the Caddoan Archeological Area nearby, the period between

European contact and colonization is called Caddo IV. During this time, mound construction ceased, and mortuary practices shifted away from multiple shaft burials in mounds and household cemeteries to individual flexed burials in large household cemeteries (Proctor 2004).

Contact with Europeans increased toward the end of the protohistoric, ca A.D. 1650-1700. French and Spanish settlements along the Red River at Natchitoches and Los Adaes in eastern Texas were centers of commerce for the Caddo as well as other Native American groups. The distinction between the Protohistoric and Historic periods is somewhat vague. Native lifeways did not immediately change across the board with the first appearance of Europeans, and the sporadic nature of contacts with actual persons or with the new material culture meant that European influence was minor at first (Proctor 2004). Also, archeological remains that can be clearly assigned to protohistoric groups are poorly documented (Proctor 2004).

3.10.1.6 Historic Period

The Historic period refers to the time post-dating European colonization of the region. In the Caddoan Archeological Area, the period after European colonization is called Caddo V. The period is relatively short-lived, and appears to have ended in the Red River basin by approximately A.D. 1750 (Proctor 2004). After this, the Caddo abandoned the area. Episodes of severe raiding by the Osage forced abandonment in favor of relocation further to the south. All of Oklahoma, like the rest of the continent, was substantially affected by the encroachment of European peoples and their culture after A.D. 1500. In considering the archeological expression of human culture in this region, all interpretations must take account of the significant changes created by Euro-American/African-American influx. Some overall trends in post-Contact history are outlined here that are relevant to Oklahoma in general. Events and developments more specific to Osage County and the project area follow (Proctor 2004).

European and Euro-American exploration begins with the Coronado expedition, known to have entered what is now Texas and Oklahoma in 1541. Spanish and French presence in the Oklahoma/Texas region was sporadic, but continued until the transfer of the huge area known as the Louisiana Territory to the U.S. in 1803. Purchase of the Louisiana Territory by the U.S. began another phase of exploration. This period can be described as more systematic, related to scientific as well as military motives. American exploration was initiated by Lewis and Clark in 1804. Other American expeditions of a semi-scientific and military nature were led by Zebulon Pike and Lieutenant James Wilkinson, Major Stephen Long, and others (Proctor 2004).

Trade and colonization were well underway in Oklahoma by the start of the 19th century. Early efforts of St. Denis and Bourgmont led to a successful French-dominated fur trade in the river basins. By 1812, hunters and trappers of various nationalities drawn to the region began to settle more permanently, often integrating with the aboriginal culture through marriage to native women (Proctor 2004). Possibly the most significant trend in coloring the character of modern Oklahoma and Kansas encompassed the two phenomena of the push for Indian "removal" from desirable lands in the east and southeast, and the overall hunger for land that characterized early American culture. Numerous treaties, both before and after 1830, were promulgated to deal with transfers of land by specific tribes, but the Indian Removal Act of 1830 became the watershed of public policy from which there was no return for native groups. Oklahoma was treated as "empty land" suitable for re-settlement of Eastern tribes despite the presence of aboriginal societies already in place. Later, the area saw serious conflict as U.S. citizens demanded that these economically desirable lands be opened to white settlement (Proctor 2004).

The Civil War, though fought mainly in the eastern half of the U.S., had serious effects on the native inhabitants of Indian Territory. The legacy of mistrust and fraudulent or broken treaties made many groups distrustful of the Union. When advocates for the Confederacy began to proselytize in the region, many of the "Five Civilized Tribes" saw the secessionist movement as a chance to escape the oppression of the Federal government. Reconstruction after the war was as destructive to Native American communities as it was to former Confederate cities. Raiding and guerrilla-type fighting caused considerable loss of life to native civilians (Proctor 2004).

The final decades of the 19th century saw an explosion of the railroad as the primary transportation across the West. Inroads were made in eastern Oklahoma by proponents of the new lines. Treaties allowed rights-of-way across lands of the Five Civilized Tribes. Outlaws and renegades that had profited from post-war Indian poverty were assisted even more by the growth of the railroads. Land runs became rampant in Oklahoma after 1889, when the Unassigned Lands in the center of the state were opened to settlement. Both white and black settlers, many of the latter former slaves of the Five Civilized Tribes, obtained parcels all over the territory, as even sovereign Indian areas fell to the land hunger. Importantly, the black settlers founded more all-black towns in the state than anywhere else in the U.S. Statehood,

however, did not come until 1907, long after similar settlement trends had fully altered the ethnic composition of nearby Kansas, Texas and Arkansas (Proctor 2004).

3.10.2 Recent Investigations

Archeological work sponsored by the USACE in the Candy Lake project area was first done by Cheek and Wilcox (1974) and provided initial site descriptions of prehistoric and historic sites (34OS147 – 158). Additional research on the Candy Lake property was conducted under the direction of D. Kevin Leehan in 1976 (Leehan 1977) and by Joe Saunders and colleagues in 1979 (Saunders 1980). Leehan's (1977) work in 1976 consisted of the reexamination and testing of eight previously recorded archeological sites (34OS147, 34OS149, 34OS151, 34OS153, 34OS154, 34OS155 34OS157, 34OS158) and the archeological survey of approximately 675 acres in the upper reaches of the proposed Candy Lake Reservoir. Two of the sites 34OS149 and 34OS153 could not be investigated due to access problems. As a result, Leehan (1977) recommended that testing be carried out on those sites when access was obtained. In addition, Leehan (1977) recommended additional testing and mitigation be done at 34OS155, as it would provide valuable additional information. Leehan (1977) recommended no additional work for the rest of the sites investigated (34OS147, 34OS151, 34OS154, 34IS157, and 34OS158). Leehan's (1977) survey of 675 acres in the upper reaches of the proposed Candy Lake Reservoir yielded three additional sites (34OS190, 34OS191, and 34OS187) along with a headstone near 34OS191. Leehan recommended no additional work at any of the sites. The headstone, found along the riverbank, bore the surname of Dickey. According to local informants, a number of graves, possibly 14, were located in this general area and the markers had been bulldozed from their original locations during pasture clearing operations (Leehan 1977).

Saunders (1980) conducted test excavations on three archeological sites (34OS149, 34OS153, and 34OS155) in 1979. Excavations at 34OS149 produced both historic and prehistoric artifacts. The prehistoric element probably represents an extremely disturbed late prehistoric occupation. Excavations carried out at 34OS153 suggest that the site may represent a Plains woodland occupation. Saunders carried out extensive data recovery excavations at 34OS155 along with radiocarbon dating of samples and extensive lithic analysis. Saunders found three horizontally distinct concentrations of cultural material. Each of the concentrations seems to represent temporary campsites, or "transient camps", which were occupied for differing amounts

of time. Two of the areas date to the Plains Woodland period and one area dates to the Archaic period. Saunders made no recommendations for additional work at any of the sites.

More recent surveys were conducted in 2001 in support of this land transfer (Raab and Rust 2002). During these surveys of 1223 acres comprising parcels in the northern and southern ends of the Candy Lake property, one new site (34OS664) and 10 isolated finds were recorded. The 10 isolated finds were recommended as ineligible for listing on the National Register of Historic Places (NRHP) and no further work is recommended for any of those locations. Artifacts recovered from 34OS664 include faunal remains, a partial Folsom preform, and a dart point dating to the Archaic period. Further work is recommended for this site because of its information potential for both the archeology and geomorphology of the area. Both 34OS664 and the previously recorded 34OS155 are located on Mason series soils. Their association with Mason series soils conform to a predictive model developed by Reid and Artz (1984) for locating pre-A.D. 1 occupations within the region based on the presence of Mason series soils. These soils provide good drainage in the middle and lower reaches of stream valleys, providing stable surfaces for soil development. The Osage County Soil Survey documents Mason soils throughout much of the Candy Creek floodplain, suggesting potential for further discovery of human activity dating to the Early and Middle Holocene.

Four previously recorded archeological sites (34OS155, 34OS187, 34OS191, and 34OS192) were revisited in the 2001 surveys. Site 34OS155 could not be relocated during the 2001 survey. However, site 34OS155 has been extensively tested and evaluated and was concluded that further investigation would be unlikely to yield data or information of a unique or significant scientific nature. As a result, no additional work is recommended at this site. A rock shelter was located opposite of 34OS155 but no cultural material was recovered from either the surface or in shovel tests in the vicinity of the rock shelter. The three other previously recorded sites (34IS187, 34OS191, and 34OS192) were already determined to be not eligible for listing on the NRHP and the findings of the 2001 survey concur with the previous assessments of the sites. The current project has made reference to these investigations and has reexamined several of the sites recorded by them. Additional information has been gathered on the history of the area from Mary Elizabeth Good's publication on the Bird Creek Basin (Good 1977).

A pedestrian survey of the remaining 2,434 acres of the Candy Lake project site was completed in 2003 and 2004. Locations of eight previously recorded archeological sites were revisited and

reevaluated (Table 3-5). They are sites 34OS148, 34OS149, 34OS150, 34OS151, 34OS152, 34OS153, 34OS154, and 34OS158. The scope of work and schedule for the current fieldwork allowed the crew to reexamine known archeological sites by conducting limited shovel testing along with the pedestrian walkover. At least two of the sites, 34OS149 and 34OS150 yielded surface and subsurface material indicating the presence of cultural deposits having some level of integrity. However, cultural deposits at site 34OS149 appear to be of very low density and may have a questionable degree of integrity. Therefore site 34OS149 was recommended as ineligible for listing on the NRHP. Only a single flake from one shovel test was recovered from site 34OS150, and provided no indication of the presence of intact prehistoric or historic cultural deposits at the site. Therefore site 34OS150 was also recommended as ineligible for listing on the NRHP. Four of the sites could not be relocated using GPS plotting, walkover, and shovel testing. One site, 34OS154, appears to have been destroyed. One other site, 34OS152, appears to be a natural feature. This site had been recorded originally as a 2-3 course wall with evidence of fire nearby (recorded by Saunders 1980—does not appear in survey report). Because only a few rocks were observed, it might be conjectured that much of the structure has eroded away in the intervening years. There was no good evidence, however, that any of the rocks observed during this survey had been placed deliberately.

Efforts to relocate the remaining previously recorded archeological sites were unsuccessful. Site 34OS148 was originally recorded as a small artifact scatter and sites 34OS151, -153, and –158 were originally recorded as prehistoric lithic scatters. Thus, based on previous archeological work and because sites 34OS148, -151, -153, and -158 could not be relocated, they were recommended as ineligible for listing on NRHP.

Two additional historic period archeological sites were recorded on the Candy Lake property, 34OS699, and 34OS700 (see Table 3-5). Site 34OS699 was identified as a more recent home site and appears to date from a time after the initial Osage allotments, and does not seem to conform to the location of any known Osage homestead in the project area. Its later date, lack of structural integrity, and lack of clear association with recorded Osage tribal activity suggests that it is ineligible for inclusion in the NRHP. No additional research is recommended there at this time.

Table 3-5. Archeological Sites Recorded, and Recommended NRHP Status

Site No.	USACE NRHP Eligibility Determination	OAS NRHP Eligibility Determination	SHPO NRHP Eligibility Determination
34OS147	Ineligible	Ineligible	N/A
34OS148	Ineligible	Ineligible	Ineligible
34OS149	Ineligible	Ineligible	Ineligible
34OS150	Ineligible	Ineligible	Ineligible
34OS151	Ineligible	Ineligible	N/A
34OS152	Ineligible	N/A	Ineligible
34OS153	Ineligible	Ineligible	N/A
34OS154	Ineligible	Ineligible	N/A
34OS155	Eligible, but mitigated	Sufficient mitigation completed	N/A
34OS156	Ineligible	Ineligible	N/A
34OS157	Ineligible	Ineligible	N/A
34OS158	Ineligible	Ineligible	N/A
34OS187	Ineligible	Ineligible	Ineligible
34OS191	Ineligible	Ineligible	N/A
34OS192	Ineligible	Ineligible	Ineligible
34OS664	Potentially eligible	Potentially eligible	N/A
34OS699	Ineligible	N/A	Ineligible
34OS700	Potentially eligible	N/A	Potentially eligible

Site 34OS700, also a historic homestead, appears to have undergone greater alteration in modern times, with the addition of concrete and cinderblock features. The site cannot be considered NRHP-eligible based on structural integrity, but may have historic associations with a known Osage family, as well as archeological information. Additional research, both archeological and archival, is needed to confirm its NRHP status.

Lastly, it is important to evaluate the potential effect of the proposed property transfer on buried floodplain deposits that could not be tested within the parameters of the current project, as well as areas with heavy vegetative cover that could not be fully explored with shovel tests. Information from Saunders' earlier study provides a fairly clear picture of the broad sequence of deposition in the Candy Creek floodplain (Saunders 1980). It would be irresponsible to postulate the existence of well-preserved paleo-land surfaces based on Saunders's single radiocarbon date of 8,445±140 B.P. for Unit C, but it does suggest that sediments falling well within the time range of human occupation could occur at depths of more than nine feet below the current surface. Further, the possible existence of the Copan Paleosol at Candy Creek, known from other locations in the region, increases the probability that buried sites are present

that are closer to the ground surface and thus more susceptible to disturbance by ranching, farming, or oil production.

3.11 AESTHETICS

Aesthetic resources are the natural and man-made landscape features that appear indigenous to the area and give a particular environment its visual characteristics. Aesthetic resources are present throughout the project area and consist of woodlands and grasslands on ridges along the edge of the Candy Creek floodplain. In general, the visual characteristics of the area are open space consisting of natural areas within a primarily rural region.

3.12 HAZARDOUS, TOXIC, AND RADIOLOGICAL WASTE

The potential for discovery of hazardous, toxic, and radiological waste (HTRW) during the conveyance procedures of the Candy Lake property was evaluated through examination of historic and current land use, review of environmental data bases, interviews with local regulatory personnel, and visual observations.

Lands in the project area are primarily composed of agricultural land, undeveloped riparian woodlands and other categories of undeveloped lands. As such, these lands have not been subject to industrial development or other land use activities with associated potential for significant HTRW contamination. In addition, lands in close proximity to the project area share similar land uses and have a low potential for contaminant transport to the project. Accordingly, there is no reason to believe that environmental media in the project area have been significantly contaminated by past or current land practices or by releases from adjoining properties. No hazardous, toxic or radiological waste was observed, and potential for encountering these materials is minimal.

A search of environmental databases revealed no documented areas of HTRW contamination near the project location. A search of the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database revealed the presence of five CERCLIS-listed sites in Osage County, Oklahoma. However, all are a significant distance from the project. Similarly, 78 sites listed on the Resource Conservation and Recovery Information System (RCRIS) database were noted in Osage County, but also are removed from the area and are related primarily to petroleum activities. Based on the information in these

environmental databases, there is a low probability of HTRW related problems from documented sources of contamination.

In addition to searches of environmental databases, local personnel of the Tulsa District Corps of Engineers in Osage and Tulsa County, Oklahoma were contacted for information related to potential areas of contamination that could affect conveyance procedures. None of the individuals contacted were aware of any HTRW related issues near the project.

Although petroleum activities are not considered under HTRW guidelines, a Phase I Environmental Site Assessment was conducted in September and October 2003 to identify recognized environmental conditions, as defined in ASTM Standard E 1527-00, associated with oil and gas exploration and production on the project. Historical and current oil and gas exploration and production was evident through historical records, light-duty roads, shut-in wellheads, active producing wells, flow lines, pits, and tank batteries. Historical records indicate that over 200 wells have been drilled on the project since the early 1900's. Most impacts identified were at active well sites and tank batteries. Some residual contamination was still present at inactive tank batteries that historically had adverse impacts. Impacts identified during the assessment included stained soil and erosion scars from previous oil and brine releases, crude oil at virtually all active wells, spills or leaks from drums of chemicals, spills during oil or salt water transfer, overflow of brine or crude oil, spills during cleaning out of tanks, and naturally occurring radioactive material above background levels. The assessment concluded with evidence of two recognized environmental conditions, as defined in ASTM Standard E 1527-00; releases of crude oil and brine at well locations and tank batteries, and naturally occurring radioactive material levels greater than two times background levels at two tank batteries.

Finally, a site visit was conducted in May 2004 and included a search for sites with visual evidence of potential HTRW-related problems. The site visit included the use of ATV's for greater access to and better coverage of the project area. Visual evidence of potential HTRW contamination such as areas of soil staining, unusual vegetative distress, drums of containerized waste, unusual topography (mounds or depressions), or other indicators of HTRW contamination was not noted at any location. A few solid waste dumping areas were noted that consisted essentially of household waste (household products, furniture, appliances, etc.) that could contain hazardous material. However, the areas are small (generally less than 20 feet x

20 feet). The potential for discovery of hazardous materials in these areas exists due to the unknown nature of the products disposed, although the likelihood of encountering a significant problem is low. Apart from these small areas that appear to be household trash dumps, the potential for discovery of HTRW during the land transfer is believed to be very low. However, no toxic or hazardous substances subject to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or requiring removal have been identified.

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