ALNRC 00025
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Enclosure B

Red-line strikeout changes to Sections 2.4, 4.1, 4.2 and 4.3 of the ER

2.4 ECOLOGY

This section describes the ecosystems and ecological characteristics of the areas that could potentially be impacted by the construction of Unit 2~~. The~~, the transmission lines and the collector well facilities at the Callaway Plant in Callaway County, Missouri. This section contains two main subsections: 1) Terrestrial Ecosystems, and 2) Aquatic Ecosystems. These subsections include a discussion about the affected ecosystems, flora and fauna, and important species on the Callaway Plant site.

2.4.1 TERRESTRIAL ECOLOGY

The terrestrial ecology of the Callaway Plant site, including the Callaway Plant Unit 2 construction zone, was characterized in a series of field studies conducted over a one year period extending from March 2007 to March 2008. The AmerenUE property boundary includes the area owned by AmerenUE and generally coincides with the Reform Conservation Area (Reform CA) which is managed by the Missouri Department of Conservation (MDC). The field studies included surveys for terrestrial vegetation, herpetofauna, avifauna, mammals, waters of the U.S. (including wetlands), adult/juvenile fish, benthic macroinvertebrates, and surveys for the state endangered lake sturgeon (Acipenser fulvescens). Methods used in each of these surveys are documented in the Standard Operating Procedures (SOP) for the Callaway Nuclear Plant Unit 2 Siting Study, Natural Resources Field Sampling and Analysis (MACTEC, 2007). In general, study methods within the ecological investigation area (the area included within a 6 mile (10 km) radius of Callaway Plant Unit 2) included a review of available mapping, databases, and correspondence with the appropriate agencies. Within the AmerenUE property, however, these methods were supplemented with field studies as outlined in the SOP. The subsections below summarize relevant information from each of these studies and provide other data on existing terrestrial ecology in accordance with the guidance in NUREG-1555 (NRC, 1999).

A topographic map of the site is provided as Figure 2.3-1.

2.4.1.1 Terrestrial Habitats

The floral survey covers each plant community type (terrestrial habitat type) observed on the AmerenUE property in 2007. The Reform CA and AmerenUE property are located at the northern edge of the Ozark Highlands in the Outer Ozark Border subsection (Nigh and Schroeder, 2002). The Outer Ozark Border consists of a belt of deeply dissected hills and bluff lands bordering the Missouri and Mississippi Rivers. Relief in the hills is 200 ft to 300 ft (61 m to 91 m), but smooth, loess covered uplands grade into adjacent ecoregions. A variety of ecological landscapes or Landtype Associations (LTAs) recognize differences in topography, geology, soils and potential natural vegetation in the Outer Ozark Border. Reform CA is subdivided by two LTAs: the Central Missouri Savanna/Woodland Dissected Plain on its northern half and the Central Missouri Oak Woodland/Forest Hills on the southern half. The flat to gently rolling uplands on the north half of Reform CA are blanketed in loess and were formerly prairie and oak savanna. The hilly portion of Reform CA has long, narrow loess covered ridges which give way to moderately steep slopes in Mississippian and Devonian limestones. This landscape was historically oak savanna and woodland high in the landscape, with white oak and mixed hardwood forests on lower slopes and bottoms. Limestone glade-woodland complexes were historically common, especially in the Devonian limestone. These landscapes offer a wide variety of potential natural communities and habitats.

The 2007 land cover survey consisted of plant community cover type mapping of both the site and ecological investigation area. U.S. Geological Survey (USGS) 2005 Land Use and Land Cover (LULC) mapping for the ecological investigation area was examined. The LULC data were noted to be coarse (30-meter grid) and contained some errors in actual cover type. Although these

data were utilized for the ecological investigation area, they were determined to be inadequate for the site due to their coarse level of detail and potential for error. As such, photo interpretation of existing land cover on the site was performed at a 1 inch (3 cm) to 300 ft (91 m) scale over 2006 National Agricultural Imagery Program (NAIP) aerials and utilizing data from the LULC to verify initial cover type. Field reconnaissance was performed within the site boundary to ground truth each cover type identified. Ground truth reconnaissance was not performed within the ecological investigation area. A map of the plant community types is presented in Figure 2.4-1 (site) and Figure 2.4-2 (ecological investigation area), and each plant community type is briefly discussed below.

Impervious, High Intensity Urban, and Low Intensity Urban – Impervious areas include streets, parking lots, and buildings with little, if any, vegetation. High Intensity Urban includes vegetated urban environments with a high density of buildings. Low Intensity Urban includes vegetated urban environments with a low density of buildings. Within the ecological investigation area these three land cover types occupy 666 acres (270 hectares), 0 acres (0 hectares) and 252 acres (102 hectares) respectively. These three land cover types occupy 338 acres (137 hectares), 114 acres (46 hectares), and 37 acres (15 hectares) of the site respectively. On site these land cover types are associated with the developed area of the plant site itself including roadways.

Cropland – Land cover mapping in 2007 identified 2,039 acres (825 hectares) of cropland on the AmerenUE property and 11,370 acres (4,600 hectares) of cropland in the ecological investigation area. Most of the cropland occurs in the northern part of the site surrounding the plant and south of Route 94 in the Missouri River floodplain. The designation of cropland includes land in row crops or close-grown crops and other cultivated or non-cultivated land such as hayfields or pastureland. On site row crops consist of corn (*Zea mays*), wheat (*Triticum aestivum*), and soybeans (*Glycine max*) whereas pastureland and hayfields consist primarily of red clover (*Trifolium pratense*), alfalfa (*Medicago sativa*), and various grasses such as Timothy (*Phleum pratense*) and fescue (*Festuca elatior*). Common weeds associated with Cropland include giant ragweed (*Ambrosia trifida*), annual ragweed (*A. artemisiifolia*), and foxtail (*Setaria glauca*). In 2007 MDC contracted with two permittee farmers who were awarded haying and cattle grazing contracts on the Reform Conservation Area. Other cropland on site consists of sunflowers (*Helianthus annuus*), corn and wheat left in the field as wildlife food plots (*Newbold, 2007*).

Grassland – Grasslands are lands which are dominated by native warm season or non-native cool season grasses and occupy approximately 481 acres (195 hectares) of the AmerenUE property and 12,025 acres (4,867 hectares) of the ecological investigation area. Grasslands occur primarily on the relatively flat uplands surrounding the AmerenUE property and on the levees protecting cropland in the Missouri River floodplain. Native warm season grasslands occur on the loess covered uplands of the dissected plains on the north half of Reform CA. Known locally as Coate's Prairie, this area was plowed and farmed early in the history of the area. Today, these units are a mixture of fescue dominated cropland, pasture, and native warm season grass plantings (Newbold, 2007). Native warm season grasslands surrounding the plant are dominated by big bluestem (*Andropogon gerardii*), broomsedge (*Andropogon virginicus*), little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), and switch grass (*Panicum virgatum*). Prairie and old field forbs are also present such as black-eyed Susan (Rudbeckia hirta), white wild indigo (*Baptisia alba*), ironweed (*Vernonia baldwinii*), tall goldenrod (*Solidago altissima*), and late boneset (*Eupatorium serotinum*). One large field to the east of the plant is dominated by eastern gamma grass (*Tripsacum dactyloides*) which was intentionally planted by MDC to provide habitat and forage for wildlife. Non-native cool season grasslands exist sporadically in areas surrounding the AmerenUE property and on the levees in

the Missouri River floodplain. Non-native cool season grasses include fescue, Timothy, and Kentucky bluegrass (*Poa pratensis*).

Glade – Glades are open, rocky barren areas dominated by drought-adapted forbs and native warm-season grasses. Glades occupy 4 acres (1.6 hectares) of the AmerenUE property and appear as essentially treeless openings within landscapes primarily dominated by woodlands. Rock outcrops characterize glades with bedrock near the surface, shallow soils and the absence of a developed canopy layer (Nelson, 2005). Limestone glades are listed in the *Missouri Species and Communities of Conservation Concern* (MDC, 2007a) as imperiled with a State Rank S2 (S2 = Imperiled in the state because of rarity or because of some factor(s) making it especially vulnerable to extirpation from the state). Limestone glades within the AmerenUE property are situated on narrow midslope bands on southwest-facing forested slopes. The MDC has engaged in periodic cutting and burning to remove invading cedar trees. Common glade species observed include side oats grama (*Bouteloua curtipendula*), big bluestem, little bluestem, purple prairie clover (*Dalea purpurea*), Missouri black-eyed Susan (*Rudbeckia missouriensis*), and fragrant sumac (*Rhus aromatica*).

Deciduous Forest – The Deciduous Forest cover type consists of forests with greater than 60% cover of deciduous trees. This cover type occupies 3,550 acres (1,437 hectares) of the AmerenUE property and 36,934 acres (14,947 hectares) of the ecological investigation area and was the most common cover type identified. Deciduous Forest on site primarily includes upland forests dominated by white oak (*Quercus alba*), black oak (*Q. velutina*), northern red oak (*Q. rubra*), and shagbark hickory (*Carya ovata*). Other common canopy trees include sugar maple (*Acer saccharum*), shingle oak (*Q. imbricaria*), bur oak (*Q. macrocarpa*), white ash (*Fraxinus americana*), hackberry (*Celtis occidentalis*), mockernut hickory (*Carya tomentosa*), and eastern red cedar (*Juniperus virginiana*). The forest understory consists of flowering dogwood (*Cornus florida*), downy service berry (*Amelanchier arborea*), and saplings of canopy species. Forest ground cover is patchy and, where present, includes Christmas fern (*Polystichum acrostichoides*), tick trefoil (*Desmodium glutinosum*), white snakeroot (*Eupatorium rugosum*), Virginia wild rye (*Elymus virginicus*), coral berry (*Symphoricarpos orbiculatus*), and fragrant sumac. There is no active forest management within the Reform CA other than some burning and thinning in a few small glade and savanna areas.

Evergreen Forest – The Evergreen Forest cover type consists of forests with greater than 60% cover of evergreen trees. At the AmerenUE property this cover type occupies 13.5 acres (5.5 hectares) and exists solely in the form of a pine plantation. The pine plantation is located adjacent to and northwest of the restricted access portion of the AmerenUE property and was intentionally planted in the 1930s with red pine (*Pinus resinosa*) and eastern white pine (*Pinus strobus*). The pine plantation has not been maintained in the recent past and thus a sparse shrub layer has become established consisting of hackberry, white ash, box elder, elderberry (*Sambucus canadensis*), and black raspberry (*Rubus occidentalis*). Ground cover in the pine plantation includes Virginia wild rye, coral berry, white snakeroot, poison ivy (*Toxicodendron radicans*), and pokeweed (*Phytolaca americana*). The Evergreen Forest cover type also occupies 2,027 acres (820 hectares) (or approximately 3%) within the ecological investigation area.

Deciduous Woody/Herbaceous – The Deciduous Woody/Herbaceous cover type consists of open woodland, including early successional forest, with less than 60% cover of deciduous trees and occupies 1,230 acres (498 hectares) of the AmerenUE property and 1,084 acres (439 hectares) of the ecological investigation area. This land cover type is scattered throughout the site and also includes many of the maintained transmission line corridors. Common woody species include shingle oak, white oak, white ash, persimmon (*Diospyros virginiana*), sassafras (*Sassafras albidum*), sycamore (*Platanus occidentalis*), slippery elm (*Ulmus rubra*), coral berry,

and aromatic sumac. Common herbaceous species include purpletop (*Tridens flavus*), giant foxtail (*Setaria faberii*), Virginia wild rye, broomsedge, Queen Anne's lace (*Daucus carota*), partridge pea (*Chamaecrista fasciculata*), poison ivy, and tall goldenrod (*Solidago altissima*).

Evergreen Woody/Herbaceous – The Evergreen Woody/Herbaceous cover type consists of open woodland, including early successional forest, with less than 60% cover of evergreen trees and occupies 340 acres (138 hectares) of the AmerenUE property. There were no areas of this land cover type mapped in the ecological investigation area. At the site this land cover type consists primarily of eastern red cedar thickets that have invaded glades, forest openings, pasture and old field habitat. Other woody species that can be found growing in association with the eastern red cedar include other early successional species such as persimmon, sassafras, slippery elm, black locust (*Robina pseudo-acacia*), coral berry, and fragrant sumac. Occasional immature white oak and bur oak (*Quercus macrocarpa*) are also observed. Herbaceous species may include remnant glade species such as little bluestem, big bluestem, and side oats grama (*Bouteloua curtipendula*), or typical old field species such as purpletop, giant foxtail, Queen Anne's lace and various goldenrod species.

Woody-Dominated Wetland – The Woody-Dominated Wetland cover type consists of forests with greater than 60% cover of trees with semi-permanent or permanent flood waters and occupies 402 acres (163 hectares) of the AmerenUE property and 2,108 acres (853 hectares) of the ecological investigation area. At the AmerenUE property this land cover type includes both floodplain forests and true jurisdictional forested wetlands as defined in the 1987 *Corps of Engineers Wetlands Delineation Manual.* Floodplain forests and true forested wetlands occur along the floodplains of Logan Creek, the Mollie Dozier Chute and the Missouri River. Common woody species within these communities include silver maple (*Acer saccharinum*), box elder (*A. negundo*), cottonwood (*Populus deltoides*), black willow (*Salix nigra*), peach-leaved willow (*S. amygdaloides*), and sycamore. Herbaceous groundcover, where present, includes barnyard grass (*Echinochloa crusgalli*), Virginia wild rye, water heartsease (*Polygonum coccineum*), and giant ragweed (*Ambrosia trifida*).

Herbaceous-Dominated Wetland - The Herbaceous-Dominated Wetland cover type consists of woody shrubland with less than 60% cover of trees with semi-permanent or permanent flood waters and occupies 32 acres (13 hectares) of the AmerenUE property and 154 acres (62 hectares) of the ecological investigation area. At the AmerenUE property this cover type includes portions of the four treatment lagoons adjacent to and immediately south of the plant as well as the emergent- and shrub-dominated wetlands delineated on site and on the fringe of the site stormwater runoff ponds. Dominant shrubs include black willow, peach-leaved willow, and sandbar willow (*Salix interior*). Herbaceous ground cover includes arrowhead (*Sagittaria latifolia*), narrow leaf cattail (*Typha angustifolia*), and various sedge species (*Carex sp.*).

Open Water – Open Water consists of rivers, lakes, ponds, and other open water areas and occupies 149 acres (60 hectares) of the site and 2,318 acres (938 hectares) of the ecological investigation area. Open Water on the AmerenUE property includes stormwater runoff ponds, fishing ponds, cattle ponds, portions of Logan Creek and the Mollie Dozier Chute, and the segment of the Missouri River under the transmission line corridor. The Mollie Dozier Chute is a backwater slough that frequently dries up subject to the ebb and flow of the Missouri River. The Mollie Dozier Chute defines the boundary of Binggeli Island which stretches from approximate River Mile (RM) 119 to just past RM 116. The transmission line crosses the Missouri River approximately at RM 117.5.

2.4.1.2 Important Terrestrial Species and Habitats

NUREG-1555 (NRC, 1999a) defines important species as: 1) species listed or proposed for listing as threatened, endangered, candidate, or of concern in 50 CFR 17.11 and 50 CFR 17.12 (CFR, 2007a), by the U.S. Fish and Wildlife Service, or the state in which the project is located; 2) commercially or recreationally valuable species; 3) species essential to the maintenance and survival of rare or commercially or recreationally valuable species; 4) species critical to the structure and function of local terrestrial ecosystems; or 5) species that could serve as biological indicators of effects on local terrestrial ecosystems. Floral and faunal surveys that document observations made on the AmerenUE property are summarized herein.

Table 2.4-1 provides a list of rare, threatened or endangered species identified within Callaway and Osage Counties in Missouri by the MDC Natural Heritage Database (MDC, 2008). Terrestrial species listed within the two counties include fifteen plant species, eight insect species, two amphibian species, one reptile species, three bird species, and two species of mammals. From this list of rare, threatened or endangered terrestrial species, only the gray bat (*Myotis grisescens*), bald eagle (*Haliaeetus leucocephalus*), and northern harrier (*Circus cyaneus*) were confirmed as important species by way of formal agency consultation (MDC, 2007m; USFWS, 2007b) and/or field studies. The remaining terrestrial species listed in Table 2.4-1 were not considered important species for the Callaway Plant Unit 2 project because they were not identified during formal agency consultation or they were not observed during the 2007 field studies.

The American elm (*Ulmus americana*), long-tailed weasel (*Mustela frenata*), sharp-shinned hawk (*Accipiter striatus*) and ruffed grouse (Bonasa umbellus) were identified previously as species of concern in the Environmental Report for Callaway Plant Unit 1 (Union Electric Company, 1976). Although the American elm was observed during the 2007 vegetation surveys, it is no longer listed as a species of conservation concern in the State of Missouri and is thus not considered an important species.

The long-tailed weasel has an S2 State Rank (imperiled) and was listed by the MDC Natural Heritage Database as being potentially present in Callaway County (Table 2.4-1) but it was not identified as a species of concern by either the State or the U.S. Fish and Wildlife Service (USFWS) during consultation and it was not observed during the 2007 field surveys. As such, the long-tailed weasel is not considered an important species.

The sharp-shinned hawk has an S3 State Rank (vulnerable) in Missouri but was not listed by the MDC Natural Heritage Database as being present in either Callaway or Osage County. Furthermore, it was not identified as a species of concern during agency consultation nor was it observed during the 2007 bird surveys. As such, the sharp-shinned hawk is not considered an important species.

The ruffed grouse has an SU State Rank (unrankable due to lack of information or conflicting information) in Missouri but was not listed by the MDC Natural Heritage Database as being present in either Callaway or Osage County. Furthermore, it was not identified as a species of concern during agency consultation nor was it observed during the 2007 bird surveys. As such, the ruffed grouse is not considered an important species.

Although not listed within Callaway or Osage Counties by the MDC Natural Heritage Database, the Indiana bat (*Myotis sodalis*) was identified during consultation with the USFWS as a species of concern for the Callaway Plant Unit 2 project and thus is considered an important species.

The white-tailed deer (*Odocoileus virginianus*), northern bobwhite quail (*Colinus virginianus*), mourning dove (*Zenaida macrooura*), and wild turkey (Meleagris gallopavo) were identified as important species on the basis of their value as recreational species.

Table 2.4-2 lists each species and habitat identified as important for the Callaway Plant site and surrounding area according to the criteria in NUREG-1555 (NRC, 1999). Each species deemed an important species is discussed in more detail below.

2.4.1.2.1 Mammals

Methodology for the identification of mammal species within the ecological investigation area consisted of records review (i.e., recorded range/distributional records and MDC records for game species) and agency consultation. Appropriate agency consultation was conducted as described in Section 2.4.1.8. On the AmerenUE property these methods were supplemented with a review of previous studies (Union Electric, 1976) as well as additional field studies including general site reconnaissance and observation, road kills, and the use of small mammal traps placed along five study transects established in upland forest, bottomland forest, grassland and old field habitat. Along each of the five transects, 20 Sherman live traps were set for two consecutive trap nights in the spring and fall in accordance with the *Standard Operating Procedures (SOP) for the Callaway Nuclear Plant Unit 2 Siting Study, Natural Resources Field Sampling and Analysis* (MACTEC, 2007). Supplemental field studies within the site were used in part to characterize the assemblage of mammal species and to aid in the identification of important species within the AmerenUE property. Refer to ~~Figure 2.4-5~~ Figure 2.4-3 for terrestrial ecology study locations on site.

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Typical mammal species observed during field surveys included white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor hirtus*), eastern cottontail (*Sylvilagus floridanus*), opossum (*Didelphis virginiana*), and rodent species such as the white-footed mouse (*Peromyscus leucopus*), deer mouse (*Peromyscus maniculatus*), and house mouse (*Mus musculus*). The complete list of mammals observed on site is recorded in Table 2.4-3. Based on the methodology outlined above three mammal species, the white-tailed deer, gray bat (*Myotis grisescens*), and Indiana bat (*Myotis sodalis*), are considered important species at the AmerenUE property. White-tailed deer are considered important because they are recreationally valuable since they are hunted in Callaway County and throughout the state. The gray bat and Indiana bat are considered important because they are listed federally as endangered species and agency consultation identified them as species that may potentially use the Reform CA.

2.4.1.2.1.1 White-Tailed Deer

White-tail deer are extremely common throughout the rural areas of Missouri. They were observed in all habitats on the AmerenUE property during the 2007-2008 faunal survey. They were also one of the most frequently observed mammal species on site. The 2007 deer harvest for Callaway County recorded by the MDC included 2,164 antlered bucks, 760 button bucks, and 2,349 does for a total of 5,273 white-tail deer harvested (MDC, 2007b). In addition, due to the large deer population at Reform CA, the first managed deer hunt was held in November 29 through December 2, 2007. There were 102 hunters present at the managed hunt, and they harvested 29 deer (does and yearling bucks).

White-tail deer utilize a wide variety of habitats, including woodlands and dense thickets along the edge of forests adjacent to open fields (MDC, 2007c). The dense thickets provide cover while the fields provide opportunities to forage. Fragmented forests provide good habitat for these large herbivorous mammals. The Reform CA provides ideal habitat for deer with an abundance of forest edge, grassland/old field, and row crops.

Usually in late October or early November, female white-tail deer enter estrus which is also considered the rutting season. Females mature sexually at different ages depending on population densities; however, most mature between one and two years of age. Males compete for mates during the rut, often not eating or resting, resulting in a loss of physical condition. For female white-tail deer gestation takes between six and six and a half months usually producing only one fawn the first year, but often producing two or even three fawns in the following years. Fawns are weaned at approximately six weeks of age; however they begin grazing just days after they are born. Around 18 months males reach puberty, and they begin growing their first rack during the first spring after their birth.

Historically the natural predators of white-tail deer consisted of wolves, mountain lions, and other large carnivores. However, in Callaway County there are few natural predators, and the population levels of deer are primarily controlled by hunting.

2.4.1.2.1.2 Gray Bat

The gray bat was listed as a federally endangered species on April 28, 1976 [U.S. Fish and Wildlife Service (USFWS), 1982]. Nationally, populations of gray bats are found primarily in Alabama, northern Arkansas, Kentucky, Missouri and Tennessee. When the Gray Bat Recovery Plan was written in 1982, there had been an estimated 50% decline in the national gray bat population (USFWS, 1982). Gray bats have been recorded historically in the ecological investigation area in the vicinity of the AmerenUE property in a cave along Auxvasse Creek. Although no surveys were conducted during 2007 to determine their presence, their historical presence in the ecological investigation area coupled with the presence of suitable habitat within the normal foraging range for this species, it is assumed that gray bat is present in the ecological investigation area and possibly on site.

Gray bats live in caves year round that are typically located within two miles of streams, rivers, or lakes. They do not hibernate or roost in houses or man-made structures. In the winter, their hibernation caves (hibernacula) are usually vertical (pit) caves that have cool, stable temperatures ranging from 42 degrees to 52 degrees Fahrenheit (6 degrees to 11 degrees Celsius). The summer caves usually have domed ceilings and are warmer (58 degrees to 77 degrees Fahrenheit (14 degrees to 25 degrees Celsius)). Gray bats may also require a corridor of forest vegetation connecting the roosting cave to potential foraging areas. This corridor of forest cover protects them from predation. Their foraging habitat consists primarily of areas along rivers, streams, and reservoirs (USFWS, 1982).

During September and October, adult female gray bats enter hibernacula and are shortly followed by males and juvenile females. Gray bats hibernate in large, loose clusters across the cave ceiling and walls. In early March to mid-April, female bats emerge from hibernation and establish summer roost colonies, while males remain in the cave until mid-April or May. Gray bat winter (hibernation) and summer caves can be from a few to 200 miles (322 km) apart. They often use other caves as rest stops as they migrate to their summer roosting caves. From late May to June, pregnant females roost in maternity colonies in caves separate from males and young females. In June, each gray bat female gives birth to a single young. Four weeks later these young gray bats are able to fly. In July and August, mothers and their young rejoin the bachelor colonies. Gray bats return to the same caves year after year for roosting and hibernating.

The decline of gray bat populations has occurred for many of the same reasons that other bat species have declined. The major causes of the historical decline of the gray bat population in Missouri included human disturbance to caves, commercialization of caves, pesticide contamination, and in some cases reservoir construction that flooded some important caves.

Although threats to gray bat populations still exist, gray bat populations are currently increasing. The greatest threats to gray bat populations in Missouri are the following: human disturbance, cave modification, pesticide and pollution, and the destruction of riparian areas.

2.4.1.2.1.3 Indiana Bat

The Indiana bat was federally listed as endangered March 11, 1967 (USFS, 2008). The majority of the nation's Indiana bats are found in Kentucky, Indiana, and Missouri. Since the 1960s, there has been dramatic decline of over 50% of the Indiana bat population (Clawson, 2003). No bat surveys were conducted at the AmerenUE property during 2007. However, historically Indiana bats have been observed in the vicinity and the site is within their habitat range. It is therefore assumed that they are present at the AmerenUE property. Indiana bats are also listed as state endangered. Over the last 20 years their population has declined significantly across Missouri. Missouri has approximately 5,000 known caves but only 27 have ever been known to contain Indiana bat populations (MDC, 2007d). Over 85% of the nationwide Indiana bat population hibernates in only eight different locations. Three of these eight locations are located in Missouri: in Iron, Shannon, and Washington counties (MDC, 2007d).

Indiana bats usually forage in the treetops of riparian forests and floodplains. Indiana bats are completely insectivorous, eating a diet that includes mostly moths, but also mosquitoes and aquatic insects (MDC, 2000). In addition to riparian forests they also forage in upland forests and in low fields and pastures. During the winter months Indiana bats require cool hibernacula with stable temperatures of about 40 degrees Fahrenheit (4 degrees Celsius) with the relative humidity remaining within the range of 66% to 95%. During the summer months females form maternal roost colonies in tree cavities or under loose bark of large diameter trees, such as shagbark hickory (*Carya ovata*) and cottonwood (*Populus deltoides*). Some male Indiana bats also roost within tree cavities or under the flaking bark of trees during the summer (MDC, 2000).

In early October, Indiana bats mate as they swarm at the entrances of hibernation caves in southern Missouri (MDC, 2000). Very few caves provide the necessary humidity and cold temperatures for them to properly hibernate. During hibernation their metabolism slows significantly, allowing them to conserve their fat reserves throughout the winter months. Indiana bats hibernate in clusters of from several hundred to several thousand bats. Sometimes they are clustered so closely there may be 400 bats per square foot. Since few caves (and a few mines) provide the required conditions, they return to the same cave year after year (MDC, 2000).

When spring arrives, females leave hibernacula and fly north searching for summer roost sites where they roost and raise one young (MDC, 2000). The majority of females will find roosts and raise their young in the northern half of Missouri. The females form maternity colonies consisting of 50 to 100 individuals (MDC, 2007d). Most males leave the cave and travel in small groups, roosting under the loose bark of trees. However, some males will spend the summer remaining in the hibernation caves (MDC, 2000).

The Indiana bat depends on different habitats during the summer and winter making it vulnerable to disturbances to either habitat (MDC, 2007d). One of the primary causes of decline has been the disturbance of hibernating bats in their winter caves. When humans enter caves and disturb the bats, the bats may wake and use up crucial food reserves before spring arrives. Another impact to hibernation caves is the improper installation of gates at cave entrances, which may either alter the humidity and temperatures of the cave or make the cave inaccessible to bats. Other hibernation caves have been flooded as a result of the creation of reservoirs. Indiana bat summer habitat has been altered by deforestation, agricultural development, and stream channelization (MDC, 2007d). According to biologists' surveys, in the

1970s there were approximately 399,000 Indiana bats in Missouri, while in 2003 there were approximately 66,800 Indiana bats remaining in the state (Clawson, 2003). Although the populations of some northern states are growing, namely Illinois, Indiana, New York, Ohio, and West Virginia, these numbers do not compensate for losses in the rest of the country (Clawson, 2003).

2.4.1.2.2 Birds

Methodology for the identification of bird species within the ecological investigation area consisted of records review (i.e., recorded range/distributional records and MDC records for game species) and agency consultation. Appropriate agency consultation was conducted as described in Section 2.4.1.8. On the AmerenUE property these methods were supplemented with a review of previous studies (Union Electric, 1976) as well as additional field studies including general site reconnaissance and observation, spring waterfowl spot counts, roadside bird surveys, and transect surveys along the same five study transects established in upland forest, bottomland forest, grassland and old field habitat. Five transects were surveyed on foot on two separate days during each season (spring, summer, fall, winter) wherein the observers inventoried all birds seen or heard with 65 ft (20 m) of the transect centerline (MACTEC, 2007). Three roadside survey routes were established (Figure 2.4-3) and were sampled seasonally (spring, summer, fall, winter). Observers stopped at 0.5 mile (0.8 km) intervals to record all birds seen or heard during a three-minute sampling period. Each route was driven on two separate dates during each season with observations initiated approximately 15 minutes before sunrise each day (MACTEC, 2007). Supplemental field studies within the site were used in part to characterize the assemblage of bird species and to aid in the identification of important species within the AmerenUE property. Refer to Figure 2.4-3 for terrestrial ecology study locations on site.

Typical bird species observed during field surveys included northern cardinal (*Cardinalis cardinalis*), blue jay (*Cyanocitta cristata*), American crow (*Corvus brachyrhynchos*), American robin (*Turdus migratorius*), and tufted titmouse (*Baeolophus bicolor*). The complete list of birds observed on site is recorded in Table 2.4-4. Based on the methodology outlined above five bird species including the bald eagle (*Haliaeetus leucocephalus*), northern harrier (*Circus cyaneus*), northern bobwhite quail (*Colinus virginianus*), wild turkey (*Meleagris gallopavo*), and mourning dove (*Zenaida macrooura*), are considered important species at the AmerenUE property. The bald eagle and northern harrier are considered important because they are listed in Missouri as state-endangered species and both were observed on site. The northern bobwhite quail, wild turkey and mourning dove are considered important species because all three are recreationally valuable species that are harvested locally and throughout the state.

2.4.1.2.2.1 Bald Eagle

The bald eagle was previously a federally listed species but due to its successful recovery it has now been de-listed. However, it is still listed as endangered for the State of Missouri and federally protected under the Bald Eagle Protection Act. Missouri now regularly has greater than 2,200 bald eagles each winter, making it one of the top states in the country in terms of bald eagle populations (MDC, 2007e). During the winter, Missouri's large rivers, lakes, reservoirs, and wetlands provide good habitat for the bald eagle. In particular they often congregate below the Mississippi River lock and dams where fish are plentiful. Bald eagles were observed at the Callaway site during the winter 2007 surveys along the Missouri River, along the Molly Dozier slough, and near Transect 2.

Bald eagles eat primarily fish but may also eat seagulls, waterfowl, small mammals, and carrion (MDC, 2000). They prefer nesting in tall trees in areas near large open waters such as lakes and

along rivers. The quality of the habitat seems to be more critical than its distance from the water source. Quality habitats provide a variety of prey with little to no human disturbance. Winter roost sites often are composed of clusters of large cottonwoods. Both nesting and roosting sites are often used for many years (USFWS, 2007a).

Bald eagles usually breed at the age of 4 or 5 years and mate for life (MDC, 2000). In Missouri nesting activity is usually initiated sometime from January 1st to March 1st (MDC, 2000). A large nest composed of sticks and lined with finer materials is built by the male and female. From March 1st to May 15th is the critical period for incubation and rearing of young. The pair will raise one to three young depending on the available food supply. The chicks hatch approximately 35 days after they have been laid and leave the nest about 12 weeks following hatching (MDC, 2007f).

Due to restrictions in DDT in 1972, the bald eagle population has greatly rebounded across the country. However, hunting in the late 1800s is what eliminated bald eagles in Missouri (MDC, 2007g). In the mid-1900s when DDT was negatively impacting bald eagles' ability to reproduce across the country, Missouri's eagles were already gone. Today, Missouri is one of the leading states in the country in terms of wintering bald eagle populations, and although not as dramatically, summer populations are also increasing (MDC, 2007e).

2.4.1.2.2.2 Northern Harrier

The northern harrier is not a federally listed species; however, it is state listed in Missouri as an endangered breeding species. During the mid-1900s northern harrier populations experienced a serious decline due to the thinning of their egg shells from pesticides and a loss of wetlands, their nesting habitat (MDC, 2007i). Although listed as an endangered breeding species, northern harriers are a common migrant in open grassland habitats in Missouri (MDC, 2007h). During the 2007 bird surveys, two northern harriers were observed along Transect 10 within cropland of the Missouri River floodplain.

Northern harriers require nesting areas without disturbance in either low lying or elevated areas (MDC, 2007h). Lowland habitats include pastures, prairies and dry ground in marshes, while their habitats in elevated areas include shrubby vegetation, tall weeds, and reeds. Their foraging habitat consists of open fields, grasslands, prairies, and shallow marshes (MDC, 2007h).

Leaving their winter habitats in Texas and Mexico, in March and April northern harriers arrive in Missouri for breeding (MDC, 2007i). They usually form loose nesting colonies late in the season. Northern harriers build their nests in undisturbed lowland areas on dry ground in marshes, prairies, and pastures, or on elevated ground in tall weeds, reeds, or shrubby vegetation. Their eggs incubate for 30 to 32 days, and their young are fledged approximately five weeks later (MDC, 2007i). From February to May and again from September to November, northern harriers are common migrants in Missouri. They are frequently observed in open fields, grasslands, prairies, and shallow marshes foraging on large insects, small mammals, birds, frogs, toads, snakes, lizards, and carrion (MDC, 2007i).

The northern harrier population has declined due to a number of factors. One of the major factors impacting their numbers is habitat conversion, in the form of wetlands converted to uplands, native prairies converted to agriculture, and grasslands returning to forests (MDC, 2007i). In addition, the untimely mowing or haying of grasslands has also had negative impacts on nesting areas. In the mid-1900s, northern harrier populations experienced great losses because of egg shell thinning due to pesticides and losses of nesting habitat. In some parts of the country northern harriers have disappeared from their former nesting areas, especially in

the southern portions of their range. Surveys have found that northern harrier populations are still declining in many areas of North America (MDC, 2007i).

2.4.1.2.2.3 Northern Bobwhite

Northern bobwhites are one of the United States' most important game birds and they are found statewide in Missouri. During the 2007 bird surveys 29 northern bobwhites were observed in various vegetative communities.

Since northern bobwhites are year long residents of Missouri, they often are greatly impacted by winter ice and snow if adequate cover is not available. In addition, spring rains may also negatively impact the reproductive success of this ground-nesting species (Dailey, 1996). However, their large clutch sizes allow for the rapid recovery of their population following years of low productivity. The conversion of open woodlands into other land uses or their succession into forests has also negatively impacted this species (MDC, 2007j).

Northern bobwhites prefer tall grasslands, brushland, agricultural fields, and open woodlands (MDC, 2007j). However, they can also be found using forested areas. As ground nesters they require concealment from predators and adequate cover to protect them from inclement weather.

Northern bobwhites make ground nests in shallow depressions that are lined with grass (MDC, 2007j). They produce 10 to 16 eggs that incubate for 23 to 24 days. Six to seven days following hatching the young fledge. Northern bobwhites have a high annual mortality rate; therefore their populations can experience rapid turnover. However, during good years with weather and habitat being conducive, a pair can successfully produce two or more broods during a single breeding season (MDC, 2007j).

A recent study of northern bobwhite populations in Missouri has found a decrease in the average number of quail counted at various 30-mile (48-km) routes located across the state (Dailey, 2007). The average number counted in 2006 was 3.68 per route compared to an average of 3.30 counted in 2007. From 1983 to 2006 the average count per route was 7.55. It is possible that the severe winter storms that impacted Missouri during December 2006 and January 12-14, 20-21, and February 13, 2007, could be partly responsible for the reduced population numbers. However, the larger issue for northern bobwhites in Missouri is the reduced availability of quality habitat (Dailey, 2007). During the 2007 bird survey conducted at the AmerenUE property, the average count per driving route was 5.67 northern bobwhites.

2.4.1.2.2.4 Wild Turkey

Wild turkey are commonly observed throughout the rural areas of Missouri. During the 2007 bird survey on the site, 40 wild turkeys were observed in various different habitats on the AmerenUE property. In addition, a nest was observed at the northern edge of Transect 4 on May 4, 2007, that contained 12 eggs. The 2007 turkey harvest for Callaway County recorded by the MDC included 47 adult gobblers, 56 adult hens, 19 juvenile gobblers, and 61 juvenile hens for a total of 183 wild turkeys harvested (MDC, 2007b).

Wild turkey habitats vary depending on season and reproductive behavior. About one half of the year they spend in winter habitat (October-March). Winter habitat usually consists of at least 50% mature hardwood forest that includes a variety of oak species. This habitat must provide both shelter from inclement weather and a reliable food supply. The staple food of turkey within this habitat is acorns and other mast. Nesting habitat can be varied but usually hens nest near a permanent water source along the edges of old fields, trails, or in hay fields.

Summer/fall habitat is extremely critical to both hens and their young (poults). This habitat usually consists of mowed hay fields, grazed pasture, grasslands, glades, or open woods. These areas have less plant cover, which provides ample insects and seeds.

During the winter gobblers flock together apart from the hens, young hens, and jakes, then in the early spring winter flocks break up and courtship and mating begins (MDC, 2007k). As courtship begins, males travel greater distances searching for mates and gobbling increases along with strutting displays. Late April is usually the peak time for gobbling at which time most hens are laying eggs or already incubating. Incubation takes approximately 28 days and the average clutch size is 11 poults. When the last turkey has hatched, the hen leads her brood away from the nest. The mother hen must protect her poults during the first three weeks of their life, as they are vulnerable to cold weather and may be preyed on by foxes, coyotes, bobcats, or great-horned owls. When they are two weeks old, the poults can fly short distances and at 16 weeks they look similar to adults.

According to a 1997 study conducted by a Missouri Blue Ribbon Panel of wild turkey experts, the biggest factor to wild turkey populations is the weather during the spring nesting and brood-rearing seasons (MDC, 1997a). The biologists also found only a weak association between fluctuations of wild turkey populations and the populations of their natural predators. The experts also found that in some areas of the state poaching was having a large impact on the adult gobbler populations (MDC, 1997a).

2.4.1.2.2.5 Mourning Dove

One of the most widely distributed and abundant birds in North America, the mourning dove is found in all 48 contiguous states, Hawaii, southeastern Alaska, southern Canada, the Greater Antilles and Mexico (MDC, 2007l). In Missouri, the mourning dove is found in every county in the state with the largest populations being found in the west central portion. However, most Missouri doves migrate during the winter. Those in eastern Missouri usually move southeast into Louisiana, Alabama, Georgia and Florida, while those in western and central Missouri migrate to Texas, Louisiana, Mexico and Central America. Since mourning doves migrate across state lines and international boundaries, they are considered a Federal Migratory Species (MDC, 2007l). As such, populations are managed on a national level by the USFWS.

Mourning doves usually have an abundance of available food and water in Missouri. Following the harvest of crops, such as corn and wheat, waste grain is left behind and is a great food resource for mourning doves. In addition, the seeds of bristlegrass, foxtail, ragweed, pigweed, and other annual weeds are available in the fall. Mourning doves can nest in a variety of habitats from open grasslands to trees and shrubs. They particularly prefer nesting in fields, orchards, or other areas with abundant seeds and grains. Mourning doves also roost in a variety of habitats ranging from grasslands to dense timber (MDC, 2007l).

In March, mourning doves migrate to the nesting areas used during the previous year. The males begin calling from exposed branches to establish their breeding territories. In April, the males choose a nest site and with their mates begin constructing a nest. Mourning doves are strongly monogamous. Their nests are composed of two or three twigs that are placed on horizontal tree branches. These nests are flimsy and not very secure for eggs or nestlings. Sometimes mourning doves use old robin or bluebird nests as their own. In grasslands, mourning doves will nest on the ground. During nesting the male helps incubate the eggs, feed the nestlings, and chase away rival males. The eggs are typically incubated for 14 days, and the average clutch size is two. The recently hatched offspring are usually weaned at seven days and begin eating seeds. At 13 to 15 days, the young are fully fledged. The majority of bird species stop reproducing after a successful nest. However, mourning doves average five nests

per year. In July and August, juvenile doves begin flocking together at feeding and roosting sites. The flocks reach peak numbers in late August and early September. With the first signs of winter the mourning doves migrate south, most leaving by mid-October (MDC, 2007l).

Mourning doves have been very successful at adapting to and prospering from human influence. Native Americans set prairie fires that benefited doves by establishing bare ground for feeding sites and enhancing the growth of plants that produce seeds. Land use changes with modern settlement further increased the abundance of doves. These changes included forest clearing, crop farming, livestock grazing, and the burning and introduction of exotic seed-bearing plants, all of which helped dove populations. When the passenger pigeon became extinct in the early 1900s, mourning doves became popular as game birds. Recent land use changes, such as tree planting, irrigation, and building grain storage facilities, continue to enhance dove habitat. However, not all human activities have benefited mourning doves; the establishment of larger farms, clean farming (often includes fall plowing, no brushy fencerows, and frequent mowing), and chemical pollutants can reduce dove populations. (MDC, 2007l).

2.4.1.2.3 Insects

Surveys of terrestrial insect communities were not performed in the study area. Preoperational studies indicated that the most abundant and diverse group was the insects (Class Insecta), particularly the orders Thysanoptera (thrips), Homoptera (true bugs), and Coleoptera (beetles) (UE 1976). Arachnids (Class Arachnida, or spiders and ticks) were also well represented. Species composition was comparable between 1974 and 1975 data.

The only federally listed threatened or endangered insect species in Missouri are the American burying beetle (*Nicrophorus americanus*) and the Hine's emerald dragonfly (*Somatochlora hineana*) (MDC, 2007a). Neither of these species has been encountered in the ecological investigation area of the Callaway site. Small populations of the American burying beetle have been reported from states adjacent to Missouri – Arkansas, Nebraska, and Oklahoma (USFWS, 2007), but none have been encountered in Missouri since prior to 1975 (MDC 2000). This species has not been collected from either Callaway or Osage Counties. The Hine's emerald dragonfly has been found on one site (a fen in Reynolds County in 1999) in Missouri, but has not been collected near the Callaway Site (MDC, 2000; USFWS, 2001).

An additional eight species of conservation concern have been reported from either Callaway or Osage counties (see Table 2.4-1). These include three dragonflies, the Ozark clubtail (*Gomphus ozarkensis*), the gilded river cruiser (*Macromia pacifica*), and Westfall's snaketail (*Ophiogomphus westfalli*), a stonefly (*Acroneuria ozarkensis*), two butterflies, the swamp metalmark (*Calephelis muticum*) and the regal fritillary (*Speyeria idalia*), and two katydids, the two-voiced conehead (*Neoconocephalus bivocatus*) and the round-tipped conehead (*N. retusus*). Of these eight species, four (*G. ozarkensis, M. pacifica, N. bivocatus,* and *N. retusus*) are either not ranked globally or have an apparently secure (G4) status. Of the remaining group, two (*A. ozarkensis* and *O. westfalli*) have been collected only in Osage County, where activities are not anticipated to affect potential habitats for these species. None of these species were mentioned as being of concern during agency consultation associated with this project (MDC, 2007m; USFWS, 2007b) and are, therefore, not considered important species.

Plants

Methodology for the identification of terrestrial plants within the ecological investigation area consisted of records review (recorded distributional records) and agency consultation. Appropriate agency consultation was conducted as described in Section 2.4.1.8. On the AmerenUE property these methods were supplemented with a review of previous studies

(Union Electric Company, 1976; Fuller, 1981; Union Electric Company, 1987) as well as additional field studies including vegetative cover type mapping and ground truthing, general site reconnaissance, and transect surveys along the same five study transects established in upland forest, bottomland forest, grassland and old field habitat. Pedestrian transect surveys were performed during the growing season in the spring and fall in order to record the various terrestrial plant species growing on site (MACTEC, 2007). Supplemental field studies within the site were used in part to characterize the assemblage of terrestrial plant species and to aid in the identification of important species within the AmerenUE property. Refer to Figure 2.4-3 for terrestrial ecology study locations on site. The complete list of terrestrial plants observed on site is recorded in Table 2.4-5. Based on the methodology outlined above, there were no terrestrial plant species identified as important species at the AmerenUE property.

2.4.1.2.4 Habitats

At the AmerenUE property two terrestrial habitat types have been identified as important habitats: limestone glade and U.S. Army Corps of Engineers (USACE) jurisdictional wetlands (see Figure 2.4-4). Glades are open, rocky, barren areas dominated by drought-adapted forbs, native warm-season grasses and typically contain an assemblage of specialized fauna. They appear as essentially treeless openings within landscapes primarily dominated by woodlands. Rock outcrops characterize glades with bedrock near the surface, shallow soils and the absence of a developed canopy layer (Nelson, 2005). Limestone glades are listed as imperiled with a State Rank S2 (S2 = Imperiled in the state because of rarity or because of some factor(s) making it especially vulnerable to extirpation from the state) (MDC, 2007a). Limestone glades cover approximately 4 acres (1.6 hectares) within the AmerenUE property and are situated on narrow midslope bands on southwest-facing forested slopes. The MDC has engaged in periodic cutting and burning to remove invading cedar trees. Common glade species observed include side oats grama (*Bouteloua curtipendula*), big bluestem, little bluestem, purple prairie clover (*Dalea purpurea*), Missouri black-eyed Susan (*Rudbeckia missouriensis*), and aromatic sumac.

The objective of the Clean Water Act (CWA) is to maintain and restore the chemical, physical, and biological integrity of the waters of the United States. Section 404 of the CWA authorizes the Secretary of the Army, acting through the Chief of Engineers, to regulate via a permit system the discharge of dredged or fill material into the waters of the United States, including wetlands. As such, the USACE issued the *Corps of Engineers Wetlands Delineation Manual* in January of 1987 (hereafter referred to as the 1987 Manual) to provide the methodology to determine whether a given area is a wetland for purposes of CWA Section 404 compliance. The 1987 Manual is the currently accepted guidance document for making wetland determinations and is the guiding document used to identify and delineate jurisdictional wetlands at the AmerenUE property. Wetlands at the AmerenUE property were delineated within the construction zones for the planned Unit 2, transmission line corridor, and collector well system in the floodplain of the Missouri River. Site wetlands included palustrine emergent wetlands (PEM), palustrine scrub shrub wetlands (PSS) and palustrine forested wetlands (PFO). Characteristic species within these wetlands include black willow, peach-leaved willow, silver maple, narrow-leaved cattail, and various sedge species. Jurisdictional wetlands on site are included within the Woody-Dominated Wetland and Herbaceous-Dominated Wetland land cover types as described in Section 2.4.1.1. It should be noted that not all areas mapped as Woody-Dominated Wetland or Herbaceous-Dominated Wetland would qualify as jurisdictional wetlands in accordance with the 1987 Manual. The jurisdictional wetlands delineated within the construction zones for the planned Unit 2, transmission line corridor, and collector well system in the floodplain of the Missouri River are identified in Figure 2.4-4.

2.4.1.2.5 Herpetofauna

Methodology for the identification of amphibians and reptiles (herpetofauna) within the ecological investigation area consisted of records review (i.e., recorded range/distributional records and MDC records for game species) and agency consultation. Appropriate agency consultation was conducted as described in Section 2.4.1.8. On the AmerenUE property these methods were supplemented with a review of previous studies (Union Electric, 1976) as well as additional field studies including general site reconnaissance and observation, spring night-time audio surveys for calling frogs and toads, live turtle traps, and transect surveys along the same five study transects established in upland forest, bottomland forest, grassland and old field habitat. Live turtle traps consisted of hoop net traps that were baited with fresh fish. Five traps were run for two consecutive days during the spring and fall season at various site ponds and streams (MACTEC, 2007). Supplemental field studies within the site were used in part to characterize the assemblage of amphibian and reptile species and to aid in the identification of important species within the AmerenUE property. Refer to Figure 2.4-3 for terrestrial ecology study locations on site. Typical herpetofauna species observed during field surveys included Blanchard's cricket frog (*Acris crepitans*), American toad (*Bufo americanus*), bullfrog (*Rana catesbiana*), fence lizard (*Scleroporus undulatus hyacinthinus*), and red-eared slider (*Trachemys scripta elegans*). The complete list of herpetofauna observed on site is recorded in Table 2.4-6. Based on the methodology outlined above there were no amphibian or reptiles identified as important species at the AmerenUE property.

2.4.1.3 Habitat Importance

The importance of the habitat found at the Callaway Plant Unit 2 site to important terrestrial species is discussed in the following paragraphs.

White-tail Deer: As habitat generalists white-tail deer can adapt to a variety of environments. The population at the AmerenUE property is so large that a managed hunt was introduced in 2007 to help reduce the population. Due to their ability to adapt to a variety of habitats, white-tail deer populations are resilient and are not often affected by localized habitat changes. In fact, white-tail deer populations have grown in the midst of habitat fragmentation associated with human construction and development. A discussion of the potential impacts to white-tail deer and the other important species as a result of the proposed construction activities is included in Section 4.3

Gray Bat: Gray bats have been recorded historically in the ecological investigation area in the vicinity of the AmerenUE property in a cave along Auxvasse Creek. However, there are no known records of gray bats on the AmerenUE property and no bat surveys were conducted in 2007. Potential foraging habitat is available along the riparian zones of Auxvasse Creek, Logan Creek, Mud Creek, Molly Dozier Slough, and the Missouri River.

Indiana Bat: Indiana bats have been recorded historically and are assumed to be present in the vicinity of the AmerenUE property. Large diameter trees with cavities or flaking bark that may provide roosting habitat exist at the site. Potential foraging habitat is available along the riparian zones of Auxvasse Creek, Logan Creek, Mud Creek, Molly Dozier Slough and the Missouri River and also in upland forested areas.

Bald Eagle: Although no nesting sites are known at the AmerenUE property, there is potential roosting and nesting habitat along the Missouri River. Since bald eagles will often reuse the same nest for many years, any disturbance to nesting sites could prevent the use of such nests in the future. Bald eagles invest much less energy into roosting sites, so these sites are less often reused.

Northern Harrier: Two northern harriers were observed at the AmerenUE property during the 2007 bird surveys. Northern harrier foraging habitat includes open fields, grasslands, prairies, and shallow marshes.

Northern bobwhite: Twenty-nine northern bobwhites were observed during the 2007 bird surveys at AmerenUE property. Since this species' breeding success is greatly affected by inclement weather, potential nesting areas with adequate cover are important habitats. Their preferred habitat includes tall grasslands, brushland, agricultural fields, and open woodlands (MDC, 2007j).

Wild Turkey: Forty wild turkeys were observed during the 2007 bird survey at the AmerenUE property. In addition, the Callaway County harvest numbers for wild turkey reflect the presence of a healthy population of wild turkeys. Wild turkeys use a variety of habitats based on their different needs at different times of year, including mature hardwood forest, old field, along trails, mowed hay fields, grazed pastures, glades, or open woods.

Mourning Dove: The mourning dove is one of the most widely distributed and abundant birds in North America; it is found in all 48 contiguous states, Hawaii, southeastern Alaska, southern Canada, the Greater Antilles and Mexico. In Missouri, the mourning dove is found in every county in the state with the largest populations being found in the west central portion. The 2007 bird surveys at the AmerenUE property observed 102 mourning doves in various habitats indicating a healthy population.

2.4.1.4 Disease Vector and Pest Species

~~A disease vector is an organism (commonly an insect) that carries disease agents (commonly bacteria or fungi) to a receptor host, which can be man, domestic or wild animals, or crops or wild plants. The only disease vector known to occur on the AmerenUE property is the deer tick (*Ixodes scapularis*) which has been known to transmit Lyme disease to humans. Lyme disease is a non-fatal but debilitating disease whose victims can display fever and severe joint pain. The causal agent is a bacterium, *Borrelia burgdorferi*, which is transmitted by the deer tick from white-tailed deer, squirrels, rodents, and other mammalian wildlife to humans.~~ A disease vector is an organism (commonly an insect) that carries disease agents (commonly bacteria or fungi) to a receptor host, which can be man, domestic or wild animals, or crops or wild plants. The only disease vector known to occur on the AmerenUE property is the deer tick (*Ixodes scapularis*) which has been known to transmit Lyme disease and tick-borne rickettsial diseases (TBRD) to humans. Deer ticks are abundant within the Reform CA. Lyme disease is a non-fatal but debilitating disease whose victims can display fever and severe joint pain. The causal agent is a bacterium, *Borrelia burgdorferi*, which is transmitted by the deer tick from white-tailed deer, squirrels, rodents, and other mammalian wildlife to humans. TBRD, such as ehrlichiosis/anaplasmosis and Rocky Mountain spotted fever, can be life threatening. Causative agents of TBRD include:

- *Ehrlichia chaffeensis* – human monocytic ehrlichiosis (HME);
- *Ehrlichia evingii* – human granulocytic ehrlichiosis (HGE);
- *Anaplasma phagocytophilum* – human granulocytic anaplasmosis (HGA); and
- *Rickettsia rickettsiae* – Rocky Mountain spotted fever.

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The Missouri Department of Health and Senior Services (MDHSS) issued a Health Advisory for the State of Missouri on June 14, 2007 following a TBRD-related fatality to a child from northeast Missouri on May 23, 2007 (MDHSS, 2007).

No pest species are known to be widespread or cause serious problems at the AmerenUE property and surrounding ecological investigation area. Sericea lespedeza (*Lespedeza cuneata*), however, is a non-native invasive plant species prevalent at several locations on the AmerenUE property primarily in disturbed areas. Sericea lespedeza was especially prevalent along roadside right of way (ROW) areas, transmission line corridors, fallow fields, and other areas of recent human disturbance. Sericea lespedeza is a native of eastern Asia and was originally introduced into the southern United States for ground cover, erosion control and forage/hay. Each mature plant can produce thousands of seeds which are dispersed in the fall by mowing, haying and bird consumption. Seeds may remain viable for several decades. Sericea lespedeza is problematic because it spreads rapidly, it is extremely difficult to control, and it out-competes and replaces many native species. Since its introduction into Missouri, sericea lespedeza has been widely planted and has become naturalized in most if not all Missouri counties. Although sericea lespedeza is designated a noxious weed in several Kansas counties, it has not yet been declared noxious in the State of Missouri.

2.4.1.5 Wildlife Travel Corridors

Wildlife tends to move across landscapes using distinct corridors of favorable habitat. Movement of most forest wildlife across fragmented agricultural and rural landscapes is enhanced by linear corridors of forest consisting of forested hedgerows, forested stream corridors, and forested ridge tops. The minimum width for a forest corridor to benefit wildlife is not known but may vary among species depending on body size and species-specific requirements. Wildlife movement may also be enhanced with closely spaced patches of favorable habitat that form "stepping stones" across areas of unfavorable habitat.

The landscape within the ecological investigation area is predominantly forested land fragmented by agricultural fields, small rural towns (Reform and Steedman), and rural residences. The landscape is crossed by a network of stream valleys – Auxvasse Creek, Mud Creek, Logan Creek, Big Tavern Creek, and their numerous unnamed tributaries. Most of the stream valleys in the lower reaches of the named creeks, however, have been cleared for agriculture. The riparian zones of the upper reaches of the named creeks and their smaller tributaries are mostly forested.

Within the AmerenUE property, the landscape is again mostly forested land fragmented by agricultural fields and the infrastructure associated with Callaway Plant Unit 1. The area to the south of Callaway Plant Unit 1 consists of predominantly large tracts of upland forest with small clearings for roads, transmission lines or small hayfields/pasture. Wildlife movement within this area is presumed to be essentially unimpeded. Immediately surrounding Callaway Plant Unit 1 and extending to the north, the landscape is more fragmented with large agriculture fields and narrow strips of woodland and hedgerow. These narrow strips of woodland and hedgerow may facilitate wildlife movement within and through the agricultural landscape.

The new water supply collector well system will be located within the floodplain of the Missouri River which primarily consists of row crops bordered by narrow bands of floodplain forest along the banks of the Missouri River and Mollie Dozier Chute. This floodplain corridor facilitates the movement of riparian zone species such as the gray bat, Indiana bat and bald eagle.

The AmerenUE property is located on the western edge of the Mississippi River "flyway" for migratory waterfowl. Spot surveys were conducted in the spring of 2007 to evaluate the

relative importance of site wetlands and ponds to migratory waterfowl. The only pond where waterfowl were congregating was P-6 but the numbers were small. In general, the ponds at the AmerenUE property are not considered a significant resource for migratory waterfowl.

The AmerenUE property is part of a larger avian travel corridor for neotropical migratory bird species. Bird surveys conducted in 2007 demonstrate the movement of neotropical species through the site, as evidenced particularly by the spring 2007 surveys.

2.4.1.6 Existing Natural and Man-Induced Ecological Effects

Existing natural stressors to site ecosystems include weather conditions, diseases, and insects. Plant species (especially trees) vary in their tolerance of, or sensitivity to, adverse conditions brought about by any of the aforementioned stressors. Sometimes tree decline and death can be attributed to a single condition, but often it is the interaction of multiple stressors that is the ultimate cause of death. Unseasonable frost, drought, flooding, lightning damage, and high winds are all examples of weather conditions that can stress trees. Anthropogenic activities such as mechanical injury from cutting and trimming associated with transmission line corridor clearing also cause stress on trees. In some cases, these environmental conditions can cause outright death. In other cases, these conditions can stress trees to the point that they are no longer able to withstand invasion by secondary disease organisms or insect pests (MACTEC, 2008).

Disease is a condition in plants brought about as a result of invasion of plant tissues by microorganisms. Primary diseases, such as oak wilt (*Ceratocystis fagacearum*) and Dutch elm disease (Ophiostoma sp.), are caused by microorganisms that can invade healthy plant tissues. These organisms consume plant-supplied water and nutrient reserves for their own growth, thereby creating stress on the tree. General forest decline disease complexes are generally caused by microorganisms that cannot invade tissues of healthy plants. When plants are stressed or injured, however, their normal resistance to invasion by decline-associated insects and pathogens is lowered. The disease-complex organisms then are able to invade plant tissues, causing further stress potentially leading to death of the tree (MACTEC, 2008).

Insects may cause direct or indirect damage to plants that may result in stress. Direct damage usually is a result of feeding on plant parts such as leaves, bark (cambial layers), wood, or roots. Oviposition (egg-laying) is another type of direct damage that can restrict the flow of water and nutrients in the plant. Insects may also cause indirect damage by serving as vectors of disease-causing organisms. In certain highly evolved pathologic systems, one or more insect-pathogen associations have evolved to spread disease within and among host plant populations (MACTEC, 2008).

Several upland areas in the northern part of the AmerenUE property are currently used for agriculture including row crops and hay/pasture land. Agricultural activities at the Reform CA in 2006 included 683 acres (276 hectares) of row crops (corn, wheat and soybeans), 409 acres (166 hectares) of hay, and over 800 acres (324 hectares) of pasture for grazing cattle. Permittee farmers also cleared approximately 270 acres (109 hectares) in 2006 for additional cropland, pasture and hayfields (Newbold, 2007). Furthermore, areas under the existing electric transmission lines on the AmerenUE property are periodically mowed and treated with herbicides to maintain the corridors and prevent trees from growing.

2.4.1.7 Other Ecological and Biological Studies

A forest pathology study was performed at the AmerenUE property in 2007 using infrared aerial photography (flown in July 2007), photointerpretation and subsequent ground-based

evaluation and diagnosis of stress and/or disease. Field phytopathological assessment and diagnosis was supported by laboratory analysis of field samples as needed. This study was performed to provide a baseline assessment of forest health prior to construction and operation of Unit 2 facilities. Most of the deciduous and evergreen tree cover at the AmerenUE property and surrounding area was determined to be healthy and in good condition. However, due to the interaction of weather-related stressors, disease, and insect factors, some general decline was determined to be inevitable. There seemed to be no apparent pattern of stressed vegetation and the general forest decline noted did not appear to be due to the operation of the Callaway Plant Unit 1. The study concluded that the general health of the forests at the AmerenUE property is typical of other forests of similar age and stand structure in Missouri (MACTEC, 2008).

No other ecological or biological studies are known from the AmerenUE property within the last five years other than the surveys described herein. These studies were completed in spring 2008.

2.4.1.8 Regulatory Consultation

Agency consultation was conducted to identify known occurrences of Federal and State listed threatened, endangered, or special status species and critical habitat at the AmerenUE property and ecological investigation area. Regulatory consultation included correspondence with the MDC and the USFWS. Agency consultation letters are provided (MDC, 2007m; USFWS, 2007b) and were used in part to identify important species, as defined in NUREG-1555 (NRC, 1999). Important species are identified in Section 2.4.1.2 (Terrestrial) and Section 2.4.2.2 (Aquatic).

2.4.1.9 Offsite Transmission and Access Corridors

There will be one new transmission line associated with the construction and operation of Callaway Plant Unit 2. This new transmission line will be approximately 6.7 miles (10.8 km) in length and 150 ft (45.7 m) in width and will be located immediately adjacent to (and on the west side of) the existing transmission line which extends southward out of the plant and crosses the Missouri River (Figure 2.4-4). The new transmission line will terminate at the tie-in point with another transmission line coming from the west called the Loose Creek line.

~~Methodology for the identification of flora and fauna within the transmission line corridor is the same as discussed in Section 2.4.1.1 (Terrestrial Habitat) and Section 2.4.1.2 (Important Terrestrial Species and Habitat).~~ Methodology for the identification of flora and fauna within the proposed transmission line corridor is same as discussed in Sections 2.4.1.1 (Terrestrial Habitat) and 2.4.1.2 (Important Terrestrial Species and Habitat). Specifically, surveys were conducted during the growing season in 2007 to identify baseline vegetation and wildlife and to identify important species within the proposed transmission line.

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The planned transmission line corridor consists of areas mapped predominantly as Deciduous Forest, Deciduous Woody/Herbaceous, and Cropland. Dominant trees within the Deciduous Forest include white oak, black oak, northern red oak, shagbark hickory, sugar maple, and white ash. The Deciduous Woody/Herbaceous cover type consists of open woodland and early successional forest and includes various oak species, persimmon, sassafras, slippery elm, coral berry, aromatic sumac, and various herbaceous old field species. Cropland within the transmission line corridor consists of row crops such as corn and soy beans.

Other terrestrial habitats mapped within the planned transmission line corridor include Grassland, Evergreen Woody/Herbaceous, Woody-Dominated Wetland, and

Herbaceous-Dominated Wetland. Complete descriptions of these cover types are provided in Section 2.4.1.1.

Common fauna encountered within the transmission line corridor include white-tailed deer, gray squirrel, eastern cottontail, northern cardinal, American goldfinch, eastern wood pewee, downy woodpecker, northern mockingbird, and mourning dove. Important species that may utilize the transmission line corridor include white-tailed deer, mourning dove, bobwhite quail, and wild turkey. No rare, threatened, or endangered species (flora or fauna) were observed within the transmission line corridor.

2.4.2 AQUATIC ECOLOGY

2.4.2.1 Aquatic Habitats

2.4.2.1.1 Freshwater Bodies Onsite

Freshwater bodies near the AmerenUE property include eight ponds approximately circling the operational and main proposed construction areas, several ephemeral or intermittent streams in all directions, 2 permanent streams to the south, and the Missouri River to the south (Figure 2.4-5). Drainage east of the plant enters a series of intermittent tributaries of Logan Creek, which drains directly into the Missouri River approximately 0.5 miles (0.8 km) downstream of the plant water intake structure. Drainage north and northwest of the plant enters intermittent tributaries of Auxvasse Creek, which drains into the Missouri River approximately 6 miles (10 km) upstream of the intake structure. Drainage southwest of the plant enters intermittent tributaries of Mud Creek, which drains into Logan Creek approximately 2.5 miles (4.0 km) before it enters the Missouri River. Streams, with the exception of lower Logan Creek, have substrates consisting primarily of gravel and cobble, with sand generally present and boulders occasionally present. Lower Logan Creek has predominantly sand substrate.

Surveys of adult and juvenile fish in the Missouri River and in selected streams in the ecological investigation area were conducted in July 2007, October 2007, January 2008 and March/April 2008 (Table). Benthic macroinvertebrate surveys in the same locations were performed in September 2007 (Missouri River), November 2007 (streams), and March 2008(streams) ~~and April (Missouri River and streams) 2008~~ (Table 2.4-10). Fish sampling methods followed the procedures used in the pre-operational environmental study at the Callaway site. Macroinvertebrate methods followed the procedures used in that study for collections from the Missouri River. For stream macroinvertebrate collections, methods followed those currently recommended by the Missouri Department of Natural Resources (MDNR, 2002).

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2.4.2.1.1.1 Missouri River

In the Missouri River, six fish sampling locations were surveyed using shoreline electrofishing, gill netting, hoop netting, and beach seining. A total of 4,128 fish representing 45 distinct species was collected (Table 2.4-8). Results indicated communities typical of large river habitats, including several species (e.g., shovelnose sturgeon, paddlefish, river shiner, channel shiner, and blue sucker) that are typically caught only in major rivers (Pflieger 1997). Samples were numerically dominated by gizzard shad, red shiner, and emerald shiner. Other common large-river species present in samples included shovelnose sturgeon, speckled chub, bullhead minnow, river carpsucker, channel catfish, and freshwater drum. Total abundance was substantially greater, and species richness was slightly higher, in collections from the near shore (plant side) zones. Total abundance was also higher in the zones adjacent to, and downstream of, the plant intake as compared to the zone upstream of the intake. Total richness was greatest

in the adjacent zone (34 species), followed closely by the upstream (33) and downstream (30) zones, respectively. Abundance patterns primarily reflected differential capture of schooling species, rather than habitat differences among sampling locations. Nearly all species that have been consistently encountered in historical collections from this reach of the Missouri River were found in the 2007 – 2008 survey (UE, 1976; CDM, 1981; C. Gemming, MDC, personal communication August 17, 2007). The exceptions were highfin carpsucker and white crappie. Catch-per-unit-effort (CPE) rates were greatest in electrofishing and seining samples, substantially lower in gill net samples, and extremely low in hoop net samples (Table 2.4-9). The same trend was evident for species richness. Gill netting resulted in the capture of two species – lake sturgeon and paddlefish – that were not collected by any other method. Black crappie was collected only while hoop netting.

Benthic macroinvertebrate communities were likewise characteristic of large rivers. A total of 814 organisms representing 54 taxa was obtained in these surveys (Table 2.4-10). Taxonomic composition and abundance were much greater in towed (water column) samples than in ponar (depositional substrate) samples (Table 2.4-11). The most abundant taxa in ponar samples included burrowing mayflies (~~Hexagenia~~ *Hexagenia* and ~~Pentagenia~~ *Pentagenia*), the Asiatic clam ~~Corbicula~~ *Corbicula*, and tubificid worms. In tow samples, the mayfly ~~Labiobaetis~~ *Labiobaetis* and the caddisflies ~~Hydropsyche orris~~ *Hydropsyche orris* and ~~Potamyia flava~~ *Potamyia flava* were the dominant taxa. Communities did not clearly differ between locations upstream and downstream of Callaway Plant, although ~~both~~ abundance was somewhat greater and taxa richness was slightly higher in the downstream zone. Both areas had numerous representatives of the Ephemeroptera, Plecoptera, and Trichoptera (EPT) groups, a category that is indicative of good stream quality (DeShon 1995; Barbour, et al. 1999). Many taxa that were reported in historical macroinvertebrate surveys were also collected in 2007 – 2008, despite much less sampling effort (UE, 1976; CDM, 1981, Poulton et al,. 2005). The most extensive taxa list for the Missouri River in the study area was reported by CDM (1981), when monthly surveys were conducted.

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2.4.2.1.1.2 Small Streams

Surveys for fish and benthic macroinvertebrates were performed in seven stream segments on the AmerenUE property (see Figure 2.4-5). These included Logan Creek (one perennial and two intermittent tributary segments), Mud Creek (one perennial and one intermittent segment), and unnamed tributaries of Auxvasse Creek (two intermittent segments). Samples were collected using 6-ft by 6-ft kick seines in riffle areas and 6-ft by 20-ft seines in the run and pool habitats. In summer and fall 2007, only three of the seven streams contained water, but these contained fish assemblages indicative of small, rocky-bottomed streams. In January 2008, two attempts were made to sample these streams. The first occasion followed a thunderstorm and the streams were too high and turbid to sample. On the second occasion, the streams that contained water were covered with ice more than an inch thick, and samples were not taken. In March, all seven streams contained flowing water, a reflection of the relatively wet conditions present in the early months of 2008. Samples from the two perennial stream segments were numerically dominated by sand shiner (Logan Creek only), redfin shiner, and mosquitofish (Table 2.4-12). Other common or abundant species included stonerollers, red shiner, creek chub and orangethroat darter. In the intermittent stream segment – a tributary of Auxvasse Creek – that generally contained water, stonerollers comprised nearly 50% of the collection, with most of the rest consisting of juvenile centrarchids. For three of the four streams that contained water only in March 2008, abundance was extremely low. In the fourth – a tributary of Logan Creek – the assemblage consisted almost entirely of juvenile centrarchids. Taxonomic richness was substantially higher in the two perennial segments, ranging from 16 to 21 species, as compared to only 5 or less in the intermittent sample reaches. No threatened or endangered species, or species of special conservation concern were found in these samples. Almost all the

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stream species that were collected in previous surveys of creeks in the AmerenUE property (CDM, 1981 and 1982; C. Gemming, MDC, personal communication August 17, 2007) were collected in the present study. The exceptions included golden shiner and common shiner in the 1981 study, and fathead minnow and blackspotted topminnow in the 2003 (MDC) study.

Benthic macroinvertebrate collections were performed at 3 of the 7 small stream locations in fall 2007 – the perennial segments of Logan Creek and Mud Creek and at one of the intermittent tributaries of Auxvasse Creek. In March 2008, all seven contained flowing water and invertebrate assemblages. A total of ~~928~~ 6,940 specimens representing ~~56~~ 107 distinct taxa was found in these samples (Table). As noted in the fish surveys, total richness was greater in the permanent sections of Mud Creek and Logan Creek (56 to 63 taxa) as compared to the intermittent stream sections (19 to 39 taxa). Crustaceans, particularly the isopods ~~Caecidotea~~ *Caecidotea* and ~~Lirceus~~ *Lirceus*, and the amphipod ~~Crangonyx~~ *Crangonyx* were common to abundant in the study area. Flatworms (Turbellaria), mollusks (e.g., physid snails and sphaeriid clams), and tubificid worms (e.g., ~~Branchiura sowerbyi~~ *Branchiura sowerbyi* and ~~Limnodrilus~~ *Limnodrilus* spp) were other common non-insect taxa. Mayflies (~~Caenis~~ *Caenis* and ~~Stenonema femoratum~~ *Stenonema femoratum*), stonefiles (~~Allocapnia~~ *Allocapnia* and ~~Isoperia~~ *Isoperia*) and caddisflies (~~Ironoquia~~ *Ironoquia* and ~~Rhyacophila~~ *Rhyacophila* spp) were most numerous in the permanent sections of Logan and Mud creeks. Aquatic beetles were largely represented by the riffle bettles ~~Dubiraphia~~ *Dubiraphia* and ~~Stenelmis~~ *Stenelmis*, and the water penny ~~Ectopria~~ *Ectopria*. Among the dipteran family Chironomidae, the most abundant genus was ~~Hydrobaenus~~ *Hydrobaenus*, ~~Cricotopus/Orthocladius~~ *Cricotopus/Orthocladius*, ~~Chironomus~~ *Chironomus*, ~~Eukiefferiella claripennis~~ *Eukiefferiella claripennis* gp. ~~Glyptotendipes~~ *Glypotendipes*, ~~Kiefferulus~~ *Kiefferulus*, and ~~Stictochironomus~~ *Stictochironomus*) were also common at one or more of the sample sites.

2.4.2.1.1.3 Ponds

Six of the eight ponds at the site were built as catch basins during the original construction of the plant and two existed prior to Unit 1 construction (see Figure 2.4-5). They were built near the upper points of intermittent drainages, to prevent migration of material away from the site. They range approximately in size (area) from 2 to 15 acres (0.8 to 6.1 hectares). Depths are generally five feet or less. Deeper spots (7 ft to 10 ft (2 m to 3 m)) were found during surveys at ponds P1 and P6. Four of the ponds (P1, P2, P7, and P8) are actively managed by MDC, and are open to the public for fishing (S. Voney, MDC, personal communication, August 15, 2007; B. McKeage, MDC, personal communication). Surveys of three of the ponds (P1, P6, and P8) were conducted by MDC in June 2004. Four species were collected. Largemouth bass and bluegill were common to abundant in each of the ponds. Two to three channel catfish were found in each pond. A single green sunfish was collected in P6. Each of the ponds contained young-of-the-year centrarchids, indicating that some reproductive activity is occurring.

In 1984, MDC stocked lake sturgeon into five of the ponds – P1, P2, P4, P5, and P6. Gill net surveys were performed in November 2007 in an attempt to determine whether individuals of this species remained in any of these ponds. A total sampling effort of 4 to 6 net days was performed at each pond. No fish were collected at ponds P2 and P4, although common snapping turtles – ranging from 8.2 inches to 9.4 inches (205 mm to 235 mm) in carapace length – were found in each. At pond P1, one common carp 16.1 inches (403 mm in length) and two channel catfish 17.4 inches to 18.5 inches (434 mm to 462 mm) were collected. At pond P6, three channel catfish 27.6 inches to 29.3 inches (691 mm to 733 mm) were found, and at P7, two channel catfish 15.6 inches to 17.4 inches (390 mm to 435 mm) and two freshwater drum 15.9 inches to 16.2 inches (397 mm to 405 mm) were collected.

2.4.2.1.1.4 Wetlands and Other Waters of the U.S.

Wetlands and streams were delineated on the AmerenUE property within the Unit 2 construction zone, the Unit 2 transmission line corridor (described in Section 2.4.1.9), and within the potential construction zone for the new water intake facilities in the well field area of the Missouri River. Wetlands were delineated in accordance with the 1987 *Corps of Engineers Wetlands Delineation Manual*. In addition, wetlands were deemed jurisdictional waters of the United States if a direct hydrologic connection could be made to a Traditional Navigable Water, such as the Missouri River, in accordance with the U.S. Supreme Court ruling in *Solid Waste Agency of Northern Cook County versus U.S. Army Corps of Engineers*. Streams were identified as jurisdictional waters of the United States based on the presence of an ordinary high water mark (OHWM), bed and bank, and the presence of a surface water connection to Traditional Navigable Waters of the United States such as the Missouri River.

Because the Callaway Site was sited at the highest point in the local landscape, several small drainages radiate away from the plant to the north and south. These small unnamed streams are tributary to several named streams in the site and ecological investigation area including Auxvasse Creek, Mud Creek, and Logan Creek, all of which are tributary to the Missouri River. Since the small unnamed drainages and named streams are connected to the traditionally navigable waters of the Missouri River, all said drainages and streams are considered jurisdictional waters of the U.S.

In general, four wetland types were delineated at the AmerenUE property: isolated ponds, stormwater runoff ponds, Logan Creek wetlands, and big river wetlands located within the Missouri River floodplain. Functional values for each of the four wetland types are presented in Table .

Isolated Ponds – In the higher elevations surrounding the plant site are several small, non-jurisdictional, isolated ponds which are classified by Cowardin, et al. (1979) as palustrine unconsolidated bottom (PUB) wetlands. Most of these isolated ponds are man-made and were constructed for grazing cattle. Some of the isolated ponds have developed a fringe community of wetland vegetation consisting of cattails (*Typha angustifolia* and *T. latifolia*), arrowhead (*Sagittaria latifolia*), sedges (*Carex spp.*) and willows (*Salix amygdaloides* and *S. nigra*). The isolated ponds surrounding the AmerenUE property are typically too small and many are not permanent enough (vernal) to support fish which makes them valuable breeding habitat for salamander, frog, and toad species. This is especially true for the ponds not being used by cattle. Because the ponds are not connected via a significant nexus to the traditionally navigable waters of the Missouri River, the isolated ponds are not considered jurisdictional waters of the U.S. and would not be regulated by the USACE.

Site Ponds – Also located in the higher elevations surrounding the Callaway Plant are the larger site ponds (designated as P-1 through P-8 in Figure 2.4-5) on the small unnamed streams radiating away from the plant. Six of the ponds were constructed as impoundments or catch basins during construction of Callaway Plant Unit 1. Because ponds P-2 through P-8 have a surface water connection to the unnamed streams which eventually flow into named streams and then to the Missouri River, these ponds are considered jurisdictional waters of the U.S. runoff pond P-1 is isolated and, thus, is not a jurisdictional water of the U.S. Some of the ponds have developed an emergent (PEM) or scrub-shrub (PSS) wetland fringe consisting of American lotus (*Nelumbo lutea*), cattails, sedges, and occasional black and peach-leaved willows. Because they are located in the headwaters of the various stream systems in the area, the ponds have played a valuable role in controlling runoff and retaining sediment. Ponds P-1, P-2, P-7, and P-8 are actively managed by the MDC and are open to the public for fishing. For additional information on the ponds see Section 2.4.2.1.1.3.

Logan Creek Wetlands – Only a small portion of the Logan Creek floodplain was surveyed for wetlands, primarily the portion that is traversed by the transmission line corridor. In this area a few wetlands were delineated with portions of PEM, PSS, and Palustrine Forested (PFO) wetlands in accordance with the Cowardin system (Cowardin, et al., 1979). These wetlands have direct surface water connections to Logan Creek and are thus considered jurisdictional waters of the U.S. Hydrophytic vegetation includes the dark green rush (*Scirpus atrovirens*), river oats (*Chasmanthium latifolium*), buttonbush (*Cephalanthus occidentalis*), black willow, silver maple (*Acer saccharinum*), and box elder (*A. negundo*).

Big River Wetlands – Wetlands identified on the floodplain of the Missouri River have been classified as either PEM, PSS or PFO wetlands (Cowardin, et al., 1979) and manifest the greatest overall functional value when compared with the other wetland types identified at the AmerenUE property (Table). High functional values associated with these wetlands include groundwater recharge/discharge, flood storage, fish habitat, nutrient/contaminant removal, wildlife habitat, and uniqueness/heritage value due to their importance for listed species such as gray bats (*Myotis grisescens*), Indiana bats (*M. sodalis*), and bald eagles (*Haliaeetus leucocepahlus*). Many of the same plant species identified in the Logan Creek wetlands were also observed in the Missouri River floodplain wetlands. These big river wetlands are considered adjacent to the traditionally navigable waters of the Missouri River and are thus jurisdictional waters of the U.S.

2.4.2.2 Important Aquatic Species

NUREG-1555 (NRC, 1999a) defines important species as: 1) species listed or proposed for listing as threatened, endangered, candidate, or of concern in 50 CFR 17.11 and 50 CFR 17.12 (CFR, 2007a), by the U.S. Fish and Wildlife Service, or the state in which the project is located; 2) commercially or recreationally valuable species; 3) species essential to the maintenance and survival of rare or commercially or recreationally valuable species; 4) species critical to the structure and function of local terrestrial ecosystems; or 5) species that could serve as biological indicators of effects on local terrestrial ecosystems.

A list of species considered important in the project area was compiled based on these criteria and summarized in Table 2.4-15. A single species may meet more than one of the five criteria. A 6th criterion, status as a potential nuisance to plant operation, is not discussed, as no nuisance aquatic species are expected to occur in the ecological investigation area of the project area.

- Species Under Special Protection – Threatened, Endangered, or Candidate Species: Any species that is known to occur or could occur in the various water bodies near the AmerenUE site that is afforded special protection under the federal Endangered Species Act, or under the equivalent State of Missouri law, is defined as an important species.

- Commercially Harvested Species: Fish that rely on habitat in the ecological investigation area of the AmerenUE site during any life stage, and are commercially harvested to a substantial degree, are considered important resources.

- Recreational Target Species: Fish that rely on habitat in the ecological investigation area of the AmerenUE property during any life stage, and are preferentially taken by recreational anglers or trappers to a substantial degree are considered important resources.

- Keystone Species: Any species that is essential to maintaining the structure and function of the aquatic ecosystem in the ecological investigation area of the AmerenUE site will be identified as important.

- Indicator Species: A species whose abundance, distribution, or condition is known or believed to be a reliable predictor of the status of another species of interest is considered an important species.

2.4.2.2.1 Description of Important Species

Each important species is described in terms of the following parameters, which provide a context within which site-related effects may be measured and interpreted:

- Critical life support (natural history) requirements, including spawning areas, nursery grounds, food habits, feeding areas, wintering areas, and migration routes (including maps)

- Temporal and three-dimensional spatial distribution and abundance, especially in the discharge area and receiving water body (including maps)

- Seasonal catch data (location, volume, and value) for commercially and recreationally important species

- Existing stressors and adverse effects not related to the proposed project

2.4.2.2.2 Threatened/Endangered Species or Species of Concern

Four fish and two unionid mussels that are listed as either federally endangered or state endangered may potentially occur near the study area and were considered for this analysis. The fish are lake sturgeon, Topeka shiner, flathead chub, and pallid sturgeon. The mussels are the pink mucket and the scaleshell. Although neither of these species have been collected in the vicinity of the project, they were mentioned as species of concern during consultation with malacologists from the Missouri Department of Conservation and U.S. Fish and Wildlife Service (MDC, 2007m; USFWS, 2007b). Due to the remote likelihood of encountering either pink mucket or scaleshell in the study area, assessment of these species was limited to searches of historical records. Neither has been found in the Missouri River near the site, or in Auxvasse Creek – the only stream in the vicinity of the Callaway Site where surveys have been performed (S. McMurray, MDC, personal communication November 28, 2007). Six additional fish species were considered that were: (a) listed as vulnerable (S3) in Missouri (MDC, 2007a); (b) listed as critically imperiled (G1), imperiled (G2), or vulnerable (G3) globally (MDC 2007); and (c) had previously been collected in the study area (Pflieger, 1997) or were collected during this study. These are paddlefish, sturgeon chub, sicklefin chub, blacknose shiner, blue sucker, and plains topminnow.

Fifteen additional species that have been encountered in either Callaway or Osage County and that are included in Missouri's list of conservation concern (MDC, 2008) are listed in Table 2.4-1). These included nine fish and six mussel species, and were excluded from the following sections for one of three reasons. First, seven of the fish species – highfin carpsucker, starhead topminnow, mooneye, western silvery minnow, plains minnow, silver chub, and ghost shiner – have global status as secure (G5) or apparently secure (G4) (MDC, 2008). Second, two of the fish species – Alabama shad and Niangua darter – were encountered in streams of Osage County, but not in the Missouri River. No activity associated with this project is anticipated to affect any streams in Osage County. Third, the six mussel species – elktoe, rock pocketbook,

spectaclecase, elephant ear, black sandshell, and hickorynut – did not come up as species of concern during consultation with malacologists from the Missouri Department of Conservation and U.S. Fish and Wildlife Service (MDC, 2007m; USFWS, 2007b). Consequently, none of these taxa were considered as important species.

2.4.2.2.2.1 Lake Sturgeon

The lake sturgeon (*Acipenser fulvescens*) – listed as endangered by the state of Missouri – is a large (commonly 6 ft (1.8 m) or longer) primitive species that inhabits lakes and rivers in North America including the Mississippi River drainage and Hudson Bay and the Great Lakes (Pflieger, 1997). Prior to 1900, it was a common and economically important species. But overfishing, river pollution, and river damming have resulted in a steep decline in the number of lake sturgeon (Dewey~~, T.~~ and ~~D.~~ Sturgeon, 2001). LBDCR 09-0158

The lake sturgeon feeds on the bottom searching for snails, clams, insect larvae, and crayfish. Due to the limited light on the river bottom, lake sturgeons use their sensitive barbels to locate food items. Spawning occurs in small tributary streams when water temperatures reach 59 to 64°F (typically late spring). More than 500,000 adhesive eggs are deposited by females in the shallow water of gravel riffles. Lake sturgeon are a slow-growing, long-lived species, not reaching sexual maturity until an age of 15 to 20 years old and only spawn every 4 to 7 years, from then on (Smith, 2002).

One sub-adult specimen 30.9 inches (773 mm) in total length was collected from the Missouri River in a gill net upstream and across the river from the Callaway Site in January 2008. This species has also been collected by MDC in the Missouri River between river miles 112 and 132 in the period from 2001 – 2006 (C. Gemming, MDC, personal communication, August 17, 2007). In the 1980s, the MDC conducted a stocking program and introduced juveniles into lakes and rivers of the state (Pflieger, 1997). Five ponds on the AmerenUE property were stocked during this program. In November 2007, AmerenUE's subcontractor biologists surveyed these ponds using large (3-inch and 4-inch (8-cm and 10-cm)) mesh gill nets. Two to four nets were set in each pond for 48 hours, and were checked every 12 hours. No lake sturgeons were collected during this effort. Since the species requires clean (i.e., silt-free) sand or gravel substrate to spawn and extensive amounts of silt were present in these ponds, lake sturgeon may not have persisted.

2.4.2.2.2.2 Topeka Shiner

The Topeka shiner (*Notropis topeka*) – a federal and state endangered species – is a small, (1.5-inch to 2.5-inch (3.8-cm to 6.4-cm)) schooling minnow that occurs primarily in the runs and pools of prairie streams (Pflieger, 1997). Its historical distribution included portions of Iowa, Kansas, Minnesota, Missouri, Nebraska, and South Dakota ~~(web, 2007)~~. It has undergone a steep decline in abundance, believed to be primarily associated with increased sedimentation and water quality degradation from pesticide application, livestock operations, and urban development (Pflieger, 1997). LBDCR 09-0158

The Topeka shiner is a carnivorous, schooling fish found near the water surface or the midwater. In central Missouri, spawning occurs from late May to mid-July. During the spawning act, males will follow females by swimming below them. Topeka shiners spawn over the nests of green-and orange-spotted sunfish with males occupying territories around the edges of the sunfish nests). Males grow faster and larger than females. Breeding males will be tinged with orange on their head and body and have orange-red fins. Small tubercles will be present over the top portion of their head. The life span of a Topeka shiner is short, not exceeding three years and the majority of individuals reach sexual maturity by age 2 (Pflieger, 1997).

The species was collected from Auxvasse Creek, west of the site but within the ecological investigation area of the AmerenUE property, prior to 1945 (Pflieger 1997), but was not found in stream collections of the 2007/2008 study or in previous surveys of Logan Creek (UE, 1976; CDM, 1982.

2.4.2.2.2.3 Flathead Chub

The flathead chub (*Platygobio gracilis*) is an endangered species in Missouri (MDC, 2007a). It is a small (generally 4-inch to 6-inch (10-cm to 15-cm)) minnow found in the mainstems of large streams and rivers, generally in swift, turbid water (Pflieger, 1997). Its abundance has declined, however, from high levels (approximately 30% of small fishes) in seine collections from the Mississippi and Missouri Rivers in the 1940s to about 1% in the 1980s (Pflieger, 1987). The primary threats to this species are hypothesized to be habitat alterations changing riverine habitats to standing water habitats of reservoirs (Rahel and Thel, 2004a). The consequent reduction in turbidity aids both sight-feeding competitors for food and piscivorous species that prey on the flathead chub (Rahel and Thel, 2004a).

This continually moving, active minnow is found in schools with other large-river minnows. Since the flathead chub inhabits more turbid waters, it relies on external taste buds to locate food items. Its diet primarily constitutes small terrestrial insects that fall into the water. Other food items include invertebrates and detritus. In Missouri, this fish spawns in July and August (Pflieger, 1997). Breeding males exhibit small tubercles on the upper portion of head and body and on all fins except the caudal fin. These fish spawn in response to flooding to keep their semi-buoyant eggs afloat until hatching occurs. Strong river currents are required during the hatch to keep the weak-swimming fry suspended. Otherwise, the fry would sink to the bottom and become buried (Rahel and Thel, 2004a).

Flathead chub has been collected from the Missouri River upstream and downstream of the study area since 1980 (Pflieger 1997), and was collected in small numbers in pre-operational surveys for Callaway Site (CDM, 1982). It was not collected in the current study.

2.4.2.2.2.4 Pallid Sturgeon

The pallid sturgeon (*Scaphirhynchus albus*) is a federally listed endangered species, as well as an endangered species in Missouri (MDC, 2007a). This large (up to 5 ft (1.5 m) in length) primitive species occurs throughout the Missouri River and in the Mississippi River downstream of the mouth of the Missouri (Pflieger, 1997). It inhabits open channels of large turbid rivers, preferring bottom areas with strong currents and firm substrate (Pflieger, 1997). The pallid sturgeon has been listed as an endangered species since 1990; its decline is believed to be attributable to overfishing and habitat destruction associated with the impoundment of the upper Missouri River (Kallemeyn, 1983).

The diet of the pallid sturgeon consists of aquatic invertebrates and fish. The pallid sturgeon consumes more fish than the similar shovelnose sturgeon. Males reach sexual maturity at 5 to 7 years of age while females do not spawn until the age of 15 to 20 years of age with several years between spawning events thereafter. Females may contain several hundred thousand eggs. Hybridization with the shovelnose sturgeon has occurred in the most recent decades, likely due to human-induced changes in their environment that brought the two species in more direct competition (Pflieger, 1997).

Pallid sturgeon has been collected from the Missouri River near the study area since 2001 by MDC (C. Gemming, MDC, personal communication, August 17, 2007). It was not encountered in pre-operational studies conducted near the Callaway site, or in the current study.

2.4.2.2.2.5 Pink Mucket

The pink mucket (*Lampsilis abrupta*) is found in gravel and cobble substrates of rivers and streams (Oesch, 1984). This species occurs in several states containing or bordering the lower Mississippi and Ohio Rivers and their large tributaries (MDC, 1997b). It is state and federally listed as an endangered species (MDC, 2007a). Its decline has been attributed to habitat alteration from dam construction, channelization, river dredging (MDC, 1997), and overharvest by the commercial mussel industry (USEPA, 2007).

The pink mucket is a long-term breeder in that the glochidia (larvae) are found in females in September and are held by the females until they are released the following June. Six species have been confirmed as suitable hosts for the pink mucket: largemouth bass, spotted bass, smallmouth bass, walleye, sauger, and freshwater drum. In order to attract the host, the female pink mucket possess a spot on the shell that mimic a fish eye. Once the host is attracted to the female, she releases the glochidia to attach themselves to the host (USEPA, 2007).

Pink mucket individuals and shells have been collected from lower portions of the Osage and Gasconade Rivers, near their entrances into the Missouri (A. Roberts, USFWS, personal communication November 28, 2007). Neither of these locations is within the ecological investigation area of the AmerenUE property.

2.4.2.2.2.6 Scaleshell

The scaleshell mussel (*Leptodea leptodon*) is a federally listed and state listed endangered species (MDC, 2007a). It occurs in medium to large rivers with low to medium gradients, primarily inhabiting stable riffles and runs with gravel or mud substrates and moderate current velocity (Roberts, 2007). Factors contributing to the decline of the scaleshell throughout its range include water quality degradation, sedimentation, and competition from the non-native zebra mussel (Roberts, 2007).

Little is specifically known about the scaleshell reproductive biology. Similar to the pink mucket described above, the scaleshell mussel is also believed to be a long-term breeder. Females develop the unfertilized eggs in the fall, uptake the sperm released by the males, where the fertilized eggs develop into glochidia. During the following spring or summer the female expels the glochidia for attachment to a suitable host (USFWS, 1998).

Currently, the scaleshell can only be found consistently in the Meramec, Bourbeuse, and Gasconade Rivers in central Missouri (Roberts, 2007). It has also been collected from the lower Osage River, upstream of the Callaway Plantsite, and from Auxvasse Creek, to the west of the plant (S. McMurray, MDC, personal communication November 28, 2007).

2.4.2.2.2.7 Paddlefish

The paddlefish is a large (commonly exceeding 60 pounds (27 kg)) primitive species with a cartilaginous, rather than bony, skeleton and an elongate, paddle-shaped snout (Pflieger, 1997). It is ranked as vulnerable (S3) in Missouri, although its global rank (G4) indicates that its status is apparently secure at present (MDC, 2007a). It is also a sport fish in Missouri, and is taken by snagging during its spawning season in the spring (Pflieger, 1997). This species was formerly abundant in the Mississippi River valley, but has declined in number since 1900 due to overfishing and habitat destruction (Pflieger, 1997).

Paddlefish require open water that is slow-moving during most of its life; however, it needs free-flowing water with the presence of gravel bars during its spring spawning season. Paddlefish swim free in open water continuously filtering out microcrustaceans and insect

larvae from the water with its gill rakers. Its long snout contains sense organs that are used to locate concentrations of food. Spawning occurs in the spring when the paddlefish migrate upstream during high water. The adhesive eggs are deposited on shallow, silt-free gravel bars for the males to fertilize. Eggs hatch in approximately nine days when water temperatures near 57°F. For a successful spawn, many days of high water are needed after the hatch in order to facilitate the newly hatched fry to be swept downstream. Paddlefish are long-lived where 20 year-old fish are common and some reach 30 years of age (Pflieger, 1997).

Paddlefish have frequently been encountered in Missouri River fish surveys near the Callaway site. Collections were reported from preoperational studies in 1974 and 1975 (UE 1976). Totals of 5 and 10 individuals were collected in 1980 and 1981 surveys, respectively (CDM 1981 and 1982). They have also been found in or near the study area since 2001 by the MDC (C. Gemming, MDC, personnel communication, August 17, 2007), and one specimen was collected in the current study.

2.4.2.2.2.8 Sturgeon Chub and Sicklefin Chub

The sturgeon chub (*Macrhybopsis gelida*) and the sicklefin chub (*Macrhybopsis meeki*) are small (2.5-inch to 3.5-inch (6.4-cm to 8.9-cm)) members of the minnow family that primarily inhabit large, turbid rivers. Both species are considered vulnerable (S3) in Missouri and vulnerable (G3) globally (MDC 2007). Both occur in the Missouri River and the Mississippi River downstream from the entrance of the Missouri (Pflieger, 1997). Sturgeon and sicklefin chubs have undergone population declines since the 1940s, a pattern that has been attributed to the conversion of riverine habitat to reservoir habitat in the upper Missouri River (Stukel, 2001).

Both the sturgeon chub and the sicklefin chub are confined to the open channels of large rivers in strong current over sand and gravel substrates. These minnows do not enter tributary streams. Both of these species are adapted for life in turbid water by having reduced eyes and external taste buds for locating food. The sicklefin chubs' eyes are even partly covered by skin. They are likely bottom feeders locating their food by taste. Spawning occurs in the spring. Breeding males of the sturgeon chub have small tubercles along the pectoral fin rays (Pflieger, 1997).

Sicklefin chub was previously collected from the Missouri River in pre-operational surveys; six specimens were found in 1981 and two were found in 1982 (CDM, 1981 and 1982). A single sturgeon chub specimen was encountered while seining upstream of the Callaway site. Additionally, MDC biologists encountered both species in surveys between river miles 112 and 132 between 2001 and 2006 (C. Gemming, MDC, personal communication, August 17, 2007).

2.4.2.2.2.9 Blacknose Shiner

The blacknose shiner (*Notropis heterolepis*) is a small (2-inch to 2.5-inch (5-cm to 6.4-cm)) minnow that inhabits small creeks and weedy shallows in natural lakes and ponds (Smith 1985). It is listed as imperiled (S2) in Missouri, but apparently secure (G4) globally (MDC, 2007). It is found in most states and Canadian provinces surrounding the great lakes; in Missouri, it is apparently restricted to streams in the upper Osage, Big Piney and Gasconade drainages and tributary streams of the lower Missouri River (Pflieger, 1997). Destruction of vegetated backwater habitat is proposed as the factor most attributable to declining numbers of this species (Mayhew, 1987).

The blacknose shiner is a schooling, midwater minnow that often occurs in association with other minnows: sand shiner, bigeye shiner, redfin shiner, bluntnose minnow, and brook silverside. It feeds near the bottom on insects, crustaceans, and other small invertebrates. In

Missouri, spawning occurs in June and July. Breeding males develop small tubercles on the upper portion of their head and along the pectoral fin rays. Spawning habits have not been observed. Individuals do not live beyond their second summer (Pflieger, 1997).

Blacknose shiner has been collected from Auxvasse Creek (west of the study area) and Loutre River (east of the study area) (Pflieger, 1997). It was not, however, encountered in previous surveys of Logan and Mud Creeks (CDM, 1982) or in the present study.

2.4.2.2.2.10 Blue Sucker

The blue sucker (*Cycleptus elongatus*) is a medium to large-sized (1.5-inch to 2-inch (3.8-cm to 5-cm) or greater) fish in the sucker family that primarily inhabits swift current areas of large rivers (Pflieger, 1997). It is listed as vulnerable (S3) in Missouri and potentially vulnerable (G3/G4) globally (MDC, 2007a). It is primarily found in the Mississippi and Missouri Rivers, and their major tributaries where its movements are not blocked by dams (Elstad and Werdon, 1993). In Missouri, blue suckers are most common in the Missouri River and Mississippi River, as well as in the lowland section of the St. Francis River (Pflieger, 1997). Replacement of riverine habitat by reservoirs through impoundment is the principal threat to blue sucker populations (Montana AFS Website, 1998).

The blue sucker is a highly mobile fish with a streamlined body to maintain its position in strong currents. It is typically found in deep riffles and fast moving chutes over rock, gravel, or sand bottoms (Smith, 2002). Based on the composition of its diet (caddisflies, midges, and hellgrammites), blue suckers are likely bottom feeders over firm, silt-free substrates. In Missouri, this species spawns in the late spring. Males are sexually mature near the age of four, while females are not sexually mature until the age of six. Life span for a blue sucker is approximately 10 years (Pfliger, 1997).

Blue sucker has been consistently collected from the Missouri River – albeit in low numbers – in surveys near the study area. In pre-operational surveys from 1980 through 1982, one specimen was found (CDM, 1981). Sturgeon monitoring surveys conducted by MDC have collected this species (C. Gemming, MDC, personal communication, August 17, 2007), and 6 individuals have been found in the present study.

2.4.2.2.2.11 Plains Topminnow

The plains topminnow (*Fundulus sciadicus*) is a small (2-inch to 2.5-inch (5-cm to 6.4-cm)) fish that inhabits quiet pools of small creeks, and backwaters of larger streams (Pflieger, 1997). It is listed as vulnerable (S3) in Missouri and apparently secure (G4) globally (MDC, 2007a). It is found in several states in the northern Great Plains, including Colorado, Kansas, Nebraska, South Dakota and Wyoming (Rahel and Thel, 2004b). In Missouri, it is primarily found in creeks of the northern and western margins of the Ozarks, the former of which are all tributaries to the Missouri River (Pflieger, 1997). The primary threats to this species are habitat loss associated with receding water tables, and water quality degradation from sewage discharges and agricultural runoff (Rahel and Thel, 2004b).

The plains topminnow is typically found near the surface of clear water without noticeable current, adjacent to or in beds of aquatic vegetation. It occurs singly or in small groups. Small insects are likely the primary component of its diet. Spawning for this species occurs in the late spring and early summer. Females deposit eggs on aquatic vegetation or on algae and hatch in 8 to 10 days at a water temperature near 70°F. Breeding males exhibit orange-red fins (Pfieger, 1997).

The plains topminnow has not been found in pre-operational or subsequent surveys of Logan and Mud Creeks (UE, 1976; CDE, 1981 and 1982; MDC, personal communication), but was reported from Tavern Creek in Callaway County, east of the study area (Pflieger, 1997).

2.4.2.2.3 Harvested Fish

The majority of fish harvested either commercially or recreationally has been from the MDC-managed ponds and the Missouri River. Annual commercial fish harvests from the Missouri River (statewide) ranged from 128,000 to over 700,000 pounds (58,060 to 317,515 kg) from 1991 through 1999 (~~MDC, 1999~~ Robinson, 1993-2001). Throughout this period, Callaway County ranked from 4th to 9th of 32 counties with regard to commercial fish harvest from the Missouri River. Prior to 1993, shovelnose sturgeon, paddlefish, smallmouth and bigmouth buffaloes, channel, blue, and flathead catfishes, and freshwater drum were harvested from the Missouri River (Robinson 1994). From 1993 on, however, commercial harvests of paddlefish and catfish have not been legal in the Missouri River and in 2005 commercial shovelnose sturgeon harvests were also prohibited from the section of the river that is adjacent to the AmerenUE property. Paddlefish and catfish harvest restrictions were associated with concern about low abundance coupled with an intention to make policies consistent with other Missouri River states. Although bullheads are not included in the restriction, commercial fishermen have evidently stopped harvesting these species (V. Trevnichek, MDC, personal communication, April 8, 2008). In the years since 1999, commercial fish harvest from the Missouri River has ranged between 163,000 and 308,000 pounds annually, and has been dominated by non-native rough species such as carp, grass carp, Asiatic (silver, black and bighead) carp, and by smallmouth and largemouth buffalo (V. Trevnichek, MDC, personal communication, April 8, 2008). Recreational fishing occurs in the Missouri River near the AmerenUE property. A list of fish reportedly caught between the Mokane and Hermann accesses over an approximate one-year period from January 2004 through January 2005 includes 35 species, although most of these were encountered in low numbers (S. Sheriff, MDC, personal communication January 28,2008).

2.4.2.2.3.1 Smallmouth and Bigmouth Buffaloes

Smallmouth (*Ictiobus bubalus*) and bigmouth (*I. cyprinellus*) buffaloes are large-sized fish (15 inches to 31 inches (38 cm to 79 cm)) or greater and are common and widespread in Missouri, particularly in the Missouri and Mississippi Rivers and their large tributaries (Pflieger, 1997). These species are opportunistic feeders, ingesting both living plant (algae or rooted plants) and animal (insect larvae) material as well as detritus (McComish, 1967).

The smallmouth buffalo prefers clearer water than the bigmouth buffalo and is found less often in swift currents. The bigmouth buffalo is more tolerant of turbid and slow-moving or standing water and is found in deep pools. The peak of the smallmouth buffalo spawning season occurs in late June and early July, while the bigmouth buffalo spawns in late April and early May. During the spawn for both species, females are accompanied by one to two males. Females deposit their adhesive eggs in relatively shallow water over varying substrates in tributary streams or in quite backwaters. Once the males fertilize the eggs, the eggs develop without any parental care. Eggs hatch in nine to ten days (Pflieger, 1997).

They are commercially harvested from the Missouri River (V. Travnichek, MDC, personal communication February 25, 2008). Both species have been regularly collected in Missouri River surveys near Callaway site, with smallmouth buffalo appearing to be more numerous (UE, 1976; CDM, 1981 and 1982). In 2007 surveys, 15 smallmouth buffalo were found.

2.4.2.2.3.2 Blue Catfish

Blue catfish (*Ictaluras furcatus*) is a large (20 inches to 44 inches (50 cm to 112 cm) in length and 3 pounds to 40 pounds (1.4 kg to 18 kg) in weight) species that primarily occurs in the Mississippi, Missouri, and Osage rivers, and in the lower reaches of their largest tributaries (Pflieger, 1997). Blue catfish is carnivorous, eating fishes, crayfish, immature aquatic insects, and mollusks near the bottom. Its barbells, rather than sight, are more important in locating food (Pflieger, 1997). It is an important food fish, and is harvested both recreationally and commercially.

The blue catfish inhabits chutes and pools of large rivers and the lower end of major tributaries (Smith, 2002). It is typically found in swift current with silt-free sand and gravel. Blue catfish make seasonal migrations in response to water temperature, moving downstream in the winter and upstream in the summer. Spawning normally occurs near the month of June. Males select and clean a natural cavity nest site (piles of drift, logs, undercut banks, burrows of muskrats and beavers). Eggs are deposited in the nest and hatch in approximately 7 days. The fry remain in the nest for an additional 7 to 8 days. Males guard the fry during this time until the fry leave the nest (Pflieger, 1997).

The commercial harvest of blue catfish in the Mississippi and Missouri Rivers increased dramatically in recent decades, but peaked in 1990 with a harvest of 150,000 pounds (68,040 kg) (Robinson, 1994). This species was consistently encountered in collections from the Missouri near the AmerenUE property (UE, 1976; CDM, 1981 and 1982). In the present study, 24 blue catfish were collected.

2.4.2.2.3.3 Channel Catfish

Channel catfish (*Ictaluras punctatus*) is smaller (12 inches to 32-inches (31 cm to 81 cm) and 0.8 pounds to 15 pounds (0.4 kg to 7 kg)) than the closely related blue catfish, and is more widely distributed (Pflieger, 1997). It occurs throughout the state, but particularly numerous in prairie streams of the north and west, in the larger lowland streams and ditches of the southeast, and in the Mississippi and Missouri Rivers (Pflieger, 1997). Its diet is extremely variable, and may include living or dead plant or animal material (Pflieger, 1997). Channel catfish occur naturally, but are also reared for stocking into artificial impoundments throughout the state.

Channel catfish are found in a variety of habitats, but are characteristically found in low to moderate gradient, somewhat turbid streams. Adults can be found in large, deep pools, while young channel catfish are often found in the shallower parts of the pools or in riffles. In Missouri, the channel catfish spawns from late May to late July. As with the blue catfish, channel catfish males select a natural cavity nest site, females lay their eggs in the bottom of the nest, and the male guards the larvae until they leave the nest (approximately 7 to 8 days after the hatch) (Pflieger, 1997).

It is valuable as a game fish, particularly in the northern prairie streams of Missouri (Purkett, 1958) and is one of the most important commercial species in the state (Robinson, 1994). Channel catfish were common in past surveys in the Missouri River near the AmerenUE property (UE, 1976; CDM, 1981 and 1982). A total of ~~104~~ 110 individuals was collected in the present study. They have also been stocked into the MDC managed ponds on the site, and seven specimens were collected during the lake sturgeon survey in November 2007.

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2.4.2.2.3.4 Flathead Catfish

Flathead catfish (*Pylodictis olivaris*) is the third largest (15 inches to 45 inches (38 cm to 114 cm) and 1 pound to 45 pounds (0.5 kg to 20 kg)) catfish species in Missouri and occurs in most of

the large streams in the state (Pflieger, 1997). Adults are generally found in pools, and near submerged woody debris or other cover and feed primarily on fish and crayfish (Pflieger, 1997).

The flathead catfish is a solitary species that usually will have a favorite resting place (drift pile or log) where it can be found every day unless disturbed. At night, adults move from deeper water to feed in more shallow water. The flathead catfish is not a scavenger, rarely consuming decomposing or dead matter. Spawning occurs in late June and July. One of the parents will excavate a depression in a natural cavity, where the female will deposit more than 100,000 eggs. Once fertilized, one of the parents continually fans the eggs to provide oxygen and flush away silt during egg development. The male guards the hatched fry for approximately 7 days until they leave the confines of the nest (Pflieger, 1997).

It is commonly taken by sport fisherman and is an important commercial species in the Mississippi and Missouri Rivers (Pflieger, 1997). Flathead catfish was common in all previous surveys on the Missouri River near the AmerenUE property (UE, 1976; CDM, 1981 and 1982). In the present study, 15 flathead catfish were collected.

2.4.2.2.3.5 White Bass

White bass (*Morone chrysops*) is a medium-sized (typically 9 inches to 15 inches (23 cm to 38 cm) in length) schooling predator that is increasing in abundance in the Missouri River and its tributaries (Pflieger, 1997). It generally inhabits deep pools in streams and rivers, and the open water of lakes and reservoirs (Pflieger, 1997). Young white bass feed primarily on crustaceans and aquatic insects, while adults feed primarily on fish.

White bass are found over sand and rocky bottoms and tend to avoid turbid waters. Gizzard shad is a main component of their diet and the abundance of white bass can exhibit considerable fluctuations in response to gizzard shad abundance. White bass spawn in the early spring (March and April in Missouri), migrating up tributary streams. Spawning occurs over rock or gravel, usually in current, and with no nest preparation. Males crowd around females to fertilize the eggs as they are released. The adhesive eggs settle to the bottom and hatch in approximately two days. A large, adult female may produce up to one million eggs in a single spawning season (Pflieger, 1997).

This is a major sport species in Missouri, particularly during its spring spawning migrations, and in the summer when large schools are feeding near the water's surface (Pflieger, 1997). White bass were common to abundant in pre-operational surveys in the Missouri River near the AmerenUE property (UE, 1976; CDM, 1981 and 1982). In the present study, 29 individuals in the genus *Morone* were collected that were either white bass or hybrids of white and striped bass.

2.4.2.2.3.6 Bluegill

Bluegill (*Lepomis macrochirus*) is a sunfish that commonly reaches a length of 9 inches (23 cm) and a weight of 12 ounces (340 g) (Pflieger, 1997). It is found in running or standing waters throughout the state. Its propagation for stocking lentic environments from small farm ponds to large reservoirs has made bluegill more widespread and abundant now than 50 to 60 years ago (Pflieger, 1997). The diet is primarily insects, but small fish, crayfish and snails and, occasionally, plant material are also eaten (Pflieger, 1997).

Bluegill are found in deep pools and backwaters of low-gradient streams. They thrive in clear water where aquatic vegetation and other cover are present (Smith, 2002). During the hottest part of the day, bluegill stay in deep water or the shade of a overhanging tree and move to shallow water in the early morning and night to feed. Spawning occurs from May to August

with a peak in June. Bluegill will nest on any type of bottom substrate, but prefer gravel. Males build nests in 1 to 2 feet of water and strongly guard the nest until the eggs hatch. Females may deposit eggs in more than one nest. (Pflieger, 1997).

It is a very popular recreational species because of its wide distribution and good flavor (Becker, 1983). Bluegill were collected in pre-operational surveys of the Missouri River and streams near the AmerenUE property (UE ,1976; CDM, 1981 and 1982). Similarly, they were found in nearly all sampling locations in the present study. Bluegill have also been stocked into the MDC managed ponds on the site, although no specimens were collected during the lake sturgeon survey in November 2007.

2.4.2.2.3.7 Spotted and Largemouth Basses

Spotted bass (*Micropterus punctulatus*) and largemouth bass (*M. salmoides*) are two medium-sized (spotted bass 10-inch to 17-inch (25-cm to 43-cm); largemouth bass 10-inch to 20-inch (25-cm to 51-cm) sunfish species that inhabit a variety of running and standing water habitats (Pflieger, 1997). The largemouth bass is more widely distributed, and is common or abundant in all regions except streams of the northwestern region of the state (Pflieger, 1997). Spotted bass is primarily found in the lowland ditches and large Ozark streams in southeastern Missouri, and in the White, Spring, and Missouri River systems (Pflieger, 1997). The spotted bass diet is primarily aquatic insects supplemented with crayfish and fish, whereas largemouth bass feed mostly on fish, but will eat a variety of other animals including large insects, crayfish, frogs, or mice (Pflieger, 1997).

The spotted bass is primarily found in permanent-flowing waters that are warmer and more turbid than those of the smallmouth bass. Spotted bass are active fish that move into smaller tributary streams when flow is high in the spring and move to larger waters in the fall when the high water resides. Spawning occurs in mid-April to early June. Males build the nest and protect the eggs after the female deposits them. Eggs hatch in 2 to 3 days (Pflieger, 1997).

The largemouth bass thrives in somewhat clearer water with no noticeable flow. Largemouth bass spend the heat of the day in deeper water near some type of cover (logs, downed trees, submerged vegetation) and move to shallow water in the evening to feed. Spawning occurs from mid-May to June. A firm substrate such as gravel or rock is preferred for a nest. Depending on water clarity, the nest will be constructed in water ranging for 1 ft to 15 ft (0.3 m to 4.6 m). As with the sported bass, the male guards the nest until the eggs hatch. However, the male will also remain with the schooling fry for some time after they leave the nest (Pflieger, 1997).

Both species are important game fish; the largemouth bass is one of the most popular sport fishes in North America. Both species were found in the Missouri River and in small streams in the pre-operational studies of the 1970s (UE, 1976). Only spotted bass was encountered in the Missouri River; however, both species were common in streams in the studies of the early 1980s (CDM, 1981 and 1982). The present study has likewise collected one specimen each of spotted bass and largemouth bass in the Missouri River but largemouth bass only in the small streams. Largemouth bass have also been stocked into the MDC managed ponds on the site, although no specimens were collected during the lake sturgeon survey in November 2007.

2.4.2.2.3.8 White and Black Crappies

White crappie (*Pomoxis annularis*) and black crappie (*P. nigromaculatus*) are sunfish species that may attain lengths of 14 inches (36 cm) and weights of 1.5 pounds (0.7 kg), and primarily inhabit lowland lakes, large Ozark reservoirs, and navigation pools of the upper Mississippi

River (Pflieger, 1997). The diet of adult crappie is primarily fish, supplemented by insects and crustaceans (Pflieger, 1997).

In reservoirs, crappies are found near standing timber or cover and in streams are found in deep pools. The black crappie is less tolerant of turbidity and siltation than the white crappie. Crappies move to shallower water in the spring to spawn. Crappies do not school, but loosely aggregate near cover. Nesting activity is initiated when water temperatures reach approximately 56°F (Pflieger, 1997). Nests are built in areas free from wave action. Males fan out nests on practically any silt free substrate. Females deposit between 10,000 and 180,000 eggs (Smith, 2002). Eggs hatch in about 3 days and remain attached to the substrate for another 3 to 4 days at which time they leave the nest. Fry do not school after they leave the nest (Pflieger, 1997).

Crappies are highly valued as panfish. White crappie was consistently collected from both the Missouri River and small streams near the AmerenUE property in pre-operational surveys in the 1970s (UE 1976). Black crappie, however, was only encountered in stream samples from one year during this period. In surveys from the early 1980s, white crappie was the more commonly found species in both the Missouri River and in streams (CDM, 1981 and 1982). In the present study, only black crappie was collected and only a single specimen from the Missouri River.

2.4.2.2.3.9 Sauger

Sauger (*Stizostedion canadense*) is primarily an inhabitant of large rivers; it commonly attains a length of 12 inches (31 cm), up to a maximum of 18 inches (46 cm) (Smith, 2002). It is the most common large percid in the Missouri sections of the Missouri and Mississippi Rivers (Pflieger, 1997). Adult sauger feed primarily on fish, predominantly emerald shiner and small gizzard shad (Wahl and Nielseen, 1985).

The sauger is more tolerant of high turbidity than the walleye and is found in areas with swift current. Its eyes are specially adapted to gather light during the late evening and nighttime when it feeds and is most active. Spawning occurs at night in late April and early May. Adults make migratory runs up tributary streams to spawn. The adhesive eggs are scattered in riffles by the females. Males accompany the females and immediately fertilize the eggs. Eggs hatch in approximately 7 days (Pflieger, 1997).

Although not as popular as the closely related walleye, sauger is a valued sport fish in Missouri (Pflieger, 1997). This species was consistently collected from the Missouri River near the AmerenUE property in pre-operational surveys (UE, 1976; CDM, 1981 and 1982). In the present study, a single sauger was collected while electrofishing in July 2007.

2.4.2.2.3.10 Freshwater Drum

Freshwater drum (Aplodinotus grunniens) is typically 12 inches to 20 inches (31 cm to 51 cm) in length as an adult and occurs in large streams throughout the state, but is most numerous in the Missouri and Mississippi Rivers and prairie streams (Pflieger, 1997). It has commonly been considered to be a mollusk feeder, but research has suggested that adults feed primarily on fish, crayfish and immature aquatic insects (Priegel, 1967).

The freshwater drum is usually found in deep pools (i.e., greater than 30 ft deep), avoids swift current, is tolerant of high turbidity, and feeds on or near the bottom. Spawning occurs in tributary streams in late spring and early summer in open water. Eggs of freshwater drum float for 1 to 2 days before hatchings (Pflieger, 1997). The drumming sound for which this species is

named originates from the swim bladder and is assumed to play a role in the spawning act (Smith, 2002).

This species is valuable as both a sport and a commercial fish in the Mississippi and Missouri Rivers (Pflieger, 1997). Freshwater drum was consistently collected in the Missouri River and in Logan Creek in pre-operational surveys of the 1970s (UE, 1976) and were among the most abundant species in Missouri River collections from the early 1980s (CDM, 1981 and 1982). In the present study, drum were relatively numerous (63 individuals) in Missouri River surveys, but were not collected in the small streams. Additionally, two specimens were collected from an onsite pond (P6) during the lake sturgeon survey in November 2007.

2.4.2.2.3.11 Shovelnose Sturgeon

Shovelnose sturgeon (*Scaphirhynchus platorynchus*) is the smallest member of the family in Missouri, rarely exceeding 30 inches in length or 5 pounds in weight (Pflieger, 1997). It is the most numerous sturgeon in the Missouri and Mississippi Rivers, despite a steep decline in abundance since 1900. It inhabits the open channels of large rivers, residing on the bottom in areas of swift current over a sand or gravel bottom (Pflieger, 1997).

The shovelnose sturgeon feeds on the bottom, using its highly protrusible mouth to suck up its food. Aquatic insect larvae, primarily mayflies, caddisflies, and dipterans, comprise the bulk of its diet (Held, 1969). Spawning is believed to occur in the open channels of large rivers in a strong current over rocky or gravelly bottom, primarily in May (Pflieger, 1997). In the upper Mississippi River, this species was reproductively mature at 5 to 7 years of age. Shovelnose sturgeon from this population averaged 8.3, 12.4, 16.1, 19.1, 21.3, and 23.6 at the ends of their first, second, third, fourth, fifth, and sixth years (Helms, 1973).

This species was historically taken from the Missouri River both recreationally (S. Sherriff, MDC, personal communication January 28,2008) and commercially (MDC, 1999). Between 1991 and 1999, annual totals of 717 to 15,410 pounds of sturgeon – predominantly shovelnose – were harvested from the Missouri River. Commercial fishing restrictions on this species, combined with a health advisory not to consume its flesh or eggs due to PCB and chlordane contamination likely limit the harvest of shovelnose sturgeon from the Missouri River near the Callaway site. This species was commonly collected in pre-operational studies (CDM, 1981 and 1982), and was relatively numerous (55 individuals in the present study.

2.4.2.2.4 Harvested Invertebrates

This section is not used

2.4.2.2.5 Other Important Resources

2.4.2.2.5.1 Submerged Aquatic Vegetation

In the Missouri River, preoperational studies found very little submerged aquatic vegetation. The study in the mid-1970s found a few hydrophytes, primarily *Potamogeton*, in a cut-off chute, but none in the Missouri River itself (UE, 1976). The study in 1980 found no vascular hydrophytes in the Missouri River near the AmerenUE property (CDM, 1981).

In surveys of Logan and Mud Creeks in the 1970s, submerged aquatic vegetation was limited to sparse growths of water primrose (*Jussiaea*), water willow (*Dianthera*), duckweed (*Lemna*), sedges (*Carex*), a filiform pondweed (*Potamogeton*), a water plantain (probably *Alisma*), and watercress (*Nasturtium officinale*) (UE, 1976). The later study likewise reported sparse

populations in Logan Creek, probably due to widely fluctuating water levels, high turbidity, and high current velocity which likely inhibited hydrophyte growth (CDM, 1981).

In the present study, no systematic surveys for aquatic macrophytes were performed. However, extensive areas of the Missouri River near the Callaway Site were visited during fish and macroinvertebrate surveys, and no submerged aquatic vegetation was encountered. Similarly, no submerged aquatic vegetation was observed during our surveys of the small streams of the study area. The extensive areas of high current velocity and turbid water conditions are not optimum conditions for colonization of macrophytes. Other studies of large river systems have found little submerged aquatic vegetation in main channel or channel border habitats (MACTEC, 2006, USFWS, 2007b).

2.4.2.2.5.2 Phytoplankton

Preoperational studies characterizing the phytoplankton assemblages in the ecological investigation area of the AmerenUE property found low densities in the Missouri River, most likely attributable to the high turbidity, high current velocity, and scarcity of stable bottom substrate (UE, 1976; CDM, 1981). The study in the 1970s found the assemblage dominated by diatoms, particularly *Asterionella*, with greatest density occurring in the winter (UE, 1976). The later study reported maximum density in the fall, with centric diatoms the most abundant group (CDM, 1981). Overall, the assemblage appeared to be diverse, and therefore unstressed by pollution (UE, 1976).

In Logan and Mud creeks, species composition was similar to that observed in the Missouri River in the earlier study, but densities were much greater due to the stable substrate, lower turbidity and reduced current velocity (UE, 1976). Seasonal variations appeared to be typical of temperate streams, with green and euglenoid species most abundant in warmer months, but diatoms predominating when colder temperatures were present (UE, 1976). The later study found the same seasonal abundance pattern in the creeks as in the Missouri River, i.e., unimodal with maximum density in the fall (CDM, 1981). The most abundant groups in this study were flagellated chrysophytes, cryptophytes, and euglenoids.

2.4.2.2.6 Nuisance Species

The Asian clam (*Corbicula fluminea*) is a freshwater bivalve of Asian origin that had been introduced into North America in the early 1900s (Counts, 1985). Adults are typically 1 inch (3 cm) or less in length; the shell is yellow-green with obvious concentric ridges (Gottfried and Osborne, 1982). They feed primarily on phytoplankton, which they filter from the water near the bottom of the stream, river, or lake that they inhabit. Its reproductive capability and transportation by barges hauling river gravel or releases by fishermen and aquarists have led to its high degree of infestation in the United States (Lachner, 1970). Their high growth and production rates may enable this species to alter trophic and nutrient dynamics in aquatic systems (Stites et al., 1995). They can tolerate extensive sedimentation (Belanger et al., 1985) and wide ranges of temperature (Janech and Hunter, 1984) and salinity (King et al., 1986). Moreover, they are more pollution-tolerant than native mussels (Jenkinson, 1979). Corbicula infestations can present problems to power plants by blocking intake structures and reducing flow of cooling water (NRC, 1981). In the present study, these were collected in depositional habitats in the Missouri River near the AmerenUE property.

2.4.2.3 Habitat Importance

The Missouri River and onsite streams and ponds were described above in terms of the typical surface water habitats, and the biological communities associated with them. In general, large river habitats and intermittent headwater streams are considered important. Even so, there is

nothing of regional significance about this particular segment of the Missouri River or these particular small streams. In the Missouri River, all species of importance also are found elsewhere in the system. In the streams and ponds, none of the aquatic species encountered in this study were considered to be restricted to this area. No significant loss of important onsite river, stream or pond habitat is expected.

2.4.2.4 Other Preexisting Environmental Stresses

The lower Missouri River has experienced a variety of water quality disturbances since the early 1900s, including oxygen depletions, fish kills, oil spills, and contamination from point and non-point discharges (Walter, 1971). Municipal sewage pollution combined with other urban and industrial discharges were among the major problems through the 1970s (Munger et al., 1974). Land-use trends, particularly widespread application of pesticides such as organochlorines and chlordane, as well as releases of polychlorinated biphenyl (PCB) compounds, led to the issuance of public health advisories for several Missouri River fish species during the 1980s (Poulton et al., 2005). More recently, habitat loss associated with sedimentation has been recognized as an additional impairment of the Missouri River (Poulton et al., 2005).

2.4.2.5 Transmission and Access Corridors

There will be one new transmission line associated with the construction and operation of Callaway Plant Unit 2. This new transmission line will be approximately 6.7 miles (10.8 km) in length and 150 ft (45.7 m) in width and will be located immediately adjacent to (and on the west side of) the existing transmission line which extends southward out of the plant and crosses the Missouri River (Figure 2.4-4). The new transmission line will terminate at the tie-in point with another transmission line coming from the west called the Loose Creek line.

Terrestrial habitats within the new transmission line corridor are described in Section 2.4.1.9. Aquatic resources traversed by the planned transmission line include a few unnamed intermittent streams, two crossings of Logan Creek, the Mollie Dozier Chute, and the Missouri River. Common amphibious species of the unnamed intermittent streams, Logan Creek, and the Mollie Dozier Chute include Blanchard's cricket frog, southern leopard frog, and the American toad. Common turtles associated with the more permanent waters of Logan Creek include false map turtle, red-eared slider, and common snapping turtles. Fish species observed in the Missouri River and Logan Creek are listed in Table 2.4-9 and Table 2.4-11, respectively. Benthic macroinvertebrate species observed in the Missouri River and Logan Creek are listed in Table 2.4-10 and Table 2.4-12, respectively. Outside of the Missouri River, no rare, threatened, or endangered species were observed within the transmission line corridor.

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Table 2.4-1—List of Rare, Threatened or Endangered Species Historically Recorded in Callaway and Osage Counties, Missouri

(Page 1 of 2)

Scientific Name	Common Name	Status		County	
		State	Federal	Callaway	Osage
Vegetation					
Aralia nudicaulis	Wild sarsaparilla	S2		√	
Carex conoidea	Field sedge	S1		√	
Carex trichocarpa	Hairy-fruited sedge	S1		√	
Corispermum villosum	Oriental tick-seed	SU		√	
Cyperus setigerus	Bristled cyperus	S1		√	
Cystopteris tenuis	Bladderfern	S1		√	
Dodecatheon amethystinum	Amethyst shooting star	S2			√
Fragaria vesca var. americana	Woodland strawberry	S1		√	
Geum virginianum	Pale avens	S1			√
Huperzia porophila	Fir clubmoss	S2		√	
Lycopodium digitatum	Clubmoss	S2		√	
Oryzopsis racemosa	Black-seeded mountain rice	S1		√	
Parmotrema hypoleucinum	Lichen	S1			√
Trifolium stoloniferum	Running buffalo clover	E/S1	E	√	
Woodwardia areolata	Netted chain fern	S2		√	
Insects					
Acroneuria ozarkensis	Ozark stonefly	S2			√
Calephelis muticum	Swamp metalmark (butterfly)	S3		√	
Gomphus ozarkensis	Ozark clubtail (dragonfly)	S3		√	√
Macromia pacifica	Gilded river cruiser	S3		√	
Neoconocephalus bivocatus	Two-voiced conehead katydid	S3		√	
Neoconocephalus retusus	Round-tipped conehead katydid	S4		√	
Ophiogomphus westfalli	Westfall's snaketail (dragonfly)	S3			√
Speyeria idalia	Regal fritillary butterfly	S3		√	
Freshwater Mussels					
Alasmidonta marginata	Elktoe	S2			√
Arcidens confragosus	Rock Pocketbook	S3			√
Cumberlandia monodonta	Spectaclecase	S3	C		√
Elliptio crassidens	Elephantear	E/S1			√
Lampsilis abrupta	Pink mucket	E/S2	E		√
Leptodea leptodon	Scaleshell	E/S1	E		√
Ligumia recta	Black sandshell	S2			√
Obovaria olivaria	Hickorynut	S3			√
Fish					
Acipenser fulvescens	Lake sturgeon	E/S1		√	√
Alosa alabamae	Alabama shad	S2			√
Carpiodes velifer	Highfin carpsucker	S2			√
Cycleptus elongates	Blue sucker	S3		√	√
Etheostoma nianguae	Niangua darter	E/S2	T		√
Fundulus dispar	Starhead topminnow	S2		√	
Fundulus sciadicus	Plains topminnow	S3		√	√
Hiodon tergisus	Mooneye	S3		√	√
Hybognathus argyritis	Western silvery minnow	S2		√	√
Hybognathus placitus	Plains minnow	S2		√	√
Macrhybopsis gelida	Sturgeon chub	S3		√	√
Macrhybopsis meeki	Sicklefin chub	S3		√	√

Table 2.4-1—List of Rare, Threatened or Endangered Species Historically Recorded in Callaway and Osage Counties, Missouri

(Page 2 of 2)

Scientific Name	Common Name	Status		County	
		State	Federal	Callaway	Osage
Macrhybopsis storeriana	Silver chub	S3		√	√
Notropis buchanani	Ghost shiner	S2		√	√
Notropis heterolepis	Blacknose shiner	S2		√	
Platygobio gracilis	Flathead chub	E/S1		√	√
Polyodon spathula	Paddlefish	S3		√	√
Scaphirhynchus albus	Pallid sturgeon	E/S1	E	√	√
Amphibians					
Cryptobranchus alleganiensis	Eastern hellbender	E/S1			√
Rana areolata circulosa	Northern crawfish frog	S3		√	
Reptiles					
Crotaphytus collaris	Eastern collared lizard	S4			√
Birds					
Haliaeetus leucocephalus	Bald eagle	E/S3		√	√
Laterallus jamaicensis	Black rail	S1		√	
Tyto alba	Barn owl	E/S3		√	
Mammals					
Mustela frenata	Long-tailed weasel	S2		√	
Myotis grisescens	Gray bat	E/S3	E	√	√

Source of information is the on-line MDC Natural Heritage Database http://www.mdc.mo.gov/cgi-bin/heritage/

Legend:

State Rank	Federal
S1: Critically Imperiled	E: Endangered
S2: Imperiled	T: Threatened
S3: Vulnerable	C: Candidate
S4: Apparently Secure	

Table 2.4-2—Important Terrestrial Species and Habitat Identified at the AmerenUE Property 2007-2008

Scientific Name	Common Name	Description	Location	Rationale
Mammals				
Odocoileus virginianus	White-tailed deer	Large herbivorous mammal prefers forest edge habitat.	Reform Conservation Area	Game species
Myotis grisescens	Gray bat	Small winged mammal, 3" (8 cm) in length with 10-12" (25-31 cm) wingspan, weighs 9 g. The largest Myotis species in Missouri.	Cave along Auxvasse Creek	Federal Endangered State Endangered
Myotis sodalis	Indiana bat	Small winged mammal, 2" (5 cm) in length with 8" (20 cm) wingspan, weighs about 7 g.	Reform Conservation Area	Federal Endangered State Endangered
Birds				
Haliaeetus leucocephalus	Bald eagle	Large bird, 31" (79 cm) in length, with 80" (203 cm) wingspan, weighs 4,325 g	Along Missouri River, Molly Dozier Slough, and near Transect 2	State Endangered
Colinus virginianus	N. bobwhite	Small bird, 9.8" (24.9 cm) in length, with 13" (33 cm) wingspan, weighs 170 g	Reform Conservation Area	Game species
Circus cyaneus	N. harrier	Medium sized bird, 18" (46 cm) in length, with 43" (109 cm) wingspan, weighs 420 g	Reform Conservation Area	State Endangered
Zenaida macroura	Mourning dove	Small bird, 12" (31 cm) in length, with 18" (46 cm) wingspan, weighs 120 g	Reform Conservation Area	Game species
Meleagris gallopavo	Wild turkey	Large bird, 37-46" (94-117 cm) in length, with 50-64" (127-163 cm) wingspan, weighs 4,200-7,400 g	Reform Conservation Area	Game species
Habitats				
Jurisdictional Wetlands		Stormwater runoff ponds P-2 through P-8 and site wetlands that have a significant nexus with the Missouri River	Reform Conservation Area	Federal protection under CWA
Glade		Openings within oak-hickory forest that have shallow soils and are dominated by drought-tolerant grasses and forbs	Approx. 1.5 miles south of Unit 1	State rank S-2

Table 2.4-3—Mammals Observed at the AmerenUE Property, Spring and Fall 2007

Species	Common Name	Abundance	Season Observed		Comments
			Spring	Fall	
Canis latrans	Coyote	Occasional	√	√	general site recon
Castor canadensis carolinensis	Beaver	Uncommon	√	√	MO River, Logan Creek
Cryptotis parva	Least shrew	Uncommon		√	trapping survey
Didelphis virginiana	Opossum	Occasional	√	√	general site recon
Marmota monax	Groundhog	Occasional	√	√	general site recon
Mephitis mephitis avia	Striped skunk	Occasional	√	√	general site recon
Mus musculus	House mouse	Uncommon	√		trapping survey
Odocoileus virginianus	White-tailed deer	Common	√	√	general site recon
Ondatra zibethicus	Muskrat	Uncommon	√	√	general site recon
Peromyscus leucopus	White footed mouse	Occasional	√	√	trapping survey
Peromyscus maniculatus	Deer Mouse	Occasional	√		trapping survey
Procyon lotor hirtus	Raccoon	Occasional	√	√	general site recon
Sciurus carolinensis	Gray squirrel	Common	√	√	general site recon
Sciurus niger	Fox squirrel	Occasional	√	√	general site recon
Sylvilagus floridanus	E. cottontail	Common	√	√	general site recon
Tamias striatus	E. chipmunk	Occasional	√	√	general site recon
Vulpes vulpes	Red fox	Uncommon	√	√	general site recon
Total Species Richness		**17**			

Table 2.4-4—Birds Observed Seasonally at the AmerenUE Property 2007

(Page 1 of 5)

Scientific Name	Common Name	Relative Abundance	Season Observed				Location	D[2]
			Spring	Summer	Fall	Winter		
Accipiter cooperii	Cooper's hawk	Uncommon	√				RB-3, T-5	X
Agelaius phoeniceus	Red-winged blackbird	Common	√	√			RB-1, RB-2, RB-3, T-1, T-3, P-5, P-9	X
Aix sponsa	Wood duck	Occasional	√	√	√		P-3, P-9	X
Ammodramus henslowii	Henslow's sparrow							X
Ammodramus savannarum	Grasshopper sparrow	Uncommon	√	√	√		RB-2, T-5	X
Anas clypeata	Northern shoveler	Occasional	√			√	P-1, P-6, P-9	
Anas crecca	Green-winged teal	Occasional	√			√	P-2, P-3, P-9	
Anas discors	Blue-winged teal	Common	√	√	√		P-2, P-3, P-6, P-7, P-9, R-7	
Anas platyrhynchos	Mallard	Common	√	√		√	P-5, P-6, P-8, P-9	
Anas strepera	Gadwall	Uncommon	√			√	P-6, P-9	
Archilochus colubris	Ruby-throated hummingbird	Occasional	√	√	√		RB-1, RB-2, RB-3, T-1	X
Ardea alba	Great egret	Rare			√		R-7	
Ardea herodias	Great blue heron	Abundant	√	√	√	√	RB-1, RB-2, RB-3, P-1, P-4, P-5, P-6, P-9, R-7	X
Aythya collaris	Ring-necked duck	Uncommon	√			√	P-6, P-9	
Baeolophus bicolor	Tufted titmouse	Abundant	√	√	√	√	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Bartramia longicauda	Upland sandpiper							X
Bombycilla cedrorum	Cedar waxwing	Abundant	√			√	RB-1, RB-2, RB-3, T-2, T-3, T-5	X
Branta canadensis	Canada goose	Abundant	√	√	√	√	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-5, P-3, P-4, P-5, P-6, P-8, P-9	X
Bubo virginianus	Great horned owl	Uncommon	√				T-1	X
Bucephala albeola	Bufflehead	Uncommon	√				P-7	
Buteo jamaicensis	Red-tailed hawk	Common		√	√	√	RB-2, RB-3, T-2, T-3, T-4, T-5	X
Buteo lineatus	Red shouldered hawk	Uncommon			√	√	RB-2, RB-3	
Butorides virescens	Green heron	Common		√	√	√	RB-3, T-1, P-5, P-9, R-7	X
Calidris minutilla	Least sandpiper	Rare	√				P-9	
Caprimulgus carolinensis	Chuck-Will's-widow							X
Caprimulgus vociferus	Whip-poor-will							X
Cardinalis cardinalis	Northern cardinal	Abundant	√	√	√	√	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Carduelis tristis	American goldfinch	Abundant	√	√	√	√	RB-1, RB-2, RB-3, T-2, T-3, T-5	X
Carpodacus mexicanus	House finch	Common	√	√			RB-1, RB-3, T-1, T-3	X
Carpodacus purpureus	Purple finch	Rare				√	RB-1	
Cathartes aura	Turkey vulture	Abundant	√	√	√		RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Catharus fuscescens	Veery	Common	√	√			RB-3, T-2, T-4, T-5	

Table 2.4-4—Birds Observed Seasonally at the AmerenUE Property 2007

(Page 2 of 5)

Scientific Name	Common Name	Relative Abundance	Season Observed				Location	D[2]
			Spring	Summer	Fall	Winter		
Ceryle alcyon	Belted kingfisher	Occasional		√	√	√	T-1, T-4, P-5	X
Chaetura pelagica	Chimney swift	Occasional	√		√		RB-1, RB-3, T-3	X
Charadrius vociferus	Killdeer	Abundant	√	√	√	√	RB-1, RB-2, RB-3, P-3, P-5, P-6, P-7, P-9	X
Chondestes grammacus	Lark sparrow	Rare	√				RB-2	X
Circus cyaneus	Northern harrier[1]	Rare	√				RB-2	
Cistothorus platensis	Sedge wren							X
Coccyzus americanus	Yellow-billed cuckoo	Occasional	√	√			RB-1, RB-2, RB-3, T-1	X
Coccyzus erythropthalmus	Black-billed cuckoo							X
Colaptes auratus	Northern flicker	Abundant	√	√	√	√	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Colinus virginianus	Northern bobwhite	Abundant	√	√			RB-1, RB-2, RB-3, T-1, T-3, T-4, T-5, P-8	X
Columba livia	Rock dove							X
Contopus virens	Eastern wood pewee	Abundant	√	√	√		RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Corvus brachyrhynchos	American crow	Abundant	√	√	√	√	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Corvus ossifragus	Fish crow	Rare	√				T-1	
Cyanocitta cristata	Blue jay	Abundant	√	√	√	√	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Dendroica coronata	Yellow-rumped warbler	Uncommon	√				RB-1, T-2	
Dendroica dominica	Yellow-throated warbler							X
Dendroica discolor	Prairie warbler	Common	√	√			RB-1, RB-2, RB-3, T-1, T-5	X
Dendroica palmarum	Palm warbler	Occasional	√				RB-1, RB-2	
Dendroica petechia	Yellow warbler	Common	√				RB-1, RB-2, RB-3, T-4	X
Dendroica pinus	Pine warbler	Rare		√			RB-1	
Dendroica virens	Black-throated green warbler	Rare	√				T-4	
Dryocopus pileatus	Pileated woodpecker	Abundant	√	√	√	√	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Dumetella carolinensis	Gray catbird	Abundant	√	√	√		RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Empidonax spp.	Willow/Alder flycatcher							X
Empidonax traillii	Willow flycatcher							X
Empidonax virescens	Acadian flycatcher							X
Eremophila alpestris	Horned lark	Uncommon	√	√			RB-1, RB-2	X
Euphagus carolinus	Rusty blackbird	Uncommon	√	√			RB-1, RB-2	
Falco sparverius	American kestrel	Uncommon	√			√	RB-1, RB-2,	X
Fulica americana	American coot	Common	√			√	P-1, P-5, P-6, P-7, P-9	
Geothlypis triachas	Common yellowthroat	Abundant	√	√			RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Guiraca caerulea	Blue grosbeak	Uncommon	√				RB-2, T-3	X

Table 2.4-4—Birds Observed Seasonally at the AmerenUE Property 2007

(Page 3 of 5)

Scientific Name	Common Name	Relative Abundance	Season Observed				Location	D[2]
			Spring	Summer	Fall	Winter		
Haliaeetus leucocephalus	Bald eagle[3]	Uncommon				√	Observed on Missouri River and surrounding areas	
Helmitheros vermivorus	Worm-eating warbler	Occasional	√				RB-3, T-2, T-4,	
Hirundo rustica	Barn swallow	Abundant	√	√	√		RB-1, RB-2, RB-3, T-3, T-5, P-5, P-6, P-7, P-9	X
Hylocichla mustelina	Wood thrush	Abundant	√	√		√	RB-1, RB-2, RB-3, T-1, T-2, T-4	X
Icteria virens	Yellow-breasted chat	Abundant	√	√	√		RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Icterus galbula	Baltimore oriole	Occasional	√				RB-2, RB-3, T-5	X
Icterus spurius	Orchard oriole	Uncommon	√	√			RB-3	X
Junco hyemalis	Dark-eyed junco	Abundant				√	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	
Lanius ludovicianus	Loggerhead shrike							X
Melanerpes carolinus	Red-bellied woodpecker	Abundant	√	√	√	√	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Melanerpes erythrocephalus	Red-headed woodpecker	Occasional	√				RB-2, RB-3, T-2, T-3	X
Meleagris gallopavo	Wild turkey	Common	√	√	√	√	RB-1, RB-2, RB-3, T-2, T-4, T-5	X
Melospiza georgiana	Swamp sparrow	Uncommon				√	T-1, T-4	
Melospiza lincolnii	Lincoln's sparrow	Rare			√		T-4	
Melospiza melodia	Song sparrow	Abundant	√	√		√	RB-1, T-1, T-2, T-3, T-4, T-5	X
Mimus polyglottos	Northern mockingbird	Abundant	√	√	√	√	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Mniotilta varia	Black and white warbler	Common	√	√			RB-2, RB-3, T-2, T-4	X
Molothrus ater	Brown-headed cowbird	Common	√	√			RB-1, RB-2, RB-3, T-1, T-4, T-5	X
Myiarchus crinitus	Great Crested flycatcher	Abundant	√	√	√		RB-1, RB-2, RB-3, T-1, T-2, T-3, T-5	X
Oporornis formosus	Kentucky warbler	Common	√	√			RB-2, RB-3, T-1, T-2, T-4, T-5	X
Otus asio	Eastern screech owl							X
Parula americana	Northern parula	Abundant	√	√			RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Passer domesticus	House sparrow	Occasional	√	√	√		RB-1, RB-3	X
Passerculus sandwichensis	Savannah sparrow	Common	√	√			RB-1, RB-2, T-3, T-5	
Passerella iliaca	Fox sparrow	Common			√	√	RB-3, T-1, T-2, T-5	
Passerina cyanea	Indigo bunting	Abundant	√	√	√		RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Petrochelidon pyrrhonota	Cliff swallow	Occasional	√				T-3, T-5	X
Pheucticus ludovicianus	Rose-breasted grosbeak	Common	√				RB-1, RB-2, RB-3, T-3, T-5	X
Picoides pubescens	Downy woodpecker	Abundant	√	√	√	√	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Picoides villosus	Hairy woodpecker	Uncommon			√	√	RB-3, T-4	X
Pipilo erythrophthalmus	Eastern towhee	Abundant	√	√	√		RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Piranga olivacea	Scarlet tanager							X

Table 2.4-4—Birds Observed Seasonally at the AmerenUE Property 2007

(Page 4 of 5)

Scientific Name	Common Name	Relative Abundance	Season Observed				Location	D[2]
			Spring	Summer	Fall	Winter		
Piranga rubra	Summer tanager	Uncommon	√	√			RB-3, T-2	X
Podilymbus podiceps	Pied-billed grebe	Occasional	√				P-1, P-5, P-6, P-9	
Poecile atricapillus	Black-capped chickadee	Abundant	√	√	√	√	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Poecile carolinensis	Carolina chickadee	Uncommon	√	√	√		RB-2, RB-3, T-4	
Polioptila caerulea	Blue-gray gnatcatcher	Abundant	√	√	√		RB-1, RB-2, RB-3, T-1, T-2, T-4, T-5	X
Progne subis	Purple martin							X
Protonotaria citrea	Prothonotary warbler	Uncommon	√				RB-3, T-4	
Quiscalus quiscula	Common Grackle	Common	√	√			RB-1, RB-2, RB-3, T-1, T-2, T-5	X
Regulus calendula	Ruby-crowned kinglet	Rare				√	T-1	
Sayornis phoebe	Eastern phoebe	Common	√	√	√	√	RB-1, RB-2, RB-3, T-1, T-3, T-4, T-5	X
Seiurus aurocapillus	Ovenbird	Occasional	√	√	√		RB-2, RB-3, T-2, T-5	
Seiurus motacilla	Louisiana waterthrush	Occasional	√	√			T-1, T-4, T-5, P-3, P-9	X
Sialia sialis	Eastern bluebird	Common	√	√	√	√	RB-1, RB-2, RB-3, T-1, T-3, T-5	X
Sitta carolinensis	White-breasted nuthatch	Abundant	√	√	√	√	RB-1, RB-2, RB-3, T-1, T-2, T-4, T-5	X
Spiza americana	Dickcissel	Common	√	√			RB-1, RB-2, RB-3, T-3	X
Spizella arborea	American tree sparrow	Uncommon				√	RB-3, T-3	
Spizella passerina	Chipping sparrow	Abundant	√	√	√		RB-1, RB-2, RB-3, T-1, T-3, T-5	X
Spizella pusilla	Field sparrow	Abundant	√	√	√		RB-1, RB-2, RB-3, T-1, T-3, T-5	X
Stelgidopteryx serripennis	Northern rough-winged swallow	Common	√		√		RB-1, RB-2, RB-3, P-9	X
Streptopelia decaocto	Eurasian collared-dove							X
Strix varia	Barred owl	Uncommon	√				T-3	X
Sturnella magna	Eastern meadowlark	Common	√	√			RB-1, RB-2, RB-3, T-3	X
Sturnella neglecta	Western meadowlark							X
Sturnus vulgaris	European starling	Common	√	√		√	RB-1, RB-2, RB-3, T-5	X
Tachycineta bicolor	Tree swallow	Uncommon	√		√		RB-1, RB-2	X
Thryothorus ludovicianus	Carolina wren	Abundant	√	√	√	√	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Toxostoma rufum	Brown thrasher	Abundant	√	√	√		RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
Tringa melanoleuca	Greater yellowlegs	Uncommon	√				P-3, P-6	
Troglodytes aedon	House wren	Common	√	√	√		RB-1, RB-2, RB-3, T-2	X
Turdus migratorius	American robin	Abundant	√	√	√	√	RB-1, RB-2, RB-3, T-2, T-3, T-4, T-5	X
Tyrannus tyrannus	Eastern kingbird	Abundant	√	√	√		RB-1, RB-2, RB-3, T-1, T-2, T-3, T-5, P-9	X
Vermivora peregrina	Tennessee warbler	Abundant	√	√			RB-1, RB-2, RB-3, T-1, T-2, T-4, T-5	
Vermivora pinus	Blue-winged warbler	Abundant	√	√			RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, P-3	X

Table 2.4-4—Birds Observed Seasonally at the AmerenUE Property 2007

(Page 5 of 5)

Scientific Name	Common Name	Relative Abundance	Season Observed				Location	D[2]
			Spring	Summer	Fall	Winter		
Vermivora ruficapilla	Nashville warbler	Occasional	√				RB-1, RB-3, T-1	
Vireo bellii	Bell's vireo							X
Vireo flavifrons	Yellow-throated vireo	Rare	√				RB-3	X
Vireo gilvus	Warbling vireo	Uncommon	√				RB-1, RB-2	X
Vireo griseus	White-eyed vireo	Abundant	√		√		RB-1, RB-2, RB-3, T-1, T-3, T-4, T-5	X
Vireo olivaceus	Red-eyed vireo	Abundant	√		√		RB-1, RB-2, RB-3, T-1, T-2, T-4, T-5	X
Wilsonia pusilla	Wilson's warbler	Uncommon	√	√			RB-3, T-4	
Zenaida macroura	Mouning dove	Abundant	√	√	√	√	RB-1, RB-3, T-1, T-2, T-3, T-5	X
Zonotrichia albicollis	White-throated sparrow	Abundant	√	√	√	√	RB-1, RB-2, RB-3, T-2, T-4, T-5	
Zonotrichia leucophrys	White-crowned sparrow	Common	√	√			RB-1, RB-2, T-2, T-5	
Total Species Richness: 122								

Notes:

See Figure 2.4-3 for T, RB, and P locations

1 State rank of S2 indicaties imperiled: "imperiled in the nation or state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the nation or state" (1,000-3,000 remaining individuals).

2 Species recorded from the Danville Breeding Bird Survey. (North American Breeding Bird Surtvey Danville Route - http://www.mbr-pwrc.usgs.gov/cgi-bin/rtena25.pl?52019

3 State rank of S3.

ER Section 2.4

Table 2.4-5—Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007

(Page 1 of 14)

Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed																C[2]	Wetlands Indicator Status
					T-1	T-2	T-3	T-4	T-5	[1]Transmission Line	Cropland	Grassland	Dediduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water		
Acer negundo	Boxelder	1	1	1	A				U					O			P				1	FACW-
Acer rubrum	Red maple	1	1	1				R					R								6	FAC
Acer saccharinum	Silver maple	1	1	1	A				U								P				1	FACW
Acer saccharum	Sugar maple	1	1	1	A	A				O			C		O						5	FACU
Achillea millefolium	Common yarrow	1	1				C	R				O	R		O						*	FACU
Agrimonia pubescens	Soft agrimony	1	1	1		R			U	U			R		U						3	UPL
Agrostis gigantea	Redtop	1	1				C		A			O									*	FACW
Alisma subcordatum	Water plantain	1	1	1														P			5	OBL
Alliaria officinalis	Garlic mustard	1	1															P			0	FAC
Allium canadense	Meadow onion	1	1		O			R					R								1	FACU
Alopecurus carolinianus	Annual foxtail	1		1											C	O					0	FACW
Ambrosia artemisiifolia	Annual ragweed	1	1	1	U		O	R	A		U/O	O	R		O	O		P			0	FACU
Ambrosia bidentata	Southern ragweed	1		1											C						0	FACU-
Ambrosia trifida	Great ragweed	1	1	1	A			U			U/O		R		U	U	P	P			0	FAC+
Amelanchier arborea	Downy service berry	1	1	1		O/C				O			O		O						6	FACU
Ammania coccinea	Toothcup	1	1	1														P			6	OBL
Amorpha canescens	Lead plant	1		1												U			U		8	UPL
Ampelopsis cordata	Racoon grape	1		1					U					U							4	FAC+
Andropogon gerardii	Big blue stem	1		1			C/A					O			U/O	O			C		5	FAC-
Andropogon virginicus	Broomsedge	1	1	1			O		R			O			C	C					2	FAC-
Antennaria plantaginifolia	Pussy toes	1		1						O			O		U/O						5	UPL
Apios americana	American potato-bean	1	1		U	A		C					O				P				6	FACW
Apocynum cannabinum	Clasping-leaf dogbane	1	1		O		R	R	O			U	R					P			3	FAC

Table 2.4-5—Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007

(Page 2 of 14)

Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed																C[2]	Wetlands Indicator Status
					T-1	T-2	T-3	T-4	T-5	[1]Transmission Line	Cropland	Grassland	Dediduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water		
Arisaema dracontium	Green dragon	1	1					R					R								6	FACW
Arisaema triphyllum	Jack-in-the-pulpit	1	1					R					R								6	FACW-
Asarum canadense	Wild ginger	1	1		U								U								6	UPL
Asclepias purpurascens	Purple milkweed	1		1											U						6	FACU
Asclepias quadrifolia	Fourleaf milkweed	1	1			U		R					R								6	UPL
Asclepias syriaca	Common milkweed	1	1		R								R								0	UPL
Asclepias tuberosa	Butterfly weed	1		1												O			O		5	UPL
Asclepias viridis	Green-flowered milkweed	1		1												U			U		6	UPL
Asimina triloba	Common pawpaw	1	1		C								U								5	FAC
Asparagus officinalis	Asparagus	1		1											R						*	FACU
Asplenium platyneuron	Ebony spleenwort	1		1									U		U						4	FACU
Aster anomalus	Blue aster	1		1						O			O		O						6	UPL
Aster ericoides	Heath aster	1		1											O	O					4	FACU-
Aster lateriflorus	Side-flowering aster	1		1													P		O		3	FACW-
Aster oblongifolius	Aromatic aster	1		1												U			O		6	UPL
Aster oolentangiensis	Sky blue aster	1		1									O		O	O			O		7	UPL
Aster patens	Purple daisy	1		1	O	O				O			O		U	U			U		5	UPL
Aster pilosus	Hairy aster	1		1											O	O					0	FACU-
Baptisia alba (Baptisia leucantha)	White wild indigo	1		1			O					U									6	FACU
Baptisia leucophaea	Cream wild indigo	1		1											U						6	UPL
Bidens frondosa	Common beggar's ticks	1		1											O		P	P			2	FACW

Table 2.4-5—Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007

(Page 3 of 14)

Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed															C[2]	Wetlands Indicator Status
					T-1	T-2	T-3	T-4	T-5	[1]Transmission Line	Cropland	Grassland	Dediduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water		
Bidens polylepis	Bur marigold	1		1	O	O			C				U				P	P			1	FACW
Boehmeria cylindrica	False-nettle	1	1					O	O				U				P	P			4	OBL
Bouteloua curtipendula	Side oats grama	1		1												U			A		7	UPL
Campsis radicans	Trumpet creeper	1	1	1	A	O							O								3	FAC
Carex annectens	Yellow-fruit sedge	1	1			O	U					U	U				P	P			4	FACW
Carex blanda	Woodland sedge	1	1			R							R				P	P			3	FAC
Carex frankii	Frank's sedge	1	1														P	P			5	OBL
Carex glaucodea	Blue sedge	1		1						U			R		U						4	UPL
Carex rosea	Rosy sedge	1	1			R		O					R								4	UPL
Carex sp.[3]	Sedge	1					R										P	P				
Carex vulpinoidea	Fox sedge	1	1															P			4	OBL
Carya illinoinensis	Pecan	1	1	1			R	R				R	R				P				6	FACW
Carya ovata	Shagbark hickory	1	1	1	O	A		C		U/O			O		U/O						4	FACU
Carya tomentosa	Mockernut hickory	1	1	1		C		O		O/C			O		O/C						5	UPL
Celtis laevigata	Sugarberry	1	1		U								R				P				4	FACW
Celtis occidentalis	Common hackberry	1	1	1				C	O				O	C			P				4	FAC-
Cephalanthus occidentalis	Buttonbush	1	1	1														P			3	OBL
Cercis canadensis	Eastern redbud	1	1	1	U								U			O			O		3	FACU
Chamaecrista fasciculata	Partridge pea	1	1	1					U						O	U					1	FACU-
Chasmanthium latifolium	River oats	1	1	1				U					U		U		P	P	A		4	FACW
Chenopodium sp.	Lambsquarters	1	1																			
Chrysanthemum leucanthemum	Ox-eye daisy	1		1											U						*	UPL

Table 2.4-5—Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007

(Page 4 of 14)

Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed															C[2]	Wetlands Indicator Status
					T-1	T-2	T-3	T-4	T-5	[1]Transmission Line	Cropland	Grassland	Dediduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water	
Cichorium intybus	Chickory	1		1											O						*	UPL
Cirsium altissimum	Tall thistle	1		1					O						O	O					4	UPL
Cirsium vulgare	Bull thistle	1	1	1					R												*	FACU-
Commelina communis	Asiatic day flower	1	1	1										O							*	FAC
Conyza canadensis	Horseweed	1	1	1					U						O						0	FAC-
Cornus drummondi	Rough-leaved dogwood	1		1											U						1	FAC
Cornus florida	Flowering dogwood	1	1	1	O	C/A		A		C			C		C						5	FACU-
Coronilla varia (Securigea varia)	Crown vetch	1		1											U						*	UPL
Croton capitatus	Hogwort	1		1												U			U		0	UPL
Cunila origanoides	Dittany	1		1				O					U								5	UPL
Cyperus esculentus	Chufa	1		1	O													P			1	FACW
Cyperus strigosus	Straw-colored flatsedge	1		1	O													P			1	FACW
Cystopteris protrusa	Lowland bladderfern	1	1		O																5	UPL
Dactylis glomerata	Orchard grass	1		1								U			U						*	FACU
Dalea purpurea	Purple prairie clover	1		1		O										O			C		8	UPL
Danthonia spicata	Poverty oat grass	1		1									U		O						3	UPL
Daucus carota	Queen Anne's Lace	1	1	1					O						O	O			U		*	UPL
Desmanthus illinoensis	Illinois bundle flower	1		1								U			U						3	FAC-
Desmodium canadense	Showy tick trefoil	1		1					O/C						O						4	FAC-
Desmodium glutinosum	Pointed tick trefoil	1		1				O		O/C			U/O		O/C						3	UPL

Table 2.4-5—Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007

(Page 5 of 14)

Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed															C[2]	Wetlands Indicator Status
					T-1	T-2	T-3	T-4	T-5	[1]Transmission Line	Cropland	Grassland	Dediduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water	
Desmodium nudiflorum	Bare-stemmed tick trefoil	1		1	C/A	C/A				U			O		U						4	UPL
Desmodium paniculatum	Panicled tick trefoil	1		1	O	O							O								3	FACU
Dianthus armeria	Deptford pink	1	1	1			R					R			U/O						*	UPL
Digitaria sp.	Crab grass	1		1											U							
Dioscorea sp.	Yam	1		1										U								
Diospyros virginiana	Common persimmon	1	1	1	U			O/C	C				O	U	O	O					3	FAC
Echinacea pallida	Pale purple coneflower	1		1											U	U					7	UPL
Echinochloa crusgalli	Barnyard grass	1		1	O	U			O				R		U			P			*	FACW
Echinodorus berteroi	Upright burhead	1		1													P	P			8	OBL
Elaeagnus umbellata	Autumn olive	1	1	1		R	U					U	R								*	UPL
Eleocharis obtusa	Blunt spike rush	1	1	1											U			P			4	OBL
Eleocharis smallii	Small's spike rush	1	1	1														P			5	OBL
Elymus canadensis	Canada wild rye	1		1											U	U					5	FAC-
Elymus hystrix (Hystrix patula)	Bottlebrush grass	1		1				O/C					U								4	UPL
Elymus villosus	Silky wild rye	1		1									U		U						4	FACU
Elymus virginicus	Virginia wild rye	1	1	1	U	U		R	O	O/C			U/O	O	O		P	P			4	FACW-
Equisetum arvense	Common horsetail	1		1												U					1	FAC
Eragrostis sp.	Love grass	1		1											U							
Erigeron annuus	White-top fleabane	1		1								O			O						1	FAC-
Erigeron strigosus	Prairie fleabane	1	1	1					U/O												3	FAC-
Eupatorium altissimum	Tall boneset	1		1											O	O			O		3	FACU

Table 2.4-5—Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007

(Page 6 of 14)

Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed															C[2]	Wetlands Indicator Status
					T-1	T-2	T-3	T-4	T-5	[1]Transmission Line	Cropland	Grassland	Dediduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water		
Eupatorium rugosum (Ageratina altissima)	White snakeroot	1		1				O	O/C	C			O	O	O						2	FACU
Eupatorium serotinum	Late boneset	1		1			O		O	O		O	U	O	O	O					1	FAC+
Euphorbia sp.	Spurge	1		1												O			O			
Festuca arundinacea	Tall fescue	1	1	1			A		A	C		C/A	U		C	O					*	FACU+
Festuca elatior	Meadow fescue	1	1	1								C				O					*	FACU-
Forestiera acuminata	Swamp privet	1	1															P			6	OBL
Fragaria virginiana	Virginia strawberry	1	1					R					R								2	FAC-
Fraxinus americana	White ash	1	1	1	O	O		O	O	C			O/C	O							3	FACU
Fraxinus pennslyvanica	Green ash	1	1	1	C			O	O				O				P	P			5	FACW
Fraxinus quadrangulata	Blue ash	1		1												U			U		6	UPL
Galium concinnum	Shining bedstraw	1	1	1		U		O	O	U			U		U						4	FACU
Galium tinctorium	Stiff marsh bedstraw	1	1		O								U				P	P			6	OBL
Gerardia tenuifolia (Agalina tenuifolia)	Slender false foxglove	1		1											O			P			4	FACW
Geum canadense	White avens	1		1									U	U							2	FAC
Gleditsia triacanthos	Honeylocust	1	1	1	O		U		C			U	U								2	FAC
Glyceria striata	Fowl manna grass	1	1	1	O					U			U				P	P			4	OBL
Glycine max	Soybean	1	1	1					A		A										*	UPL
Gratiola neglecta	Clammy hedgehyssop	1	1		R													P			4	OBL
Hedeoma pulegioides	American pennyroyal	1		1				O					U								4	UPL
Helianthus hirsutus	Oblong sunflower	1		1											O						4	UPL
Helianthus maximilliani	Maximillian sunflower	1		1					O							U					5	UPL

Table 2.4-5—Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007

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Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed																C[2]	Wetlands Indicator Status
					T-1	T-2	T-3	T-4	T-5	[1]Transmission Line	Cropland	Grassland	Dediduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water		
Heliopsis helianthoides	False sunflower	1		1												U			U		5	UPL
Humulus japonicus	Japanese hop	1		1							U	U			U						*	FACU
Hydrophyllum appendiculatum	Great waterleaf	1	1		C								U								5	UPL
Hypericum sp.	St. Johnswort	1		1												U			U			
Ilex sp.	Holly	1		1										U								
Impatiens campensis	Spotted touch-me-not	1	1	1	U			U	U				U				P	P			3	FACW
Ipomea hederacea	Small morning glory	1	1	1											U			P			1	FACW
Juglans nigra	Black walnut	1	1	1	C					U			U								4	FACU
Juncus dudleyi	Dudley's rush	1		1														P			6	FAC
Juncus tenuis	Roadside rush	1		1			U/O					U									0	FAC
Juniperus virginiana	Eastern red cedar	1	1	1	U	O	U	C	O	O		U	O	U	O	A					2	FACU
Krigia biflora	Dwarf dandelion	1	1			O		U					U								5	FACU
Lactuca floridana	Blue lettuce	1		1											U						3	FAC-
Leersia oryzoides	Rice cut grass	1	1	1														P			4	OBL
Leersia virginica	White grass	1		1										U			P				4	FACW
Lespedeza cuneata	Sericea lespedeza	1	1	1					O	O					O	O					*	UPL
Lespedeza virginica	Slender bush clover	1		1								U			U						5	UPL
Leucanthemum vulgare	Ox-eye daisy	1	1						U												*	UPL
Lobelia cardinalis	Cardinal flower	1		1						U					U			P			6	OBL
Lonicera japonica	Japanese honeysuckle	1	1	1									U			U					3	FACU
Ludwigia alternafolia	Seedbox	1		1				U	U				U					P			4	OBL
Ludwigia peploides	Floating seedbox	1	1	1														P			3	OBL

Table 2.4-5—Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007

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Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed																C[2]	Wetlands Indicator Status
					T-1	T-2	T-3	T-4	T-5	[1]Transmission Line	Cropland	Grassland	Dediduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water		
Lycopus sp.	Bugleweed	1		1														P				
Maianthemum racemosum	False Solomon's seal	1	1		U								U					P			4	FACU
Medicago lupulina	Black medick	1	1				A					O									*	FAC-
Medicago sativa	Alfalfa	1		1							C/A										*	UPL
Melilotus alba	White sweet-clover	1		1							U				U						*	FACU
Melilotus officianalis	Yellow sweet-clover	1		1							U				U						*	FACU
Menispermum canadense	Canada moonseed	1		1										O							4	FAC+
Mimulus alatus	Winged monkey flower	1	1	1		O				U					U			P			5	OBL
Monarda bradburiana (M. russeliana)	Bradbury beebalm	1		1	O	O				U			U		O	O			O		5	UPL
Monarda fistulosa	Wild bergamont	1	1			O															4	FACU
Morus alba	White mulberry	1		1	U			U					U								*	FAC
Morus rubra	Red mulberry	1	1	1	R	R							R	O							4	FAC-
Nelumbo lutea	American lotus	1	1	1														P		U	6	OBL
Nyssa sylvatica	Black gum	1	1	1	U			R					U								5	FAC
Oenothera biennis	Common evening primrose	1		1												U/O					0	FACU
Osmorhiza sp.	Sweet cicely	1		1										O								
Ostrya virginiana	Hop hornbeam	1	1			U		A					U/O								4	FACU-
Oxalis stricta	Yellow wood sorrel	1	1	1	U	R		U					U		O						0	FACU
Panicum boscii	Bosc's panic sedge	1		1						U			R								5	UPL
Panicum capillare	Old witchgrass	1	1	1											U/O			P			0	FAC

Table 2.4-5—Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007

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Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed															C[2]	Wetlands Indicator Status
					T-1	T-2	T-3	T-4	T-5	[1]Transmission Line	Cropland	Grassland	Dediduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water	
Panicum cf. *lanuginosum*	Panic grass	1		1											U					0	FAC
Panicum clandestinum	Deer tongue grass	1	1	1		O							U		O/C		P			4	FACW
Panicum dichotomum	Forked panic grass	1	1	1				R					R		C					6	FAC-
Panicum latifolium	Broad-leaf panic grass	1	1	1				U	U				U		O					6	FACU
Panicum virgatum	Switchgrass	1	1	1	O		C					O			U					4	FAC+
Parietaria pensylvanica	Pennsylvania pellitory	1		1										U						3	FACU
Parthenocissus quinquefolia	Virginia creeper	1	1	1	C	C/O		C/O	O/U	U/O			O							3	FAC-
Paspalum sp.	Beed grass	1		1											U						
Penstemon digitalis	Beard-tongue	1	1	1				U	R				U		O					4	FAC-
Penthorum sedoides	Ditch stonecrop	1		1														P		4	OBL
Phalaris arundinacea	Reed canary grass	1	1	1														P		0	FACW+
Phleum pratense	Timothy	1		1								O			U					*	FACU
Phryma leptostachya	American lopseed	1		1									U							2	UPL*
Phyla lanceolata (Lippia lanceolata)	Fog fruit	1	1	1														P		3	OBL
Phytolacca americana	Common pokeweed	1	1	1				O	O				U	O	U					2	FAC-
Pilea pumila	Clearweed	1		1	O												P			4	FACW
Pinus resinosa	Red pine	1	1	1										A						*	
Pinus strobus	White pine	1	1	1										A						*	
Plantago major	Common plantain	1		1											U/O					*	FAC+
Plantago rugelii	Pale plantain	1		1					U											0	FAC
Plantago virginica	Virginia plantain	1	1						U											1	FACU-

Table 2.4-5—Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007

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Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed																C[2]	Wetlands Indicator Status
					T-1	T-2	T-3	T-4	T-5	[1]Transmission Line	Cropland	Grassland	Dediduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water		
Platanus occidentalis	Sycamore	1	1	1	O			O					U/O				P				3	FACW
Poa compressa	Canada bluegrass	1		1								U			O	O					*	FACU+
Poa pratensis	Kentucky bluegrass	1		1											O/C	O					*	FAC-
Podophyllum peltatum	May-apple	1	1		U	C		O					O								4	FACU
Polygonatum biflorum	Solomon's seal	1		1		U							U								7	FACU
Polygonum coccineum	Water heartsease	1		1	O					U								P			5	OBL
Polygonum hydropiper	Marshpepper	1	1	1	O													P			3	OBL
Polygonum hydropiperoides	Swamp smartweed	1		1														P			4	OBL
Polygonum lapathifolium	Heartsease	1		1				O/C					U					P			0	FACW+
Polygonum pennsylvanicum	Pennsylvania knotweed	1	1	1														P			1	FACW
Polygonum persicaria	Lady's thumb	1		1											U			P			*	FACW
Polygonum punctatum	Smartweed	1		1											U		P	P			3	OBL
Polygonum virginianum	Virginia knotweed	1		1										U			P				1	FAC
Polystichum acrostichoides	Christmas fern	1	1	1	U	U		O		O			O/C		U						5	UPL
Populus deltoides	Eastern cottonwood	1	1	1	R					U			R				P				2	FAC+
Potentilla simplex	Common cinquefoil	1	1					R					R								3	FACU-
Prunella vulgaris	Lawn prunella	1		1				O					U								*	FAC
Prunus serotina	Black cherry	1	1	1		U	U	O	C			U	U/O								2	FACU
Pycnanthemum tenuifolium	Slender mountain mint	1		1											O						4	FAC
Quercus alba	White oak	1	1	1	C/A	A		A		C/A			A			U					4	FACU

Table 2.4-5—Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007

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Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed																C[2]	Wetlands Indicator Status
					T-1	T-2	T-3	T-4	T-5	[1]Transmission Line	Cropland	Grassland	Dediduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water		
Quercus bicolor	Swamp white oak	1	1														P				7	FACW+
Quercus imbricaria	Shingle oak	1	1	1				O	R				O		U/O	O					3	FAC-
Quercus macrocarpa	Bur oak	1	1	1				O					U			U					4	FAC-
Quercus marilandica	Black jack oak	1	1	1				O					U			U			U		4	UPL
Quercus muehlenbergii	Chinkapin oak	1	1	1	U								U	U		O			O		4	NI
Quercus palustris	Pin oak	1	1			C							U				P				4	FACW
Quercus rubra	Northern red oak	1	1	1	O	A		A					A		O	U			U		5	FACU
Quercus stellata	Post oak	1	1	1									U			U			U		4	FACU-
Quercus velutina	Black oak	1	1	1	O	O		O		O			O								4	UPL
Ranunculus sceleratus	Celery leaf buttercup	1		1														P			5	OBL
Rhamnus caroliniana	Carolina buckthorn	1	1			U															6	FAC-
Rhus aromatica	Fragrant sumac	1	1	1	U	A		A		A			C			O			C		3	UPL
Rhus glabra	Smooth sumac	1	1	1					O							U/O					1	UPL
Ribes missouriense	Missouri gooseberry	1	1	1	U			C	U				U	U							3	UPL
Robinia pseudo-acacia	Black locust	1	1	1				C		O			O			O					2	FACU-
Rosa multiflora	Multiflora rose	1	1	1	O		U	U	U			U	U	U							*	FACU
Rubus flagellaris	Common dewberry	1		1						O			O	U	O						2	FACU-
Rubus occidentalis	Black raspberry	1		1						O			O	O							3	UPL
Rubus pensilvanicus	Yankee blackberry	1		1											O						2	FAC-
Rubus sp.[†]	Blackberry	1			O	U	C	O	A			O										
Rudbeckia hirta	Black-eyed susan	1	1	1			O					U/O				U			U		1	FACU
Rudbeckia missouriensis	Missouri black-eyed susan	1		1												O			C		6	FACU-

Table 2.4-5—Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007

(Page 12 of 14)

Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed																C[2]	Wetlands Indicator Status
					T-1	T-2	T-3	T-4	T-5	[1]Transmission Line	Cropland	Grassland	Dediduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water		
Rudbeckia triloba	Brown-eyed susan	1		1						U					U						4	FAC-
Rumex crispus	Curly dock	1	1		O				R												*	FAC+
Sagittaria latifolia	Broad-leaf arrowhead	1	1	1														P			4	OBL
Salix amygdaloides	Peach-leaved willow	1	1	1						U							P	P			5	FACW
Salix exigua (Salix interior)	Sandbar willow	1	1	1														P			3	OBL
Salix nigra	Black willow	1	1	1	O					U							P	P			2	OBL
Salvia azurea	Blue sage	1		1			U					R									4	UPL
Sambucus canadensis	Elderberry	1		1										C							2	FACU-
Sanguinaria canadensis	Bloodroot	1	1		U																5	FACU-
Sanicula gregaria	Black-snakeroot	1	1	1	C	O							U								2	FAC+
Sassafras albidum	Sassafras	1	1	1	U	O		C	C/A	O			O		U	O					2	FACU
Satureja arkansana	Low calamint	1		1											U						7	FACW
Schizachyrium scoparium	Little bluestem	1		1												O			C		5	FACU-
Scirpus atrovirens	Dark green rush	1	1	1														P			4	OBL
Scirpus fluviatilis	River bulrush	1	1															P			7	OBL
Scutellaria laterifolia	Mad-dog skull cap	1	1															P			5	OBL
Setaria faberii	Giant foxtail	1		1	C				O	O/C					C	O					*	FACU+
Setaria glauca	Yellow bristle grass	1		1							U/O				O	O					*	FAC
Setaria viridis	Green foxtail	1		1											O	O					*	UPL
Sicyos angulatus	Bur cucumber	1	1	1													P				4	FACW-
Silphium laciniatum	Compass plant	1		1								U			U						6	FACU-
Silphium perfoliatum	Cup plant	1	1	1													P	P			3	FACW-

Table 2.4-5—Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007

(Page 13 of 14)

Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed															C[2]	Wetlands Indicator Status
					T-1	T-2	T-3	T-4	T-5	[1]Transmission Line	Cropland	Grassland	Dediduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water	
Silphium terebinthinaceum	Prairie dock	1		1					U						U						5	FAC-
Sisyrinchium albidum	White blue-eyed grass	1	1		U			R					R								6	FACU
Smilax bona-nox	Saw greenbriar	1	1		R			U	U				U								3	FACU+
Smilax tamnoides var. hispida	Bristly greenbriar	1		1									U	O							3	FAC
Solanum carolinense	Carolina nightshade	1		1			O	U	U			U/O	R		O/C						0	FACU-
Solidago altissima	Tall goldenrod	1	1	1			C		A			C			A	C					1	FACU
Solidago juncea	Early goldenrod	1		1				O/C					U								5	UPL
Solidago nemoralis	Old-field goldenrod	1	1	1	O	O	A	U	A			C	U		O	C			O		2	UPL
Solidago radula	Rough goldenrod	1		1						U			U								6	UPL
Solidago ulmifolia	Elm-leaved goldenrod	1		1	O	O				O			O		U						4	UPL
Sorghastrum nutans	Indian grass	1		1			A					O				O					5	FACU+
Sorghum halepense	Johnson grass	1		1	O										U			P			*	FACU
Spiranthes cernua	Nodding ladies' tresses	1		1												R			U/R		4	FACW-
Symphoricarpos orbiculatus	Coralberry, buckbrush	1	1	1	U	U	R	O	C			R	U	O	O/C	O					1	FACU
Teucrium canadense	American germander	1		1											U			U			2	FACW-
Thalictrum revolutum	Waxyleaf meadow-rue	1	1			U							R								5	FAC
Thlaspi arvense	Field pennycress	1	1		A																*	NI
Tilia americana	American basswood	1	1	1		U		O		U			U								5	FACU
Toxicodendron radicans	Poison ivy	1	1	1	O	O	C	A	A			O	C	C	O/C			P			1	FAC+
Tridens flavus	Grease grass, pupletop	1		1					C						C	O			O		1	UPL

Table 2.4-5—Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007

(Page 14 of 14)

Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed															C[2]	Wetlands Indicator Status
					T-1	T-2	T-3	T-4	T-5	[1]Transmission Line	Cropland	Grassland	Dediduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water	
Trifolium pratense	Red clover	1	1						C		U/O										*	FACU+
Trifolium repens	White clover	1	1	1			C		O			O									*	FACU+
Trillium recurvatum	Purple trillium	1	1		U			R					R								6	FACU-
Tripsacum dactyloides	Eastern gamma grass	1	1	1								O									5	FAC+
Triticum aestivum	Wheat	1	1	1							A										*	UPL
Typha angustifolia	Narrow-leaved cattail	1	1	1														P			2	OBL
Ulmus rubra	Slippery elm	1	1	1	C	O	R	A	O			U	O/C	O		U	P				3	FAC
Urtica dioica	Stinging nettle	1	1	1	O																3	FAC+
Vaccinium vacillans	Late low blueberry	1		1		O							U								5	UPL
Verbascum blattaria	Moth mullein	1		1											U	O			O		*	FACU-
Verbascum thapsus	Common mullein	1		1					U												*	UPL
Verbena urticifolia	White vervain	1		1									U								4	FAC+
Vernonia baldwinii	Western ironweed	1		1	O		O/C					O				O			C		2	UPL
Vernonia missurica	Missouri ironweed	1		1											U						4	FAC+
Viola sororia	Hairy wood violet	1	1	1				O	U												2	FAC-
Vitis aestivalis	Summer grape	1	1	1	U	U		O	U				O								5	FACU
Vitis cinerea	Winter grape	1	1	1													U				4	FACW-
Vitis riparia	River bank grape	1	1	1													P				4	FACW-
Xanthium strumarium	Cocklebur	1		1	C				U												*	FAC
Zea mays	Corn	1	1	1	R						A										*	UPL
	Total Taxa	**295**	**158**	**245**																		

1 Transmission Line = location of the new Unit 2 transmission line corridor.

2 Coefficient of Conservatism is a scale of 0 – 10 with 0 being weedy species tolerant of disturbance and 10 being highly conservative species typically found in

natural areas. C values obtained from *Missouri Flora* (The Nature Conservancy, 2000).

* Adventive species are not assigned C values.

† Carex sp. and Rubus sp. are not counted in the total taxa number

Wetlands Indicator Status

OBL	Obligate Wetland Plants
FACW	Facultative Wetland
FAC	Facultative Plants
FACU	Facultative Upland
UPL	Obligate Upland Plants

Categories were originally developed and defined by the USFWS National Wetlands Inventory and subsequently modified by the National Plant List Panel. The three facultative categories are subdivided by (+) and (-) modifiers.

Abundance Categories: A = abundant, C = common, O = occasional, U = uncommon, R= rare

Table 2.4-6—Herpetofauna Observed Seasonally at the AmerenUE Property 2007

(Page 1 of 2)

Scientific Name	Common Name	Relative Abundance	Season Observed			Location
			Spring	Summer	Fall	
Acris crepitans blanchardi	Blanchard's cricket frog	Abundant	√			Site ponds, wetlands, MO River floodplain
Agkistrodon contortrix phaeogaster	Osage Copperhead	Occasional		√	√	Logan creek low water crossing
Ambystoma maculatum	Spotted salamander	Uncommon	√			Cattle pond near T-3 by entrance gate
Apalone mutica	Smooth softshell	Uncommon		√		Missouri River
Apalone spinifera hartwegi	Western Spiny softshell	Uncommon		√		Low water crossing near T-1
Bufo americanus americanus	Eastern American toad	Abundant	√		√	Site ponds, wetlands, MO River floodplain
Chelydra serpentina	Common snapping turtle	Common	√	√		P-6 and Logan Creek
Chrisemys picta bellii	Western Painted turtle	Uncommon	√	√	√	P-5, P-6, Logan Creek, quarry pond
Coluber constrictor flaviventris	Eastern yellow-bellied racer	Occasional	√			Near pump house bridge
Diadophis punctatus arnyi	Prairie Ring-necked snake	Occasional			√	Bluffs near T-1, creek near quarry, limestone glades
Elaphe obsoleta obsoleta	Black rat snake	Occasional		√		Katy Trail near T-1, gravel road near Auxvasse Creek
Eumeces fasciatus	Common Five-lined skink	Occasional		√		T-2
Eumeces laticeps	Broad head skink	Uncommon		√		Parking lot on North CC
Gastrophyne carolinensis	Eastern narrowmouth toad	Uncommon	√	√		MO River floodplain near Katy Trail
Graptemys pseudogeographica pseudogeographica	False map turtle	Occasional	√	√		Logan Creek and Mollie Dozier Chute
Hyla versicolor/chrysoselis	Gray treefrog	Common	√			Site ponds, wetlands, MO River floodplain, Mollie Dozier Chute
Lampropeltis calligaster calligaster	Prairie kingsnake	Occasional		√		Parking lot on North CC
Nerodia sipedon sipedon	Northern water snake	Common		√		Logan Creek, near pump house
Notophthalmus viridiscens louisianensis	Central newt	Uncommon		√		Cattle pond near T-3 by entrance gate, T-3 mammal trap
Oephydrys aestivus aestivus	Rough green snake	Uncommon	√			Transmission line corridor near T-1
Ophisaurs attenuatus	Western Slender Glass Lizard	Uncommon			√	T-5
Pseudacris crucifer crucifer	Northern spring peeper	Common	√			Site ponds, wetlands, Mollie Dozier Chute
Pseudacris triseriata	Western chorus frog	Uncommon	√			Isolated ponds
Rana catesbiana	Bullfrog	Common	√		√	P-4,P-5,P-6
Rana clamitans melanota	Green frog	Common	√		√	Site ponds, wetlands, and MO River floodplain
Rana palustris	Pickeral Frog	Uncommon	√			Fishless Pond 5
Rana sphenocephala utricularia	Southern Leopard Frog	Common	√	√		Site ponds, wetlands, MO River floodplain, and Mollie Dozier Chute
Scincella lateralis	Ground skink	Occasional		√	√	T-2, T-4
Scleroporus undulatus hyacinthinus	Fence Lizard	Common			√	T-2, T-4
Storeria dekayi	Midland brown snake	Occasional			√	T-5
Terrapene carolina triunguis	Three-toed box turtle	Occasional			√	Throughout study area

Table 2.4-6—Herpetofauna Observed Seasonally at the AmerenUE Property 2007

(Page 2 of 2)

Scientific Name	Common Name	Relative Abundance	Season Observed			Location
			Spring	Summer	Fall	
Trachemys scripta elegans	Red-eared slider	Common	√	√	√	P-6,Logan Creek, Mollie Dozier Chute
Total Species Richness: 32						

Taxonomic Composition and Abundance in Fish Surveys of the Missouri River and Stream Stations Near Callaway Plant, by Season, 2007-2008

(Page 1 of 2)

Species	Scientific Name	July 2007	October 2007	January 2008	Spring 2008
Chestnut lamprey	Ichthyomyzon castaneus		2		
Lake sturgeon	Acipenser fulvescens			1	
Shovelnose sturgeon	Scaphirhynchus platorynchus	13	6	36	
Paddlefish	Polyodon spathula	1			
Spotted gar	Lepisosteus oculatus	1			
Longnose gar	Lepisosteus osseus	3	10		
Shortnose gar	Lepisosteus platostomus	4	3		
Goldeye	Hiodon alosoides	30	7	18	
Mooneye	Hiodon tergisus			1	
Skipjack herring	Alosa chrysochloris		2		
Gizzard shad	Dorosoma cepedianum	1,104	30	496	
Stoneroller	*Campostoma* sp.	94	4		4
Largescale stoneroller	Campostoma oligolepis	3			
Central stoneroller	Campostoma pullum	2			1
Grass carp	Ctenopharyngodon idella		2		
Red shiner	Cyprinella lutrensis	749	237	20	4
Common carp	Cyprinus carpio	17	13		
Plains minnow	Hybognathus placitus	3	1	6	
Silver carp	Hypopthalmichthys molitrix	2		8	
Striped shiner	Luxilus chrysocephalus	6			
Redfin shiner	Lythrurus umbratilis	195	22		44
Speckled chub	Macrhybopsis aestivalis			89	
Sturgeon chub	Macrhybopsis gelida			1	
Silver chub	Macrhybopsis storeriana	5	1		
Emerald shiner	Notropis atherinoides	187	504	137	
River shiner	Notropis blennius	1	3		
Sand shiner	Notropis ludibundus	171	3		
Ozark minnow	Notropis nubilus	19	1		
Channel shiner	Notropis wickliffi	28	2	1	
Bluntnose minnow	Pimephales notatus	21	3		19
Bullhead minnow	Pimephales vigilax	22	16	13	
Creek chub	Semotilus atromaculatus	70			
Carpsucker or Buffalo	Carpiodes/Ictiobus	4	8		
Carpsuckers	*Carpiodes* sp.			3	
River carpsucker	Carpiodes carpio	15	13	11	
White sucker	Catostomus commersoni	9	1		
Blue sucker	Cycleptus elongatus	1	4	1	
Smallmouth buffalo	Ictiobus bubalus	3	10	2	
River redhorse	Moxostoma carinatum			2	
Golden redhorse	Moxostoma erythrurum			2	
Shorthead redhorse	Moxostoma macrolepidotum	1	1	1	
Yellow bullhead	Ameiurus natalis	1			1
Blue catfish	Ictaluras furcatus	2	15	7	

Taxonomic Composition and Abundance in Fish Surveys of the Missouri River and Stream Stations Near Callaway Plant, by Season, 2007–2008

(Page 2 of 2)

Species	Scientific Name	July 2007	October 2007	January 2008	Spring 2008
Channel catfish	Ictaluras punctatus	6	92	12	
Flathead catfish	Pylodictis olivaris	1	14		
Blackstripe topminnow	Fundulus notatus	13	5		1
Mosquitofish	Gambusia affinis	34	268	4	2
Brook silverside	Labidesthes sicculus	3	13		8
Temperate basses	*Morone* sp.	14	9	5	
White bass	Morone chrysops	1			
Sunfishes	*Lepomis* sp.	5	5	18	44
Green sunfish	Lepomis cyanellus	13	3		10
Orangespotted sunfish	Lepomis humilus	2			
Bluegill	Lepomis macrochirus	13	2	3	
Longear sunfish	Lepomis megalotis	4			
Spotted bass	Micropterus punctulatus	1			
Largemouth bass	Micropterus salmoides	6	1	1	
Black crappie	Pomoxis nigromaculatus	1			
Fantail darter	Etheostoma flabellare		1		
Johnny darter	Etheostoma nigrum	3	10		
Orangethroat darter	Etheostoma spectabile	62	5		
Missouri saddled darter	Etheostoma tetrazonum			1	7
Slenderhead darter	Percina phoxocephala	2			
Sauger	Stizostedion canadense	1			10
Freshwater drum	Aplodinotus grunniens	3	32	28	
Total		**2,975**	**1,384**	**928**	**155**
Species richness		**49**	**40**	**27**	**11**

Table 2.4-7—Taxonomic Composition and Abundance in Fish Surveys of the Missouri River and Stream Stations near Callaway Plant by Season, 2007- 2008

(Page 1 of 4)

Species	Scientific name	July 2007		October 2007		January 2008		March 2008	
		River	Streams	River	Streams	River	Streams[a]	River[b]	Streams
Chestnut lamprey	*Ichthyomyzon castaneus*			2					
Lake sturgeon	*Acipenser fulvescens*					1			
Shovelnose sturgeon	*Scaphirhynchus platorynchus*	13		6		36			
Paddlefish	*Polyodon spathula*	1							
Spotted gar	*Lepisosteus oculatus*	1							
Longnose gar	*Lepisosteus osseus*	3		10					
Shortnose gar	*Lepisosteus platostomus*	4		3					
Goldeye	*Hiodon alosoides*	30		7		18			
Mooneye	*Hiodon tergisus*					1			
Skipjack herring	*Alosa chrysochloris*			2					
Gizzard shad	*Dorosoma cepedianum*	1104		30		496			
Stoneroller*	*Campostoma sp.*		94		4				4
Largescale stoneroller	*Campostoma oligolepis*		3						
Central stoneroller	*Campostoma pullum*		2						1
Grass carp	*Ctenopharyngodon idella*			2					
Red shiner	*Cyprinella lutrensis*	685	64	222	15	20			4

Table 2.4-7—Taxonomic Composition and Abundance in Fish Surveys of the Missouri River and Stream Stations near Callaway Plant by Season, 2007- 2008

(Page 2 of 4)

Species	Scientific name	July 2007		October 2007		January 2008		March 2008	
		River	Streams	River	Streams	River	Streams[a]	River[b]	Streams
Common carp	*Cyprinus carpio*	5	12	13					
Plains minnow	*Hybognathus placitus*	3		1		6			
Silver carp	*Hypopthalmichthys molitrix*	2				8			
Striped shiner	*Luxilus chrysocephalus*		6						
Redfin shiner	*Lythrurus umbratilis*		195		22				44
Speckled chub	*Macrhybopsis aestivalis*					89			
Sturgeon chub	*Macrhybopsis gelida*					1			
Silver chub	*Macrhybopsis storeriana*	5		1					
Emerald shiner	*Notropis atherinoides*	187		504		137			
River shiner	*Notropis blennius*	1		3					
Sand shiner	*Notropis ludibundus*	22	149	2	1				
Ozark minnow	*Notropis nubilus*		19		1				
Channel shiner	*Notropis wickliffi*	28		2		1			
Bluntnose minnow	*Pimephales notatus*	1	20		3				19
Bullhead minnow	*Pimephales vigilax*	22		16		13			
Creek chub	*Semotilus atromaculatus*		70						
Carpsucker or Buffalo*	*Carpiodes/Ictiobus*		4	8					
Carpsuckers*	*Carpiodes* sp.					3			
River carpsucker	*Carpiodes carpio*	15		13		11			
White sucker	*Catostomus commersoni*		9		1				
Blue sucker	*Cycleptus elongatus*	1		4		1			
Smallmouth buffalo	*Ictiobus bubalus*	3		10		2			
River redhorse	*Moxostoma carinatum*					2			

Table 2.4-7—Taxonomic Composition and Abundance in Fish Surveys of the Missouri River and Stream Stations near Callaway Plant by Season, 2007- 2008

(Page 3 of 4)

Species	Scientific name	July 2007		October 2007		January 2008		March 2008	
		River	Streams	River	Streams	River	Streams[a]	River[b]	Streams
Golden redhorse	*Moxostoma erythrurum*					2			
Shorthead redhorse	*Moxostoma macrolepidotum*	1		1		1			
Yellow bullhead	*Ameiurus natalis*		1						1
Blue catfish	*Ictaluras furcatus*	2		15		7			
Channel catfish	*Ictaluras punctatus*	6		92		12			
Flathead catfish	*Pylodictis olivaris*	1		14					
Blackstripe topminnow	*Fundulus notatus*		13		5				1
Mosquitofish	*Gambusia affinis*		34		268	4			2
Brook silverside	*Labidesthes sicculus*	1	2	3	10				8
Temperate basses*	*Morone* sp.	14		9		5			
White bass	*Morone chrysops*	1							
Sunfishes*	*Lepomis* sp.		5		5	18			44
Green sunfish	*Lepomis cyanellus*		13		3				10
Orangespotted sunfish	*Lepomis humilus*		2						
Bluegill	*Lepomis macrochirus*	3	10		2	3			
Longear sunfish	*Lepomis megalotis*		4						
Spotted bass	*Micropterus punctulatus*	1							
Largemouth bass	*Micropterus salmoides*		6		1	1			

Table 2.4-7—Taxonomic Composition and Abundance in Fish Surveys of the Missouri River and Stream Stations near Callaway Plant by Season, 2007- 2008

(Page 4 of 4)

Species	Scientific name	July 2007		October 2007		January 2008		March 2008	
		River	Streams	River	Streams	River	Streams[a]	River[b]	Streams
Black crappie	*Pomoxis nigromaculatus*	1							
Fantail darter	*Etheostoma flabellare*				1				
Johnny darter	*Etheostoma nigrum*		3		10				
Orangethroat darter	*Etheostoma spectabile*		62		5				20
Missouri saddled darter	*Etheostoma tetrazonum*					1			
Slenderhead darter	*Percina phoxocephala*	2							
Sauger	*Stizostedion canadense*	1							
Freshwater drum	*Aplodinotus grunniens*	3		32		28			
Total		2173	802	1027	357	928	0	0	158
Species richness		33	23	27	15	27	0	0	10

a Stream stations were not sampled in January 2008 due to high water conditions (1 occasion) and frozen conditions (1 occasion).

b River stations were not sampled in March 2008 due to high water conditions.

Table 2.4-8—Taxonomic Composition and Abundance in Fish Surveys of the Missouri River Near AmerenUE Property

(Page 1 of 2)

Species	Total	Plant Side "Near Shore"	Opposite Side "Far Shore"	Upstream of Existing Intake	Adjacent to Existing Intake	Downstream of Existing Intake
Chestnut lamprey	2	1	1	2		
Lake sturgeon	1		1	1		
Shovelnose sturgeon	55	9	46	12	39	4
Paddlefish	1		1	1		
Spotted gar	1		1	1		
Longnose gar	13	7	6	2	9	2
Shortnose gar	7	4	3	1	4	2
Goldeye	55	38	17	32	18	5
Mooneye	1		1			1
Skipjack herring	2	2			2	
Gizzard shad	1,630	1,347	283	261	1,159	210
Grass carp	2	1	1		2	
Red shiner	927	838	89	168	89	670
Common carp	18	10	8	7	7	4
Plains minnow	10	5	5	3	1	6
Silver carp	10	5	5	6	2	2
Speckled chub	89	80	9	52	13	24
Sturgeon chub	1	1		1		
Silver chub	6	5	1	1	5	
Emerald shiner	828	546	282	325	53	450
River shiner	4	3	1	1	2	1
Sand shiner	24	18	6		17	7
Channel shiner	31	18	13	12	11	8
Bluntnose minnow	1	1			1	
Bullhead minnow	51	40	11	8	30	13
Carpsuckers	3	3		3		
Carpsucker or Buffalo	8		8			8
River carpsucker	39	14	25	21	9	9
Blue sucker	6	3	2	2	1	3
Smallmouth buffalo	15	6	9	8	7	
River redhorse	2	1	1	1	1	
Golden redhorse	2	1	1	1	1	
Shorthead redhorse	3	1	2		2	1
Blue catfish	24	4	20	20	3	1
Channel catfish	110	44	66	31	41	38
Flathead catfish	15	13	2	4	8	3
Mosquitofish	4	1	3	1		3
Brook silverside	4	4			3	1
Temperate basses	28	17	11	9	10	9
White bass	1		1		1	
Sunfishes	18	4	14	2	2	14
Bluegill	6	1	5	2	1	3
Spotted bass	1	1			1	
Largemouth Bass	1	1				1
Black crappie	1	1		1		
Missouri saddled darter	1	1			0	1

Table 2.4-8—Taxonomic Composition and Abundance in Fish Surveys of the Missouri River Near AmerenUE Property

(Page 2 of 2)

Species	Total	Plant Side "Near Shore"	Opposite Side "Far Shore"	Upstream of Existing Intake	Adjacent to Existing Intake	Downstream of Existing Intake
Slenderhead darter	2	2			2	
Sauger	1		1			1
Freshwater drum	63	20	43	15	42	6
Total	4,128	3,123	1,005	1,018	1,599	1,511
Species Richness[1]	45	40	36	33	34	30

[1] Unidentified species within a genus did not count toward the species richness total unless they were the only representatives identified within that genus.

Table 2.4-9—Taxonomic Composition and Catch-Per-Effort by Method in Fish Surveys of the Missouri River and Stream Station Near AmerenUE Property, 2007-2008

(Page 1 of 2)

Species	Missouri River				Streams
	Electrofishing (#/hour)	Gill Netting (#/24 hr)	Hoop Netting (#/24 hr)	Seining (#/haul)	Seining (#/haul)
Chestnut lamprey	0.33				
Lake sturgeon		0.03			
Shovelnose sturgeon	0.17	1.80			
Paddlefish		0.03			
Spotted gar	0.17				
Longnose gar	0.50	0.27	0.07		
Shortnose gar	0.50	0.30	0.03	0.03	
Goldeye	3.00	0.30		0.81	
Mooneye	0.17				
Skipjack herring	0.17	0.27			
Gizzard shad	64.00	0.43		34.28	
Stoneroller*					3.64
Largescale stoneroller					0.11
Central stoneroller					0.11
Grass carp	0.17		0.03		
Red shiner	0.50			25.67	2.96
Common carp	2.33	0.13			0.43
Plains minnow				0.28	
Silver carp	1.67				
Striped shiner					0.21
Redfin shiner					9.32
Speckled chub				2.47	
Sturgeon chub				0.03	
Silver chub				0.17	
Emerald shiner	1.83			22.69	
River shiner				0.11	
Sand shiner				0.67	5.36
Ozark minnow					0.71
Channel shiner	0.50			0.78	
Bluntnose minnow				0.03	0.82
Bullhead minnow				1.42	
Creek chub					2.50
Carpsucker or Buffalo*				0.22	0.14
Carpsuckers*				0.08	
River carpsucker	5.00	0.20		0.08	
White sucker					0.36
Blue sucker	0.50	0.23			
Smallmouth buffalo	2.00	0.10	0.07		
River redhorse	0.33				
Golden redhorse	0.33				
Shorthead redhorse	0.33	0.13			
Yellow bullhead					0.70
Blue catfish	2.33	0.33			
Channel catfish	2.33	0.40	0.20	2.28	
Flathead catfish	1.67		0.17		

Table 2.4-9—Taxonomic Composition and Catch-Per-Effort by Method in Fish Surveys of the Missouri River and Stream Station Near AmerenUE Property, 2007-2008

(Page 2 of 2)

Species	Missouri River				Streams
	Electrofishing (#/hour)	Gill Netting (#/24 hr)	Hoop Netting (#/24 hr)	Seining (#/haul)	Seining (#/haul)
Blackstripe topminnow					0.67
Mosquitofish				0.11	10.86
Brook silverside				0.11	0.71
Temperate basses*	2.00	0.03		0.42	
White bass		0.03			
Sunfishes*	0.50			0.42	1.93
Green sunfish					0.93
Orangespotted sunfish					0.07
Bluegill	0.50			0.08	0.43
Longear sunfish					0.14
Spotted bass				0.03	
Largemouth bass	0.17				0.25
Black crappie			0.03		
Fantail darter					0.29
Johnny darter					0.46
Orangethroat darter					3.11
Missouri saddled darter				0.03	
Slenderhead darter	0.17			0.06	
Sauger					
Freshwater drum	8.00	0.30	0.03	0.14	
Total	102.17	5.33	0.63	93.47	46.61
Species richness	29	17	6	24	24

Table 2.4-10—Taxonomic Composition and Abundance in Benthic Macroinvertebrate Surveys of the Missouri River and Stream Surveys Near Callaway Plant, Fall 2007 and Spring 2008

(Page 1 of 4)

Taxon	Missouri River		Streams	
	Fall 2007	Spring 2008	Fall 2007	Spring 2008
~~Caecidotea~~ *Caecidotea*			12	1,551
~~Caecidotea (unpigmented)~~ *Caecidotea (unpigmented)*				3
Cambaridae (not Orconectes)				1
~~Crangonyx~~ *Crangonyx*			2	1,130
~~Hyalella azteca~~ *Hyalella azteca*				3
Hydracarina			1	
~~Lirceus~~ *Lirceus*	2		40	157
~~Orconectes~~ *Orconectes*			2	12
~~Palaemonetes kadiakensis~~ *Palaemonetes kadiakensis*			8	9
~~Cf Stygobromus~~ *Cf Stygobromus*				1
Gordiidae				1
Turbellaria				219
Ancylidae			1	1
~~Corbicula~~ *Corbicula*	6			
Lymnaeidae			7	15
~~Menetus~~ *Menetus*			5	2
~~Musculium~~ *Musculium*			16	
Physidae			15	40
~~pLANORBELLA~~ *Planorbella*				3
~~Pisidium~~ *Pisidium*			5	
Sphaeriidae			33	35
~~Amercaenis~~ *Amercaenis*	6			
~~Apobaetis~~ *Apobaetis*	1			
~~Caenis~~ *Caenis*	7		35	
~~Callibaetis~~ *Callibaetis*			4	
~~Camelobaetidius~~ *Camelobaetidius*	1			
~~Cercobrachys~~ *Cercobrachys*	4			
Heptageniidae	1			
~~Hexagenia~~ *Hexagenia*	39			
~~Isonychia~~ *Isonychia*	11			
~~Labiobaetis~~ *Labiobaetis*	128			
Leptophlebiidae	1			
~~Pentagenia~~ *Pentagenia*	9			
~~Stenacron~~ *Stenacron*	1			
~~Stenonema femoratum~~ *Stenonema femoratum*			12	23
~~Stenonema integrum~~ *Stenonema integrum*	11			
~~Tricorythodes~~ *Tricorythodes*	1			
~~Anax~~ *Anax*				1
~~Argia~~ *Argia*	1			3
~~Dromogomphus~~ *Dromogomphus*	3			
~~Enallagma~~ *Enallagma*				1
Gomphidae	4			
~~Nasiaeschna pentacantha~~ *Nasiaeschna pentacantha*			1	

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Table 2.4-10—Taxonomic Composition and Abundance in Benthic Macroinvertebrate Surveys of the Missouri River and Stream Surveys Near Callaway Plant, Fall 2007 and Spring 2008

(Page 2 of 4)

Taxon	Missouri River		Streams	
	Fall 2007	Spring 2008	Fall 2007	Spring 2008
~~Neurocordulia molesta~~ *Neurocordulia molesta*	5			
~~Pachydiplax longipennis~~ *Pachydiplax longipennis*			6	
~~Perithemis~~ *Perithemis*			1	
~~Sympetrum~~ *Sympetrum*			1	
~~Acroneuria~~ *Acroneuria*	1			
~~Allocapnia~~ *Allocapnia*				398
Capniidae			2	
~~Isoperia~~ *Isoperia*				44
~~Neoperla~~ *Neoperla*	4			
~~Aquarius~~ *Aquarius*			1	3
~~Belostoma~~ *Belostoma*				1
~~Saldidae~~ *Saldidae*	1			
~~Corydalus~~ *Corydalus*	1			
~~Sialis~~ *Sialis*			6	
~~Cheumatopsyche~~ *Cheumatopsyche*	1			
~~Cyrnellus fraternus~~ *Cyrnellus fraternus*	1			
~~Diplectrona~~ *Diplectrona*				1
~~Hydropsyche orris~~ *Hydropsyche orris*	272			
Hydropsychidae	1			
~~Ironquia~~ *Ironquia*				21
~~Nectopsyche~~ *Nectopsyche*	1			
~~Neureclipsis~~ *Neureclipsis*	1			
~~Potamyia flava~~ *Potamyia flava*	167			
~~Ptilostomis~~ *Ptilostomis*				3
~~Pycnopsyche~~ *Pycnopsyche*				2
~~Rhyacophila fenestra/ledra~~ *Rhyacophila fenestra/ledra*				19
~~Rhyacophila lobifera~~ *Rhyacophila lobifera*				28
~~Agabus~~ *Agabus*				7
~~Berosus~~ *Berosus*				1
~~Dineutus~~ *Dineutus*				4
~~Dubiraphia~~ *Dubiraphia*			29	2
~~Dytiscidae~~ *Dytiscidae*			2	
~~Ectopria~~ *Ectopria*				30
~~Gyrinus~~ *Gyrinus*				1
~~Helichus~~ *Helichus*				1
Hydrophilidae (not Berosus)				1
~~Hydroporus~~ *Hydroporus*				8
~~Lutrochus~~ *Lutrochus*				2
~~Macronychus glabratus~~ *Macronychus glabratus*	1			
~~Peltodytes~~ *Peltodytes*			1	3
~~Psephenus~~ *Psephenus*				2
Scirtidae			3	2
~~Stenelmis~~ *Stenelmis*	5		3	73
~~Atherix~~ *Atherix*	1			
Ceratopogoninae	5		8	2

Table 2.4-10—Taxonomic Composition and Abundance in Benthic Macroinvertebrate Surveys of the Missouri River and Stream Surveys Near Callaway Plant, Fall 2007 and Spring 2008

(Page 3 of 4)

Taxon	Missouri River		Streams	
	Fall 2007	Spring 2008	Fall 2007	Spring 2008
~~Chaoborus~~ *Chaoborus*	2		5	
~~Clinocera~~ *Clinocera*				1
Culicidae			1	
~~Cf Erioptera~~ *Cf Erioptera*				12
~~Hexatoma~~ *Hexatoma*				2
Simuliidae (not Prosimulium)				2
Tabanidae				7
~~Tipula~~ *Tipula*				2
~~Branchiura sowerbyi~~ *Branchiura sowerbyi*	4		85	36
Enchytraeidae				17
Erpobdellidae			1	17
Glossiphoniidae			1	1
~~Haplotaxis gordioides~~ *Haplotaxis gordioides*				2
~~Limnodrilus claparedeianus~~ *Limnodrilus claparedeianus*	5			9
~~Limnodrilus hoffmeisteri~~ *Limnodrilus hoffmeisteri*	4		3	4
~~Limnodrilus udekemianus~~ *Limnodrilus udekemianus*	1			
Lumbricidae			8	1
Tubificidae w/ hair chaetae	8		69	78
Tubificidae w/out hair chaetae	30		121	79
~~Ablabesmyia annulata~~*Ablabesmyia annulata*	10			
Ablabesmyia rhamphe ~~gp~~ *gp*	1		2	
~~Clinotanypus~~ *Clinotanypus*				10
~~Coelotanypus~~ *Coelotanypus*	3			
~~Natarsia~~ *Natarsia*			2	9
~~Procladius~~ *Procladius*			2	9
~~Tanypus carinatus~~ *Tanypus carinatus*			5	
~~Tanypus neopunctipennis~~ *Tanypus neopunctipennis*			9	
Thienemannimyia ~~gp~~ *gp*	5			
~~Zavrelimyia~~ *Zavrelimyia*	2		1	
~~Sympotthastia~~ *Sympotthastia*				32
~~Bryophaenocladius~~ *Bryophaenocladius*				1
~~Cricotopus/Orthocladius*~~ *Cricotopus/Orthocladius**				113
~~Cricotopus cf luciae~~*Cricotopus cf luciae*				56
~~Diplocladius cultriger~~ *Diplocladius cultriger*				14
~~Epoicocladius~~ *Epoicocladius*	1			
~~Eukiefferiella claripennis gp~~ *Eukiefferiella claripennis gp*				84
~~Hydrobaenus (not "o")~~ *Hydrobaenus (not "o")*			21	654
~~Hydrobaenus cf sp. "o"~~ *Hydrobaenus cf sp. "o"*				606
~~Orthocladius (Euortho) w/13 teeth~~ *Orthocladius (Euortho) w/13 teeth*				32
~~Orthocladius (Euortho) with 19 teeth~~*Orthocladius (Euortho) with 19 teeth*				16

Table 2.4-10—Taxonomic Composition and Abundance in Benthic Macroinvertebrate Surveys of the Missouri River and Stream Surveys Near Callaway Plant, Fall 2007 and Spring 2008

(Page 4 of 4)

Taxon	Missouri River		Streams	
	Fall 2007	Spring 2008	Fall 2007	Spring 2008
~~Orthocladius obumbratus/robacki~~ *Orthocladius obumbratus/robacki*				8
~~Parametriocnemus~~ *Parametriocnemus*				10
~~Paraphaenocladius~~ *Paraphaenocladius*			1	
~~Tvetenia~~ *Tvetenia*				37
~~Axarus~~ *Axarus*	3			
~~Chernovskiia~~ *Chernovskiia*	5			
Chironomini (pupa)	2			
~~Chironomus~~ Chironomus			156	22
~~Cryptochironomus~~ *Cryptochironomus*	3			
~~Dicrotendipes~~ *Dicrotendipes*			6	
~~Dicrotendipes modestus~~ *Dicrotendipes modestus*			14	
~~Dicrotendipes neomodestus~~ *Dicrotendipes neomodestus*			5	
~~Dicrotendipes nervosus~~ *Dicrotendipes nervosus*			1	
~~Dicrotendipes simpsoni~~ *Dicrotendipes simpsoni*			10	
~~Endochironomus~~ *Endochironomus*			1	
~~Glyptotendipes~~ *Glyptotendipes*	1		49	12
~~Goeldichironomus~~ *Goeldichironomus*			31	
~~Kiefferulus~~ *Kiefferulus*			41	
Microtendipes pedellus ~~gp~~ *gp*			1	
~~Paratendipes albimanus~~ *Paratendipes albimanus*			1	
~~Paratendipes basidens~~ *Paratendipes basidens*	3			
~~Polypedilum flavum~~ *Polypedilum flavum*	9			
Polypedilum halterale ~~gp~~ *gp*	3			4
Polypedilum scalaenum ~~gp~~ *gp*	1			
~~Robackia claviger~~ *Robackia claviger*	1			
~~Saetheria~~ *Saetheria*	1			
~~Stictochironomus~~ *Stictochironomus*			9	46
~~Paratanytarsus~~ *Paratanytarsus*				1
~~Rheotanytarsus~~ *Rheotanytarsus*	1			
~~Tanytarsus~~ *Tanytarsus*			4	
Number of Organisms	**814**		**928**	**6,012**
Taxa richness	**54**	**0**	**56**	**83**
EPT Richness	**21**		**4**	**10**

Table 2.4-11—Taxonomic Composition and Abundance by Method and by Location, in Benthic Macroinvertebrate Surveys of the Missouri River Near AmerenUE Property, 2007-2008

(Page 1 of 2)

	Ponar Samples	Surface Tow Samples	Upstream of Existing Intake	Downstream of Existing Intake
~~Lirceus~~ *Lirceus*	2		1	1
~~Corbicula~~ *Corbicula*	6		5	1
~~Amercaenis~~ *Amercaenis*		6	1	5
~~Apobaetis~~ *Apobaetis*		1		1
~~Caenis~~ *Caenis*		7	1	6
~~Camelobaetidius~~ *Camelobaetidius*		1		1
~~Cercobrachys~~ *Cercobrachys*		4	1	3
Heptageniidae	1			1
~~Hexagenia~~ *Hexagenia*	26	13	20	19
~~Isonychia~~ *Isonychia*		11	5	6
~~Labiobaetis~~ *Labiobaetis*		128	49	79
Leptophlebiidae		1		1
~~Pentagenia~~ *Pentagenia*	6	3	6	3
~~Stenacron~~ *Stenacron*		1	1	
~~Stenonema integrum~~ *Stenonema integrum*		11	3	8
~~Tricorythodes~~ *Tricorythodes*		1		1
~~Argia~~ *Argia*		1		1
~~Dromogomphus~~ *Dromogomphus*		3	2	1
~~Gomphidae~~ *Gomphidae*	2	2	2	2
~~Neurocordulia molesta~~ *Neurocordulia molesta*	2	3	2	3
~~Acroneuria~~ *Acroneuria*		1		1
~~Neoperla~~ *Neoperla*		4	2	2
Saldidae	1			1
~~Corydalus~~ *Corydalus*		1	1	
~~Cheumatopsyche~~ *Cheumatopsyche*		1		1
~~Cyrnellus fraternus~~ *Cyrnellus fraternus*		1		1
~~Hydropsyche orris~~ *Hydropsyche orris*	2	270	61	211
Hydropsychidae	1			1
~~Nectopsyche~~ *Nectopsyche*		1	1	
~~Neureclipsis~~ *Neureclipsis*		1		1
~~Potamyia flava~~ *Potamyia flava*		167	32	135
~~Macronychus glabratus~~ *Macronychus glabratus*		1	1	
~~Stenelmis~~ *Stenelmis*	2	3	2	3
~~Atherix~~ *Atherix*	1			1
Ceratopogoninae	4	1	1	4
~~Chaoborus~~ *Chaoborus*		2	2	
~~Branchiura sowerbyi~~ *Branchiura sowerbyi*	4		4	
~~Limnodrilus claparedeianus~~ *Limnodrilus claparedeianus*	5		2	3

Table 2.4-11—Taxonomic Composition and Abundance by Method and by Location, in Benthic Macroinvertebrate Surveys of the Missouri River Near AmerenUE Property, 2007-2008

(Page 2 of 2)

	Ponar Samples	Surface Tow Samples	Upstream of Existing Intake	Downstream of Existing Intake
~~Limnodrilus hoffmeisteri~~ *Limnodrilus hoffmeisteri*	4		1	3
~~Limnodrilus udekemianus~~ *Limnodrilus udekemianus*	1		1	
Tubificidae w/ hair chaetae*	6	2	2	6
Tubificidae w/out hair chaetae*	30		20	10
~~Ablabesmyia annulata~~ *Ablabesmyia annulata*	6	4	2	8
Ablabesmyia rhamphe ~~gp~~ *gp*	1			1
~~Coelotanypus~~ *Coelotanypus*	3		3	
Thienemannimyia ~~gp~~ *gp*		5	3	2
~~Zavrelimyia~~ *Zavrelimyia*		2		2
~~Epoicocladius~~ *Epoicocladius*	1		1	
~~Axarus~~ *Axarus*		3		3
~~Chernovskiia~~ *Chernovskiia*	4	1		5
Chironomini (pupa)*		2	2	
~~Cryptochironomus~~ *Cryptochironomus*	3		1	2
~~Glyptotendipes~~ *Glyptotendipes*		1	1	
~~Paratendipes basidens~~ *Paratendipes basidens*	1	2	1	2
~~Polypedilum flavum~~ *Polypedilum flavum*		9	1	8
Polypedilum halterale ~~gp~~ *gp*	2	1	1	2
Polypedilum scalaenum ~~gp~~ *gp*	1			1
~~Robackia claviger~~ *Robackia claviger*		1	1	
~~Saetheria~~ *Saetheria*		1	1	
~~Rheotanytarsus~~ *Rheotanytarsus*		1		1
Number of Organisms	128	686	250	564
Taxa Richness	25	42	37	43
EPT Richness	4	21	13	19

* Family level or higher taxa designations (unitalicized) are only counted for the taxa richness total if there is not a genus within that group present.

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Table 2.4-12—Taxonomic Composition and Abundance in Fish Surveys of Streams in the AmerenUE Property

(Page 1 of 2)

Species	Scientific name	Permanent		Intermittent Tributaries				
		Logan Creek	Mud Creek	Logan Creek-A*	Mud Creek*	Logan Creek-B	Auxvasse Creek-A*	Auxvasse Creek-B
		S1	S2	S3	S4	S5	S6	S7
Stoneroller	*Campostoma* sp.	64	13					25
Largescale stoneroller	~~Campostoma oligolepis~~ *Campostoma oligolepis*		3					
Central stoneroller	~~Campostoma pullum~~ *Campostoma pullum*	1					1	1
Red shiner	~~Cyprinella lutrensis~~ *Cyprinella lutrensis*	33	50					
Common carp	~~Cyprinus carpio~~ *Cyprinus carpio*	7	5					
Striped shiner	~~Luxilus chrysocephalus~~ *Luxilus chrysocephalus*	6						
Redfin shiner	~~Lythrurus umbratilis~~ *Lythrurus umbratilis*	147	112			2		
Sand shiner	~~Notropis ludibundus~~ *Notropis ludibundus*	149	1					
Ozark minnow	~~Notropis nubilus~~ *Notropis nubilus*	19	1					
Bluntnose minnow	~~Pimephales notatus~~ *Pimephales notatus*	21	2					
Creek chub	~~Semotilus atromaculatus~~ *Semotilus atromaculatus*	33	34					3
Carpsucker or Buffalo	~~Carpiodes/Ictiobus~~ *Carpiodes/Ictiobus*	4						
White sucker	~~Catostomus commersoni~~ *Catostomus commersoni*	10						
Yellow bullhead	~~Ameiurus natalis~~ *Ameiurus natalis*	2						
Blackstripe topminnow	~~Fundulus notatus~~ *Fundulus notatus*	6	13					
Mosquitofish	~~Gambusia affinis~~ *Gambusia affinis*	146	158					
Brook silverside	~~Labidesthes sicculus~~ *Labidesthes sicculus*	16	4					
Sunfishes	*Lepomis* ~~sp.~~ sp	12				37		5
Green sunfish	~~Lepomis cyanellus~~ *Lepomis cyanellus*	9				11		6
Orangespotted sunfish	~~Lepomis humilis~~ *Lepomis humilis*		2					
Bluegill	~~Lepomis macrochirus~~ *Lepomis macrochirus*	3				1		8
Longear sunfish	~~Lepomis megalotis~~ *Lepomis megalotis*	1	3					

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Table 2.4-12—Taxonomic Composition and Abundance in Fish Surveys of Streams in the AmerenUE Property

(Page 2 of 2)

Species	Scientific name	Permanent		Intermittent Tributaries				
		Logan Creek	Mud Creek	Logan Creek-A*	Mud Creek*	Logan Creek-B	Auxvasse Creek-A*	Auxvasse Creek-B
		S1	S2	S3	S4	S5	S6	S7
Largemouth bass	~~Micropterus salmoides~~ *Micropterus salmoides*					1		6
Fantail darter	~~Etheostoma flabellare~~ *Etheostoma flabellare*	4	4					
Johnny darter	~~Etheostoma nigrum~~ *Etheostoma nigrum*	12	1					
Orangethroat darter	~~Etheostoma spectabile~~ *Etheostoma spectabile*	11	72	2			2	
Total		716	478	2	0	52	3	54
Species richness†		21	16	1	0	4	2	5

* ~~No fish—creek was dry.~~

† Unidentified species within a genus did not count toward the species richness total unless they were the only representatives identified within that genus.

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Taxonomic Composition and Abundance in Benthic Macoinvertebrate Surveys of Streams in the AmerenUE Property

(Page 1 of 2)

Taxon	Permanent		Intermittent Tributaries				
	Logan Creek	Mud Creek	Logan Creek A*	Mud Creek*	Logan Creek B*	Auxvasse Creek A	Auxvasse Creek B*
	S1	S2	S3	S4	S5	S6	S7
Caecidotea		12					
Crangonyx						2	
Hydracarina	1						
Lirceus	7	33					
Orconectes		2					
Palaemonetes kadiakensis		8					
Ancylidae		1					
Lymnaeidae	2	5					
Menetus	1					4	
Musculium						16	
Physidae	6	7				2	
Pisidium						5	
Sphaeriidae						33	
Caenis	9	26					
Callibaetis		4					
Stenonema femoratum		12					
Nasiaeschna pentacantha		1					
Pachydiplax longipennis		1				5	
Perithemis						1	
Sympetrum						1	
Capniidae	2						
Aquarius		1					
Sialis		6					
Dubiraphia	4	25					
Dytiscidae	1	1					
Peltodytes		1					
Scirtidae	1	2					
Stenelmis		3					
Ceratopogoninae	5	2				1	
Chaoborus	2	3					
Culicidae	1						
Branchiura sowerbyi	43	42					
Erpobdellidae		1					
Glossiphoniidae						1	
Limnodrilus hoffmeisteri	1	1				1	
Lumbricidae		7				1	
Tubificidae w/ hair chaetae*	10	40	-	-	-	19	-
Tubificidae w/out hair chaetae*	34	84	-	-	-	3	-
Ablabesmyia rhamphe gp	-	2	-	-	-	-	-
Natarsia	1	1	-	-	-	-	-
Procladius	1	1	-	-	-	-	-
Tanypus carinatus	5	-	-	-	-	-	-
Tanypus neopunctipennis	-	9	-	-	-	-	-

~~Taxonomic Composition and Abundance in Benthic Macoinvertebrate Surveys of Streams in the AmerenUE Property~~

~~(Page 2 of 2)~~

~~Taxon~~	~~Permanent~~		~~Intermittent Tributaries~~				
	~~Logan Creek~~	~~Mud Creek~~	~~Logan Creek A*~~	~~Mud Creek*~~	~~Logan Creek B*~~	~~Auxvasse Creek A~~	~~Auxvasse Creek B*~~
	~~S1~~	~~S2~~	~~S3~~	~~S4~~	~~S5~~	~~S6~~	~~S7~~
~~Zavrelimyia~~	-	~~1~~	-	-	-	-	-
~~Hydrobaenus~~	~~1~~	~~19~~	-	-	-	~~1~~	-
~~Paraphaenocladius~~	~~1~~	-	-	-	-	-	-
~~Chironomus~~	~~88~~	~~53~~	-	-	-	~~15~~	-
~~Dicrotendipes*~~	~~6~~	-	-	-	-	-	-
~~Dicrotendipes modestus~~	~~1~~	-	-	-	-	~~13~~	-
~~Dicrotendipes neomodestus~~	~~5~~	-	-	-	-	-	-
~~Dicrotendipes nervosus~~	-	-	-	-	-	~~1~~	-
~~Dicrotendipes simpsoni~~	~~9~~	~~1~~	-	-	-	-	-
~~Endochironomus~~	-	-	-	-	-	~~1~~	-
~~Glyptotendipes~~	~~26~~	~~23~~	-	-	-	-	-
~~Goeldichironomus~~	~~25~~	~~5~~	-	-	-	~~1~~	-
~~Kiefferulus~~	~~34~~	~~5~~	-	-	-	~~2~~	-
~~Microtendipes pedellus gp~~	-	~~1~~	-	-	-	-	-
~~Paratendipes albimanus~~	-	~~1~~	-	-	-	-	-
~~Stictochironomus~~	-	~~6~~	-	-	-	~~3~~	-
~~Tanytarsus~~	-	~~2~~	-	-	-	~~2~~	-
~~Number of Organisms~~	~~333~~	~~461~~	~~0~~	~~0~~	~~0~~	~~134~~	~~0~~
~~Taxa Richness†~~	~~27~~	~~40~~	~~0~~	~~0~~	~~0~~	~~22~~	~~0~~
~~EPT Richness~~	~~2~~	~~3~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~

* No organisms – creek was dry.

† Family level or higher taxa designations (unitalicized) are only counted for the taxa richness total if there is not a genus within that group present.

Table 2.4-13—Taxonomic Composition and Abundance in Benthic Macroinvertebrate Surveys of Streams in the AmerenUE Property

(Page 1 of 4)

	Permanent			Intermittent Tributaries				
Taxon	Logan Creek S1	Mud Creek S2		Logan Creek - A S3	Mud Creek S4	Logan Creek - B S5	Auxvasse Creek - A S6	Auxvasse Creek - B S7
Caecidotea	4	92		10	479	366	593	19
Caecidotea (unpigmented)				2	1			
Cambaridae (not *Orconectes*)								1
Crangonyx	9	8		237	404	305	149	20
Hyalella azteca	2						1	
Hydracarina	1							
Lirceus	89	87		21				
Orconectes	1	9		4				
Palaemonetes kadiakensis	5	12						
cf *Stygobromus*				1				
Gordiidae					1			
Turbellaria	3	43		27	12	23	87	24
Ancylidae		1			1			
Lymnaeidae	8	7		2		2		3
Menetus	1						6	
Musculium							16	
Physidae	27	11		2	8	3	3	1
Pisidium							5	
Planorbella								3
Sphaeriidae*				2		1	39	26
Caenis	35	64			4		16	
Callibaetis		4						
Stenonema femoratum	4	31						
Anax					1			
Argia	2	1						
Enallagma	1							
Nasiaeschna pentacantha		1						
Pachydiplax longipennis		1					5	
Perithemis							1	
Sympetrum							1	
Allocapnia	398							

Table 2.4-13—Taxonomic Composition and Abundance in Benthic Macroinvertebrate Surveys of Streams in the AmerenUE Property

(Page 2 of 4)

	Permanent			Intermittent Tributaries				
	Logan Creek	Mud Creek		Logan Creek - A	Mud Creek	Logan Creek - B	Auxvasse Creek - A	Auxvasse Creek - B
Taxon	S1	S2		S3	S4	S5	S6	S7
Capniidae*	2							
Isoperla	17	27						
Aquarius		1		3				
Belostoma	1							
Sialis		6						
Diplectrona						1		
Ironoquia	1	2		14	2	2		
Ptilostomis	1			2				
Pycnopsyche		2						
Rhyacophila fenestra/ledra	1	15					3	
Rhyacophila lobifera	28							
Agabus				4	1			2
Berosus	1							
Dineutus	4							
Dubiraphia	4	27						
Dytiscidae*	1	1						
Ectopria					30			
Gyrinus	1							
Helichus					1			
Hydrophilidae (not *Berosus*)	1							
Hydroporus	1			1			1	5
Lutrochus							1	1
Peltodytes	3	1						
Psephenus		2						
Scirtidae	3	2						
Stenelmis	9	39		1	19		7	1
Ceratopogoninae	5	2				2	1	
Chaoborus	2	3						
Clinocera		1						
Culicidae	1							
cf *Erioptera*	1			2		2		7

Table 2.4-13—Taxonomic Composition and Abundance in Benthic Macroinvertebrate Surveys of Streams in the AmerenUE Property

(Page 3 of 4)

	Permanent			Intermittent Tributaries				
Taxon	Logan Creek S1	Mud Creek S2		Logan Creek - A S3	Mud Creek S4	Logan Creek - B S5	Auxvasse Creek - A S6	Auxvasse Creek - B S7
Hexatoma	1						1	
Simuliidae (not *Prosimulium*)		2						
Tabanidae		1				1	1	4
Tipula	1	1						
Branchiura sowerbyi	52	62			7			
Enchytraeidae							1	16
Erpobdellidae		4		1	11			2
Glossiphoniidae	1						1	
Haplotaxis gordioides								2
Limnodrilus claparedeianus		4					3	2
Limnodrilus hoffmeisteri	1	1			1	3	1	
Lumbricidae		7					1	1
Lumbriculidae		4				1		3
Tubificidae w/ hair chaetae*	10	40			7	14	63	13
Tubificidae w/out hair chaetae*	34	112			37		9	8
Ablabesmyia rhamphe gp		2						
Clinotanypus						10		
Natarsia	1	5			1	1	3	
Procladius	1	1				9		
Tanypus carinatus	5							
Tanypus neopunctipennis		9						
Zavrelimyia		1						
Sympotthastia		32						
Bryophaenocladius								1
*Cricotopus/Orthocladius**	12	96		2			3	
Cricotopus cf *luciae*	4	52						
Diplocladius cultriger		8					4	2
Eukiefferiella claripennis gp	44	40						
Hydrobaenus (not "O")	337	227		12			12	87

Table 2.4-13—Taxonomic Composition and Abundance in Benthic Macroinvertebrate Surveys of Streams in the AmerenUE Property

(Page 4 of 4)

Taxon	Permanent		Intermittent Tributaries				
	Logan Creek	Mud Creek	Logan Creek - A	Mud Creek	Logan Creek - B	Auxvasse Creek - A	Auxvasse Creek - B
	S1	S2	S3	S4	S5	S6	S7
Hydrobaenus cf sp. "O"		88	518				
Orthocladius (Euortho) w/ 13 teeth			18			12	2
Orthocladius (Euortho) w/ 19 teeth	4	12					
Orthocladius obumbratus/robacki		8					
Parametriocnemus	8		2				
Paraphaenocladius	1						
Tvetenia		28	6			2	1
Chironomus	88	69			2	19	
*Dicrotendipes**	6						
Dicrotendipes modestus	1					13	
Dicrotendipes neomodestus	5						
Dicrotendipes nervosus						1	
Dicrotendipes simpsoni	9	1					
Endochironomus						1	
Glyptotendipes	30	31					
Goeldichironomus	25	5				1	
Kiefferulus	34	5				2	
Microtendipes pedellus gp		1					
Paratendipes cf *albimanus*		1		4			
Polypedilum halterale gp		4					
Stictochironomus		50				5	
Paratanytarsus					1		
Tanytarsus		2				2	
Number of organisms	1393	1519	894	1032	749	1096	257
Taxa richness	56	63	24	20	19	39	26
EPT richness	8	7	2	2	2	2	0

Summary of Wetland Functional Values

Functional	Relative Functional Value by Wetland Type			
	Isolated Ponds	Settling Ponds	Logan Cr Wetlands	Big River Wetlands
Groundwater Recharge-Discharge	L	M	H	H
Flood Storage	L	L-M	H	H
Fish Habitat	L	M	L	H
Sediment Retention	L	H	M	H
Nutrient/Contaminant Removal	L	L	M	H
Wildlife Habitat (fishless vernal pools, waterfowl)	L-M	M	H	H
Recreation (fishing, hunting, etc.)	L	M	L	L
Uniqueness-Heritage (important for listed species)	L	L	H	H

Functional values assigned based on professional judgement whereby H = high value/benefit; M = medium value/benefit; L = low value/benefit; 0 = not applicable

Table 2.4-14—Summary of Wetland Functional Values

Functional Criteria	Relative Functional Value by Wetland Type				
	Isolated Ponds	Settling Ponds	Logan Cr Wetlands	Big River Wetlands	Mollie Dozier Chute Wetlands
Groundwater Recharge-Discharge	L	M	H	H	H
Flood Storage	L	L-M	H	H	H
Fish Habitat	L	M	L	H	H
Sediment Retention	L	H	M	H	H
Nutrient/Contaminant Removal	L	L	M	H	H
Wildlife Habitat (fishless vernal pools, waterfowl)	L-M	M	H	H	H
Recreation (fishing, hunting, etc.)	L	M	L	L	M
Uniqueness-Heritage (important for listed species)	L	L	H	H	H

Functional values assigned based on professional judgment whereby H = high value/benefit; M = medium value/benefit; L = low value/benefit; 0 = not applicable

Table 2.4-15—Important Aquatic Species Collected from or Potentially in the Missouri River or Streams Near the AmerenUE Property

Common Name	Scientific Name	Threatened or Endangered Species	Missouri S3 (Vulnerable) Species*	Recreationally or Commercially Important Species
Fish				
Lake sturgeon	Acipenser fulvescens	X		
Pallid sturgeon	Scaphirhynchus albus	X		
Shovelnose sturgeon	Scaphirhynchus platorynchus			X
Paddlefish	Polyodon spathula		X	X
Sturgeon chub	Macrhybopsis gelida		X	
Sicklefin chub	Macrhybopsis meeki		X	
Blacknose shiner	Notropis heterolepis		X	
Topeka shiner	Notropis Topeka	X		
Flathead chub	Platygobio gracilis	X		
Blue sucker	Cycleptus elongates		X	
Smallmouth buffalo	Ictiobus bubalus			X
Bigmouth buffalo	Ictiobus cyprinellus			X
Blue catfish	Ictalurus furcatus			X
Channel catfish	Ictalurus punctatus			X
Flathead catfish	Pylodictis olivaris			X
Plains topminnow	Fundulus sciadicus		X	
White bass	Morone chrysops			X
Bluegill	Lepomis macrochirus			X
Spotted bass	Micropterus punctulatus			X
Largemouth bass	Micropterus salmoides			X
White crappie	Pomoxis annularis			X
Black crappie	Pomoxis nigromaculatus			X
Sauger	Stizostedion canadense			X
Freshwater drum	Aplodinotus grunniens			X
Mussels**				
Pink mucket	Lampsilis abrupta	X		
Scaleshell	Leptodea leptodon	X		

* Only species that were also listed as globally vulnerable, and had previously been collected in the study area, were considered.

** Neither mussel species has been collected from the site or ecological investigation area, but both potentially occur in the ecological investigation area.

Figure 2.4-1—Site Land Cover

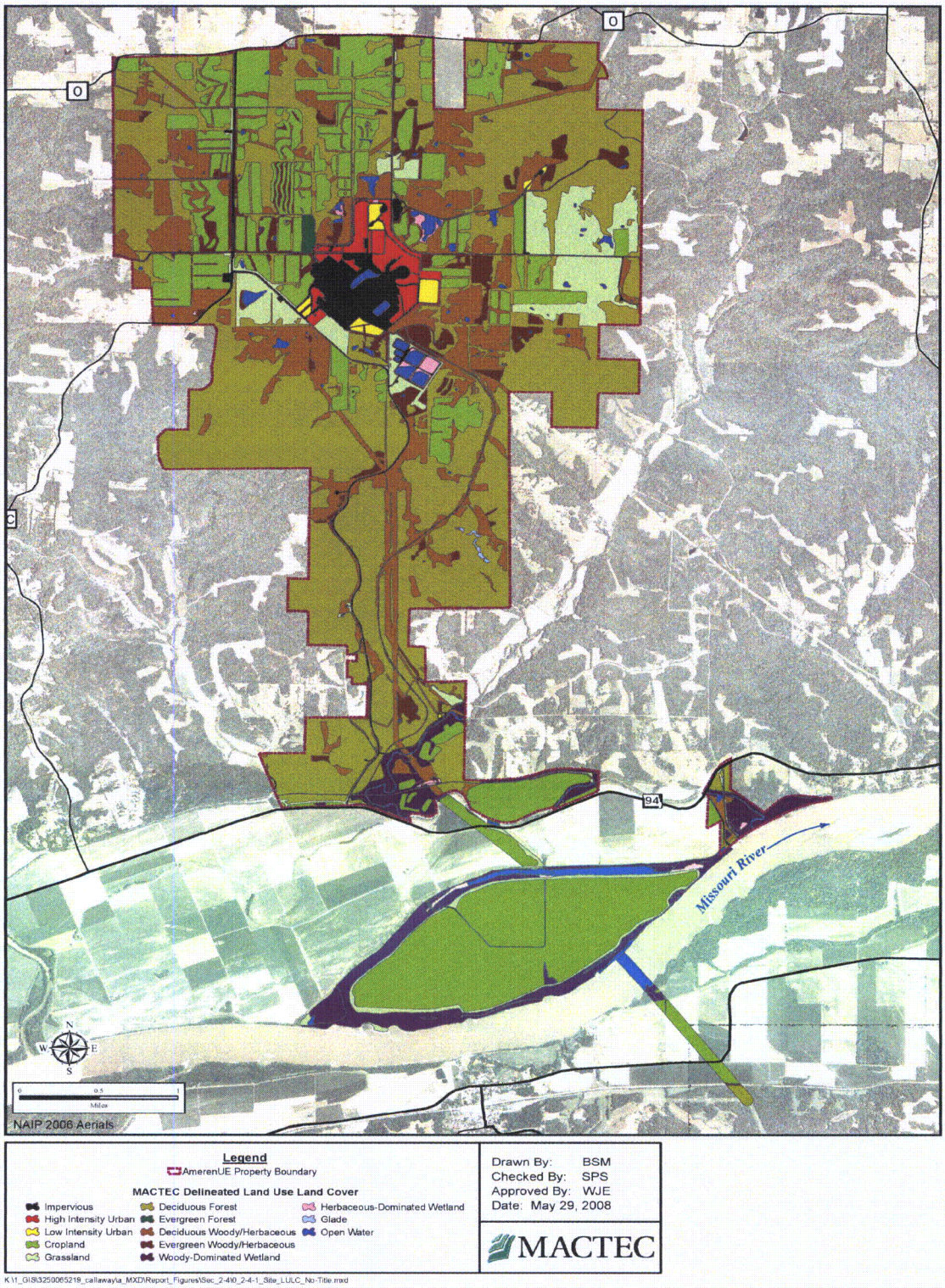

Figure 2.4-2—Land Cover-Ecological Study Area

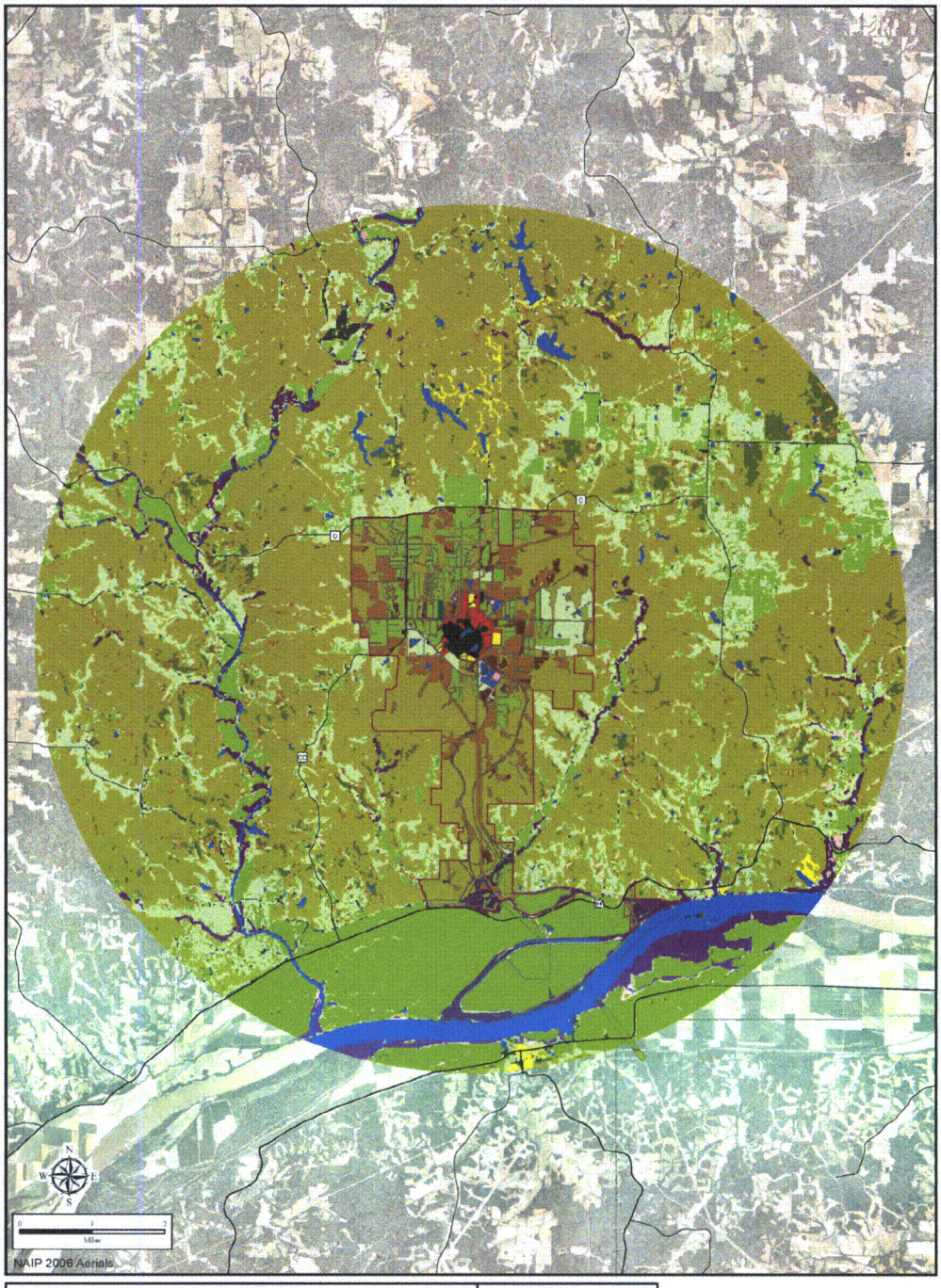

Figure 2.4-3—Terrestrial Sampling Locations

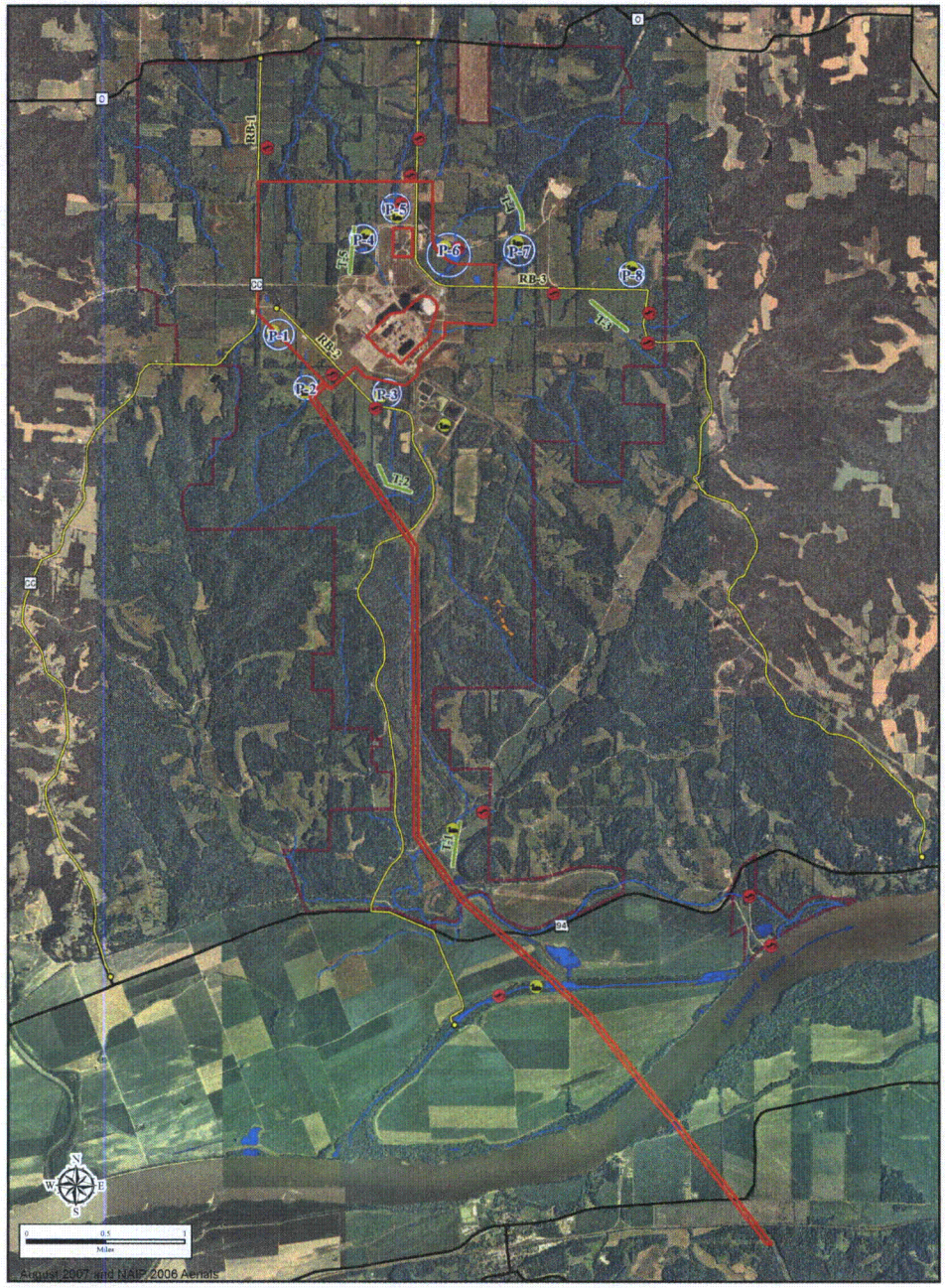

Figure 2.4-4—Terrestrial Important Habitats

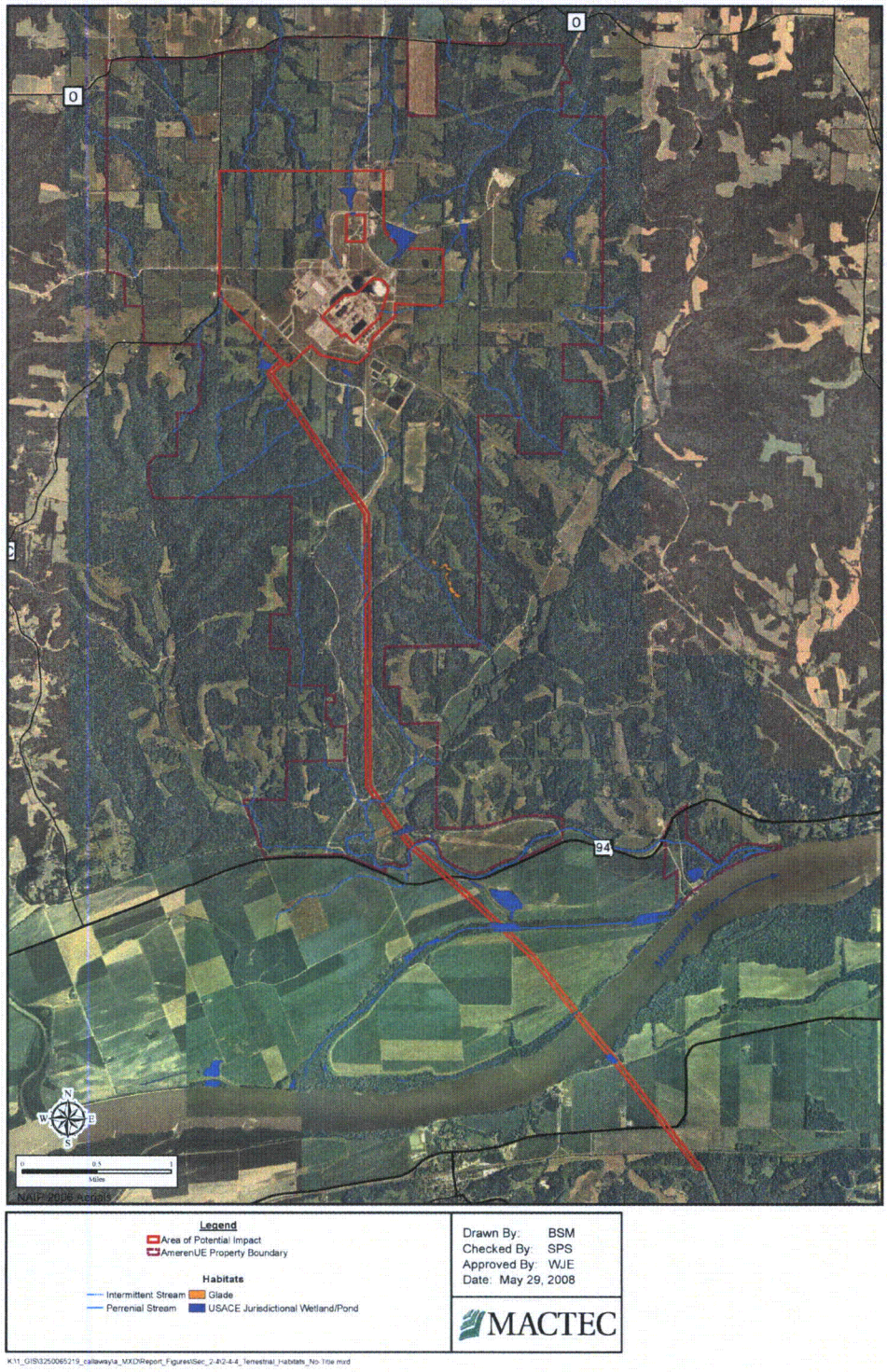

Figure 2.4-5—Aquatic Sampling Locations

4.0 ENVIRONMENTAL IMPACTS OF CONSTRUCTION

4.1 LAND USE IMPACTS

This section describes the impacts of site preparation and construction to the Callaway site and the surrounding area. Section 4.1.1 describes impacts to the site and vicinity. Section 4.1.2 describes impacts that could occur along transmission lines. Section 4.1.3 describes impacts to historic and cultural resources at the site.

4.1.1 THE SITE AND VICINITY

The Callaway site land use is presented in Table 2.2-1 and shown on Figure 2.2-1. The land use categories are consistent with USGS land use/cover categories. Land use/cover within the 8 mile (13 km) site vicinity is presented in Table 2.2-2 and shown on Figure 2.2-2. Highways and utility right-of-ways that cross the site and vicinity are shown on Figure 2.2-9 and Figure 2.2-7.

4.1.1.1 The Site

Callaway Plant Unit 2 and supporting facilities will be located on the 2,765 acre (1,119 hectare) Callaway site, to the northwest of and adjacent to Callaway Plant Unit 1. The Callaway site use activities will not change as the result of this action. The Callaway site acreage is owned by AmerenUE and used for the purpose of generating electricity. The action to construct and operate an additional power unit will not alter the site's current use. The Callaway site will continue to conform to all applicable local, state, and federal land use requirements and restrictions as they pertain to this action.

Approximately 6,600 acres (2,670 hectares) of the 7,354 acre (2,976 hectare) property owned by AmerenUE, which includes the Callaway site, are managed by the Missouri Department of Conservation (MDC) and are available for public use.

In cooperation with Union Electric (now doing business as (d/b/a) AmerenUE), the MDC prepared a plan in 1976 for the development and management of the forest, fish, and wildlife resources on the AmerenUE property. This area was originally known as the Reform Wildlife Management Area (now the Reform Conservation Area). Because of the need to implement evacuation procedures in the event of postulated accidental radiation releases, the land use programs ultimately recommended for the area were of a low-intensity nature. Recommendations included the following: forest management, agriculture, research, wildlife management, hunting, fishing, picnicking, vistas, and special areas. The plan was developed to be flexible, and recommended activities could be further emphasized or modified to accommodate additional priorities or restrictions.

In 1977, Union Electric (now d/b/a AmerenUE) and the MDC entered into an agreement for an initial 5-year management plan that could be self-supporting and less intensive than the 1976 plan. This plan allowed public recreational use on designated lands within the AmerenUE property boundaries; however, camping and use of firearms (firing a single projectile) were not permitted. In 1994 AmerenUE entered into a 10-year Management Agreement for the Public Use of Lands with the MDC for the management of the Reform Conservation Area (AUE, 1994) and still operates under this agreement. The Area may be closed to the public when the National Security Level reaches "orange" or higher.

No comprehensive land use or zoning plans exist covering the rural portions of Callaway County, including the Callaway site or vicinity. Legislation authorizing the establishment of

Regional Planning Commissions was enacted in 1969 and appears in Chapter 251 of the Revised Statutes of Missouri (RSMo) Part 160 (RSMo, 2007). The functions of a Regional Planning Commission are "solely advisory to the local governments comprising the region" (RSMo 251.300). A total of 19 Regional Planning Commissions have been established in accordance with this legislation (MACOG, 2007). Callaway County is represented by the Mid-Missouri Regional Planning Commission. Comprehensive plans covering unincorporated areas of the State, including the area comprising the site and vicinity, have not generally been prepared. Enabling legislation establishing County Planning Commissions with the authority to create, adopt, amend, and carry out a county plan (Senate Bill [SB] 193, 2007) became effective on August 28, 2007.

During construction, site activities will be authorized by the agencies and programs listed in Table 1.3-1. There is no recognized Native American Tribal Land use plan that would have jurisdiction over the Callaway site or within the vicinity of the Callaway site that could impact the Callaway site.

Figure 4.1-1 shows the portions of the AmerenUE property that will be impacted by construction activities, including temporary features such as laydown areas, stormwater retention ponds, and the construction parking area. ~~Figure 4.3-4 through Figure 4.3-6~~ Table 4.3-1 provides an estimate of the land areas that will be disturbed during construction of Callaway Plant Unit 2 and its supporting facilities. Approximately 14 acres (6 hectares) of the Callaway site will be temporarily disturbed by site preparation and construction activities. An additional ~~612~~ 581 acres (~~248~~ 235.1 hectares) will be permanently dedicated to Callaway Plant Unit 2 and its supporting facilities, and lost to other uses until after decommissioning.

~~Figure 4.3-4 through Figure 4.3-6~~ Table 4.3-1 provides a breakdown by land use designation of the areas potentially impacted by Callaway Plant Unit 2 construction. Permanent and temporary impacts are listed separately on ~~Figure 4.3-4 through Figure 4.3-6~~ Table 4.3-1.

Section 2.2.1 describes the land areas that are devoted to major uses within the Callaway site boundary and the Callaway site vicinity. These areas are depicted on Figure 2.2-1 and Figure 2.2-2, respectively. In addition, Section 2.2.1 describes the highways and utility right-of-way that cross the Callaway site and vicinity. The footprint for Callaway Plant Unit 2 and its supporting facilities will be located on previously disturbed and developed land. This area is not open to the public; thus, there would be no impact to those areas of the Callaway site available to the public as the result of the action. AmerenUE is not aware of any Federal action in the area that would have cumulatively significant land use impacts as discussed in Section 2.8.

Heavy equipment and reactor components will be transported via the Missouri River to the existing barge slip. Dredging to deepen the dredge slip is not anticipated, but may be necessary in the area immediately in front of the barge slip if silt has built up sufficiently to impede barge docking and offload. The existing heavy haul road from the barge slip will be modified as necessary to access the new construction site and lay down areas. A new construction parking lot will be built with entrances from existing Access Road D connecting to State Route CC and Access Road E, thus permitting contractor access to the construction areas without impeding traffic to the existing units. To provide an entrance from Access Road E, a portion of the existing site perimeter road will be rerouted through the new laydown area. Another road will be built going south from State Route 94 providing access to the Collector Well System water intake structures on Binggeli Island.

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The new Collector Well System water intake and its access road, existing discharge, barge facilities and their access roads are located in the 100-year Missouri River floodplain. With those exceptions, construction activities would be outside the 500-year floodplain (FEMA, 1997).

The site on which Callaway Plant Unit 2 will be located is predominantly categorized as "Urban" or "Built-up" because it is on AmerenUE developed land. The only known mineral deposit currently being extracted in Callaway County is crushed and broken limestone as described in Section 2.2.1. There are no currently exploited mineral deposits on the Callaway site.

Construction activities would result in the permanent loss, through filling, of wetland habitat and wetland buffer. Section 4.3.1.3 provides a detailed discussion of construction impacts to wetlands. ~~Figure 4.3-4 through Figure 4.3-6~~ Table 4.3-2 and Table 4.3-3 include~~s a summary~~ summaries of wetland and wetland buffers potentially impacted by Callaway Plant Unit 2 construction. LBDCR 09-0158

It is concluded that the land use impacts to the Callaway site and vicinity of the Callaway site from construction of the new unit would be MODERATE, primarily due to the loss of wetlands and wetland buffers, and would require mitigation. The mitigation measures associated with the wetlands and wetland buffers are described in Section 4.3.1.6.

4.1.1.2 The Vicinity

Land in the vicinity of the Callaway site is rural. Land use within 8 miles (13 km) of the site is predominantly forest, grassland, and cropland as described in Section 2.2, and shown on Figure 2.2-2.

The construction activities that would degrade the visual aesthetics of the land would be limited to those activities potentially seen from local roads including State Route CC, State Route O, County Route 448, and County Road 459. Average daily traffic counts recorded by the Missouri Department of Transportation (MoDOT) in 2006 were 906 vehicles on the segment of State Route O adjacent to the Callaway site and 1,688 vehicles for the segment of State Route CC adjacent to the site (Haslag, D., 2007, personal communication). Because of the forested nature of the area surrounding the proposed site, the degree to which construction activities for the facilities could be seen directly from the adjacent highways can be expected to be higher in the winter when there is no foliage and lower during the summer months when the trees are leafed out. Once the facility construction extends above the tree line, construction will increasingly be seen from roadways or other areas in the vicinity of the site depending on the area's topography. However, because that portion of the Callaway site which will experience the greatest level of construction activity already contains Callaway Plant Unit 1, visual impacts from the project would be similar to existing site conditions.

Prime farmland is of importance in meeting the Country's short- and long-term needs for food and fiber. Prime farmland as defined is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses (USDA, 2007). Construction activities associated with the installation of the new Collector Well System will impact farmland along the north bank of the Missouri River. Figure 4.1-2 shows the prime farmland in the vicinity. shows soil types present between State Route 94 and the Missouri River from County Route 462 on the west to Logan Creek on the east with their farmland classification. ~~Figure 4.3-4~~ Figure 4.3-1 through ~~Figure 4.3-6~~ Figure 4.3-3 contains a list of the soil types present by soil association, and farmland classification. LBDCR 09-0158

Section 4.4.2.4 provides the details on potential population impacts on housing due to construction activities. Most of the temporary construction workforce are expected to maintain

their permanent residences outside of Callaway, Boone, or Cole Counties. These workers would commute or find temporary housing in or near Fulton in Callaway County, Jefferson City in Cole County, or Columbia in Boone County. No land use changes in the Callaway vicinity are expected to occur as a result of construction workforce related population changes.

Thus, it is concluded that impacts to land use in the vicinity of Callaway Plant Unit 2 would be SMALL, and not require mitigation.

4.1.2 TRANSMISSION CORRIDORS AND OFFSITE AREAS

In 2005, one of the two original Callaway-Bland circuits was split to allow routing power to a new Loose Creek substation and establishing a Callaway-Loose Creek transmission system. This change was made to reduce transmission line congestion to the south and provide additional power to Jefferson City. The new transmission line will route power at 345 kV from the Callaway Plant Unit 1 switchyard to a tie-in point on the Callaway-Loose Creek line 6.7 miles (10.8 km) south of the Callaway Plant Unit 1 switchyard. This action will allow the existing Callaway-Bland line to be restored to its original two-circuit design. The existing Callaway-Bland corridor will be widened by 150 ft (46 m) to accommodate the new section of the Callaway-Loose Creek transmission line. This will necessitate obtaining additional easements permitting the widening of the transmission corridor for that portion that is off AmerenUE property. New transmission towers supporting the 345 kV transmission lines will be installed in the widened corridor parallel to and west of the existing Callaway-Bland transmission line, crossing the Missouri River at river mile 116.6 (187.6 km). The transmission lines cross mostly secondary-growth hardwood forests, grassland, and farmland.

The transmission line work being considered to support this project would require new towers and transmission lines connecting the Callaway Plant Unit 1 switchyard to a tie-in point on the Callaway-Loose Creek line as described above. All federal, state, and local regulations will be met. Transmission system expansion planning will conform to the planning process established by the Midwest Independent Transmission System Operator (Midwest ISO).

There are no Federal actions that would have cumulatively significant land use impacts within the vicinity and region of the Callaway site activity and offsite areas as described in Section 2.8.

Because existing transmission corridors will be widened, it is concluded that there will be impacts to transmission corridor lands associated with the proposed construction of Callaway Plant Unit 2. No new access roads or modifications to existing roads are currently anticipated.

4.1.3 HISTORIC PROPERTIES

Table 2.5-43 and Table 2.5-44 include resources within the project's Area of Potential Effect (APE) potentially eligible or eligible for listing on the National Register of Historic Places (NRHP). These tables incorporate information received from the Missouri State Historic Preservation Office (SHPO) on 79 prehistoric sites and 29 historic sites on the Callaway site. A total of 20 prehistoric sites were evaluated as eligible for nomination to the NRHP. All are located at least one mile (1.6 km) from the Callaway Plant Unit 1 cooling tower and are expected to be outside any area to be disturbed by construction. None of the historic sites were evaluated as eligible for inclusion in the NRHP. There are two prehistoric sites and two architectural resources, listed on the NRHP that are located off of the Callaway property. None will be affected by construction.

Consultation on the Phase I cultural resources survey with Native American tribes is pending, to determine if there are any additional historic sites on the Callaway property.

As discussed in Section 2.5.3, there is potential for steamboat wrecks to be affected by the collector well construction.

Historically, the Missouri River supported a diverse ecosystem with abundant braided channels, riparian lands, chutes, sloughs, islands, sandbars, backwater areas and natural flood plain communities. These riverine and flood plain habitats were maintained by continuous bank erosion and deposition, which constantly reshaped the channel and flood plain. The river carried a high sediment load and had a propensity for flooding and changing the location of its channel. Typical river flows rose throughout the spring from rain and melting snow runoff, and then declined throughout the summer and fall, reaching their low point in late December. Attempts to control the river's unpredictable nature and its rich alluvial flood plain for transportation, farming, and urban development began in the late 19th century. In the 1940s two programs created by the U.S. Army Corps of Engineers and the Bureau of Reclamation transformed the free-flowing river into a system of main stem reservoirs and highly altered riverine reaches influenced by regulated flows, self channelization, and bank stabilization (USGS, 1998).

With construction activities, there is always the possibility for inadvertent discovery of previously unknown cultural resources or human remains. This may become a particular issue when working in the floodplain areas adjacent to the Missouri River. A Cultural Resources Discovery Plan (PCR, 2007) was prepared and submitted to the State Historic Preservation Office (SHPO) within the Missouri Department of Natural Resources (MDNR) pursuant to Section 106 of the National Historic Preservation Act (USC, 2007), and the Advisory Council on Historic Preservation's regulation (ACHC, 2004). This plan was developed prior to initiation of a soil boring program on Bingelli Island performed in conjunction with a program to investigate the feasibility and design of a Collector Well System accommodating the water intake requirements of the Callaway site. This plan was approved by the MDNR SHPO and will serve as a model for additional plans to be prepared and submitted prior to initiating other land disturbing activities. The procedure described in the Cultural Resources Discovery Plan complies with applicable Federal and State laws. These laws include the National Historic Preservation Act (USC, 2007) and the applicable sections of the Revised Statutes of Missouri (RSMo) Chapters 194 (RSMo, 2006a) and 253 (RSMo, 2006b). Phase 1 and 2 surveys will be conducted when the Collector Well System locations are finalized, and results will be used to avoid known historic sites during final design. Additionally, on-site monitoring during drilling activities will be implemented according to SHPO guidance and the Callaway 's Cultural Resources Discovery Plan.

It is concluded that although the potential is low, there may be adverse impacts to historic or cultural resources from construction. Should monitoring or further investigation identify the presence of historic or archaeological sites, then SHPO will be consulted regarding appropriate investigative and/or protective steps to minimize or mitigate any adverse effects, per Section 106 of the National Historic Preservation Act. Any identified measures would be delineated in a Memorandum of Agreement between NRC, the SHPO, and AmerenUE.

The magnitude of the impacts and requirements for mitigation are determined to be SMALL.

4.1.4 REFERENCES

ACHC, 2004. 36 CFR Part 800 – Protection of Historic Properties (incorporating amendments), August 2004.

AUE, 1994, Management Agreement for the Public Use of Lands

FEMA, 1997. Flood Hazard Boundary Map, Callaway County, Missouri, Federal Emergency Management Agency, July 15, 1997, Website: www.fema.gov/hazard/flood/index.shtm. Accessed October 2, 2007

MACOG, 2007. Missouri Association of Councils of Government, http://macog.mo-acte.org/mm.htm. Accessed June 25, 2007

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USGS, 1998. Lower Missouri River Ecosystem Initiative FINAL REPORT 1994-1998, USGS Columbia Environmental Research Center, December, 1998

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Haslag, D., 2007. Missouri Department of Transportation, Jefferson City, Missouri, personal communication (May 11, May 15).

Table 4.1-1—Construction Areas Acreage and Operations Acreage, Land Use

Construction Area	Construction Acreage (hectares)	Current Land Use[1]
Unit 2 Power Block (Including ESWEMS Makeup Pond)	50 (20.2)	Existing Site Developed
Unit 2 Switchyard	11 (4.5)	Existing Site Developed
Unit 2 Cooling Tower Area	15 (6.1)	Existing Site Developed
Permanent Laydown Area	20 (8.1)	Existing Site Developed
Permanent Laydown Area	160 (64.8)	Forest or Farm
Unit 2 Employee Parking Area	5 (2.0)	Existing Site Developed
Construction Parking Area	26 (10.5)	Forest or Farm
Connector Transmission Lines (Onsite)	28 (3.6)	Existing Site Developed
Transmission Lines (Offsite)	~~122 (49.4)~~ 43.1 (17.4)	Forest or Farm
Permanent Warehouse	5 (2.0)	Existing Site Developed
Collector Wells, Piping, and associated Access Roads	~~115 (46.5)~~ 78.8 (31.9)	Forest or Farm
Construction Access Roads	2 (0.8)	Existing Site Developed
Unit 2 Construction Landfill	~~34 (13.8)~~ 30 (12.1)	Forest or Farm
Stormwater Ponds	~~9 (3.6)~~ 5 (2.0)	Forest or Farm
Borrow Area	10 (4.1)	Existing Site Developed
Miscellaneous Permanent Facilities	34 (13.8)	Existing Site Developed
Total Acreage of Disturbed Area for Permanent Construction Features	**~~612 (247.7)~~ 522.9 (211.6)**	--
Concrete Batch Plant, Material Storage	14 (5.7)	Existing Site Developed
Transmission Line Temporary Impacts	41.5 (5.7)	Forest or Farm
Collector Well Temporary Impacts	2.5 (1.0)	Forest or Farm
Total Acreage of Disturbed Area for Temporary Construction Features	**~~14 (5.7)~~ 58.0 (23.5)**	--

Source: Burns & McDonnell

Notes:

(1) Existing Site Developed land was previously disturbed during or after Unit 1 construction for laydown, parking or facilities used during construction

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Table 4.1-2—Prime Farmland Along the Missouri River

Soil Unit Symbol	Soil Unit Description	Farmland Classification	Acres	Hectares
13598	Booker silty clay, 0 to 2% slopes, occasionally flooded, frequently ponded.	Not Prime Farmland	326.88	132.28
66034	Hodge fine sane, loamy substratum, 0 to 2% slopes, frequently flooded.	Farmland of Statewide Importance	325.73	131.82
66043	Leta silty clay loam, sandy substratum, 0 to 2% slopes, occasionally flooded.	Prime Farmland	1264.47	511.71
66095	Grable very fine sandy loam, loamy substratum, 0 to 2% slopes, occasionally flooded.	Prime Farmland	895.34	362.33
66111	Waldron silty clay, loamy substratum, 0 to 2% slopes, occasionally flooded.	Not Prime Farmland	459.8	186.07
99001	Water	Not Prime Farmland	72.17 [1]	29.20 [1]

REFERENCES:

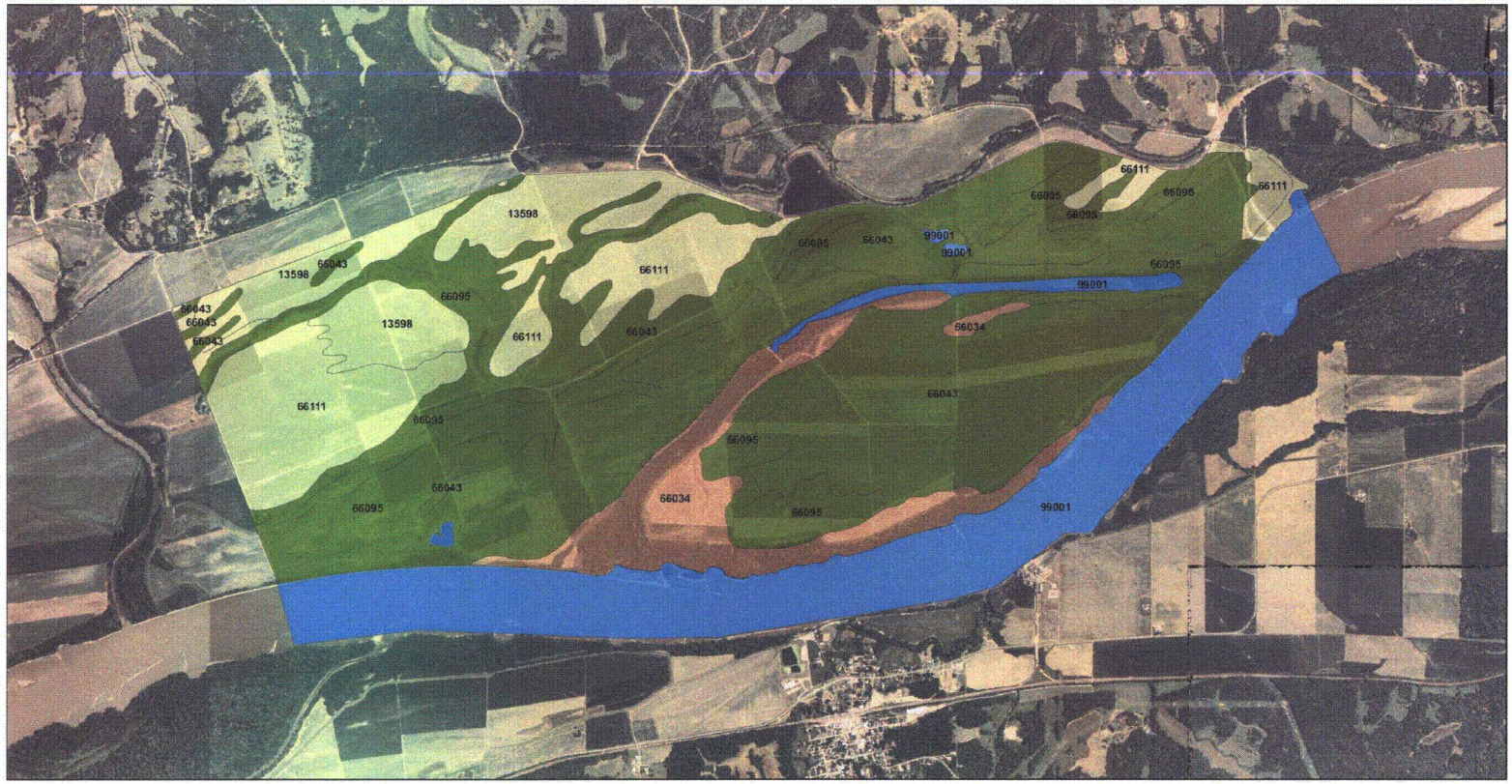
Soil Survey Geographic Database for Callaway County, Missouri, US Department of Agriculture, Natural Resources Conservation Service, June 2007

Note:

(1). Sum of area does not include the Missouri River.

Figure 4.1-1—Callaway Site Layout

Figure 4.1-2—Prime Farmland along the Missouri River



LEGEND

- Not Prime Farmland
- Farmland of Statewide Importance
- Prime Farmland
- Water

0 2,000 4,000 Feet

REFERENCE:
Soil Survey Geographic Database for Callaway County, Missouri.
US Department of Agriculture (USDA), Natural Resources Conservation Service, June 2007.
2006 Missouri USDA NAIP Data.

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4.2 WATER-RELATED IMPACTS

The following sections describe the hydrologic alterations and water use impacts that result from the construction of Callaway Plant Unit 2. Section 4.2.1 describes the hydrologic alterations resulting from construction activities including the physical effects of these alterations on other users, the best management practices to minimize any adverse impacts and how the project will comply with the applicable Federal, State and local standards and regulations. Section 4.2.2 describes the potential changes in water quality and presents an evaluation of the impacts resulting from construction activities on water quality, availability and use.

4.2.1 HYDROLOGIC ALTERATIONS

This section discusses the construction activities including site preparation, the resulting hydrologic alterations and physical effects of these activities on other water users, best management practices to minimize adverse impacts, and compliance with applicable Federal, State and local environmental regulations.

4.2.1.1 Description of Surface Water Bodies and Groundwater Aquifers

The Callaway site covers an area of approximately 2,765 acres (1,119 hectares) and is located in Callaway County, Missouri, approximately 10 miles (16 km) southeast of Fulton and 80 miles (129 km) west of the St. Louis metropolitan area. The 50 mile (80 km) region around the Callaway site is shown in Figure 2.1-2. Additional details on the Callaway site location and surrounding area are provided in Section 2.1.

The topography at the Callaway site is gently rolling upland, once part of an old glacial till plain. Erosion and downcutting of the Missouri River and its tributary streams have dissected the plain, leaving a nearly isolated plateau of approximately 8 sq mi (21 sq. km). The plateau has a maximum elevation of 858 ft (262 m) msl (mean sea level). The overall drop in elevation between the crest of the plateau and the Missouri River is about 350 ft (107 m).

Since the plateau is the topographic high in the area, surface runoff drains radially into small intermittent streams. These small streams are branches of local streams that include Logan Creek to the east, Mud Creek to the southwest, Cow Creek to the north, and Auxvasse Creek to the west. Mud Creek and Cow Creek are tributaries to Logan and Auxvasse Creek, respectively. Logan Creek and Auxvasse Creek have relatively steep channel gradients and drain directly into the Missouri River. The drainage areas and confluence points with the Missouri River for Logan Creek and Auxvasse Creek are illustrated on Figure 2.3-4.

Surface Water Bodies

The surface water bodies near the Callaway site are illustrated in Figure 2.3-4 and Figure 4.3-4 through Figure 4.3-6. Potential water bodies that may be affected by the construction of Callaway Plant Unit 2 are:

- Auxvasse Creek;
- Cow Creek;
- Logan Creek;
- Mud Creek;
- The Missouri River; and

- Existing Callaway Plant Unit 1 stormwater runoff ponds.

There are eight ponds, designated as P-1 through P-8 in Figure 4.3-4 through Figure 4.3-6, located in the vicinity of Callaway Plant Unit 1. Six of these ponds were created during construction of Callaway Plant Unit 1 to control sediment runoff and two existed prior to Unit 1 construction. The surface area of these ponds ranges from approximately 2 acres to 15 acres (0.8 hectares to 6.1 hectares) with depths generally 5 ft (1.5 m) or less. During construction of Callaway Plant Unit 2, runoff from the Callaway site will be diverted to onsite stormwater runoff ponds and new stormwater runoff ponds, thus minimizing the impacts on the surrounding streams including Logan Creek, Mud Creek, Cow Creek, and Auxvasse Creek. Because ponds P-2 through P-8 have a surface water connection to the unnamed streams which eventually flow into named streams and then the Missouri River, these stormwater ponds are considered jurisdictional waters of the U.S. Pond P-1 is isolated and, thus, is not a jurisdictional water of the U.S. Ponds P-1, P-2, P-7, and P-8 are actively managed by Missouri Department of Conservation (MDC).

Wetlands and streams were delineated on the Callaway site within the Callaway Plant Unit 2 construction zone, the Callaway Plant Unit 2 transmission line corridor and within the potential construction zone for the new water intake facilities in the well field area of the Missouri River. Wetlands were delineated in accordance with the 1987 Corps of Engineers Wetlands Delineation Manual. In addition, wetlands were deemed jurisdictional waters of the United States if a direct hydrologic connection could be made to a Traditional Navigable Water, such as the Missouri River, in accordance with the U.S. Supreme Court ruling in Solid Waste Agency of Northern Cook County versus U.S. Army Corps of Engineers. Streams were identified as jurisdictional waters of the United States based on the presence of an ordinary high water mark (OHWM), bed and bank, and the presence of a surface water connection to Traditional Navigable Waters of the United States such as the Missouri River.

Because the Callaway was sited at the highest point in the local landscape, several small drainages radiate away from the plant to the north and south. As noted earlier, these small unnamed streams are tributary to several named streams in the site and vicinity including Auxvasse Creek, Mud Creek, and Logan Creek, all of which are tributary to the Missouri River. Since the small unnamed drainages and named streams are connected to the traditionally navigable waters of the Missouri River, all said drainages and streams are considered jurisdictional waters of the U.S.

In general, four wetland types were delineated at the Callaway site: isolated ponds, settling ponds, Logan Creek wetlands, and big river wetlands located within the Missouri River floodplain. Further information on the wetland types is presented in ER Section 2.4.2.

Additional details on the surface water drainage and hydrology are also presented in ER Section 2.3.1 and FSAR Section 2.4.

Groundwater Aquifers

The subsurface aquifers that could be impacted by project construction activities at the Callaway site are the shallow Graydon Chert aquifer (Mississippian or stratigraphically equivalent to the Mississippian aquifer), the Cambrian-Ordovician aquifer system, and the Missouri River alluvial aquifer (where a horizontal collector well system for cooling water intake will be constructed on the Missouri River floodplain). A schematic cross-section of the Missouri aquifer systems is shown in Figure 2.3-17. Aquifer systems of Northern, Western, and Southern Missouri are shown in Figure 2.3-18. The physical characteristics of the groundwater aquifers are provided in ER Section 2.3.1 and FSAR Section 2.4.12.

The Graydon Chert aquifer is isolated on the plateau and is not used for public or private well use. The uppermost aquifer in the Cambrian-Ordovician aquifer system is the Cotter-Jefferson City (CJC) aquifer. It is a minor aquifer with relatively low well yields that is used by private well users in the area surrounding the plateau. The deeper portions of the Cambrian-Ordovician aquifer system that have higher well yields are utilized by AmerenUE for Callaway Plant Unit 1 potable water needs and will also be utilized for Callaway Plant Unit 2 construction needs and post-construction potable water needs. The Missouri River alluvial aquifer is located along the floodplain approximately 5 miles (8 km) south of Callaway Plant Unit 2. It is planned that a collector well system will be constructed to provide approximately 50,000 gpm (189,300 lpm) for cooling water intake for both Callaway Plant Units 1 and 2. There are no known users of this aquifer in the vicinity of the collector well system.

The Callaway site is located in EPA Region 7 (Nebraska, Iowa, Kansas, and Missouri). There are no sole source aquifers in this region; thus there would be no impact to a sole source aquifer.

4.2.1.2 Construction Activities

The following construction activities that may alter site hydrology will take place:

Clearing, Grubbing, and Grading

Spoils, backfill borrow, and topsoil storage areas will be established on parts of the Callaway site. Clearing and grubbing of the site begins with harvesting trees, vegetation removal, and disposal of tree stumps. Topsoil will be moved to a storage area (for later use) in preparation for excavation. The general plant area will be brought to plant grade in preparation for foundation excavation and installation. As described inSection 4.1, ~~612~~ 581 acres (~~248~~ 235.1 hectares) of land will be cleared for road, facility construction, laydown and parking uses.

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Road Construction

Public roadways will be used to transport most construction materials and equipment to the site. Heavy equipment and reactor components will be barged up the Missouri River and transported by truck to the site, a route that is largely along infrequently used roads but involves a small (a little more than 2 miles (3.2 km)) section of Route 94. The only road construction plan is to reroute a construction road internal to the Callaway site north of the Essential Service Water Emergency Makeup System (ESWEMS) retention pond area. This rerouting essentially expands the Owner Controlled Area (OCA) to allow for the pond construction and additional laydown area, and occurs entirely on AmerenUE property. There are no changes planned for County Roads 428, 448 and 459.

Temporary Utilities

Temporary utilities include above-ground and underground infrastructure for power, communications, potable water, wastewater and waste treatment facilities, fire protection, and for construction gas and air systems.

Temporary Construction Facilities

Temporary construction facilities include offices, warehouses, sanitary toilets, a changing area, a training area, and personnel access facilities. The site of the concrete batch plant includes the cement storage silos, the batch plant, and areas for aggregate unloading and storage.

Parking, Laydown, Fabrication, and Shop Preparation Areas

The parking, laydown, fabrication and shop areas include preparation of the parking and laydown areas by grading and stabilizing the surface with gravel. The shop and fabrication areas include the concrete slabs for formwork, laydown, module assembly, equipment parking

and maintenance, and fuel and lubricant storage. Concrete or timber pads for cranes and crane assembly will be installed.

Underground Installations

Concurrent with the power block earthworks, the initial underground fire protection, water supply, sanitary and hydrogen gas piping, and electrical power and lighting duct banks will be installed and backfilled. These installations will continue as construction progresses.

Unloading Facilities Installation

Heavy equipment and reactor components will be barged up the Missouri River to the existing barge slip. Dredging to deepen the dredge slip is not anticipated, but may be necessary in the area immediately in front of the barge slip if silt has built up sufficiently to impede barge docking and offloading.

Power Block Earthwork (Excavation)

The deepest excavations in the power block area are for the Callaway Plant Unit 2 Nuclear Island Building foundations that extend to approximately 40 ft (12 m) below plant grade. The next deepest excavations are for the Essential Service Water Emergency Makeup System (ESWEMS) foundation area which will be excavated approximately 23 ft (7 m) below plant grade with the circulating water piping excavation areas extending down to approximately 30 ft (9 m) below plant grade.

The excavations will take place concurrent with the installation of any required dewatering systems, slope protection, and retaining wall systems. At a minimum, drainage sumps will be installed at the bottom of the excavations from which surface drainage and groundwater infiltration will be pumped to a stormwater discharge point. Monitoring of construction effluents and stormwater runoff would be performed as required in the stormwater pollution prevention plan, the National Pollutant Discharge Elimination System (NPDES) permit, and other applicable permits obtained for construction. Excavated material will be transferred to the spoils and backfill borrow storage areas. Acceptable material from the excavations will be stored and reused as structural backfill.

Power Block Earthwork (Backfill)

The installation of suitable backfill to support structures or systems occurs as part of the site preparation activities. Backfill material will come from the concrete batch plant, onsite borrow pit and storage areas, or offsite sources. Excavated areas will be backfilled to reach the initial level of the building foundation grade. Backfill will continue to be placed around the foundation as the building rises from the excavation until final plant grade is reached. Backfill sources are discussed in more detail in FSAR Section 2.5.4.

Nuclear Island Base Mat Foundations

The deepest foundations in the power block are installed early in the construction sequence. Detailed steps include installation of the grounding grid, mud-mat concrete work surface, reinforcing steel and civil, electrical, mechanical/piping embedded items, forming, and concrete placement and curing.

Transmission Corridors

Callaway Plant Unit 2 would require the following new facilities and upgrades to connect to the existing transmission system:

- One new 345 kV, 16 breaker, breaker-and-a-half switchyard to transmit power from Callaway Plant Unit 2;
- two new 345 kV, 1,800 MVA (normal rating) circuits connecting the new Callaway Plant Unit 2 switchyard to the existing Callaway Plant Unit 1 switchyard;
- a extension of the Loose Creek 345 kV transmission line from a tie point on the Loose Creek transmission line near Chamois to the Callaway Plant Unit 1 switchyard resulting in approximately 6.7 miles (10.8 km) of new transmission line; and
- re-routing of the Callaway-Montgomery Lines 7 and 8 into the Callaway Plant Unit 2 switchyard from the Callaway Plant Unit 1 switchyard.
- The existing Callaway-Bland corridor will be widened by 150 ft (46 m) to accommodate the new section of the Callaway-Loose Creek transmission line. New transmission towers supporting the 345-kV transmission lines will be installed in the widened corridor parallel to and west of the existing Callaway-Bland transmission lines, crossing the Missouri River at river mile 116.6.

The routing of the new lines will be contained within the AmerenUE property lines or widened offsite easements. No new access roads or modifications to existing roads are currently anticipated.

Offsite Areas

Offsite areas impacted by construction activities for Callaway Plant Unit 2 are limited to the offsite transmission corridor. Section 3.7 provides a discussion of power transmission system construction needs.

4.2.1.3 Water Sources and Amounts Needed for Construction

For Callaway Plant Unit 1, presently only one well, Well #3 (DGLS # 028347), is utilized for potable water. Its estimated well yield is approximately 565 gpm (2,147 lpm). The estimated average total groundwater use is currently 50 gpm (190 lpm), with a break-down as follows: potable water usage is 15 gpm (57 lpm), fire make-up water is 6 gpm (23 lpm), demineralization make-up water is 15 gpm (57 lpm), and miscellaneous water use is 10 to 15 gpm (38-57 lpm). For Callaway Plant Unit 2, it is intended that the two wells, Wells #1 and #2 (DGLS # 027975 and 028076), will be used for construction. Their yields are estimated as approximately 200 gpm (760 lpm) each, such that the combined yield of the three wells is approximately 965 gpm (3,650 lpm). It is currently estimated that a peak water supply of up to 700 gpm (2,650 lpm) will be required during Callaway Plant Unit 2 construction activities (demands include those for the construction workforce, concrete mixing, dust control, and hydro testing and flushing). This is based on an estimate of 150 gpm (570 lpm) for normal operations of Callaway Plant Unit 1 and anticipated construction requirements for Callaway Plant Unit 2, de-mineralization plant full flow operations of 500 gpm (1,893 lpm), and concrete plant and miscellaneous construction usages of 50 gpm (190 lpm). Average construction demand would be less. ~~Figure 4.3-4 through Figure 4.3-6~~ Table 4.2-1 shows the estimated amounts of potable water needed by construction year.

4.2.1.4 Water Bodies Receiving Construction Effluents that Could Affect Water Quality

The surface water bodies directly downstream of the construction activities could be impacted during clearing, grubbing, and grading. The surface water bodies within the Auxvasse Creek

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hydrologic system at the Callaway site that could receive effluents during Callaway Plant Unit 2 construction are discussed in Section 4.2.1.1.

Since most of the water for construction would be used for consumptive uses such as grading, soil compaction, dust control, and concrete mixing, little infiltration to groundwater would be expected (especially considering that the excavations will be kept as dry as possible). Any effluents that might infiltrate would potentially flow into the Graydon Chert aquifer. Subsequent groundwater flow from the Callaway Plant Unit 2 area is outward and downward to the underlying aquitard and Cotter-Jefferson City aquifer. However, groundwater travel times through the aquitard are very long, i.e., on the order of 1,000 years (refer to detailed discussion in ER Section 2.3.1). Groundwater that originates in the Callaway Plant Unit 2 area is not expected to discharge to onsite drainages; rather, it travels downward through the aquitard to the underlying aquifer.

The composition of possible construction effluents that could infiltrate into the Graydon Chert aquifer would depend on several factors related to the physical nature of the effluent material, i.e., solids versus liquids, solubility, vapor pressure, mobility, compound stability, reactivity in the surface and subsurface environments, dilution, and migration distance to groundwater. It is expected that proper housekeeping and spill management practices would minimize potential releases and volumes and physically contain any releases. Pesticides and herbicides are expected to be applied in limited site areas for insect and weed/brush control.

Two new stormwater runoff ponds, in addition to the existing stormwater runoff ponds in the vicinity of the Callaway site, are planned to catch stormwater and sediment runoff from the various construction areas. Modeling of the runoff from the probable maximum precipitation (PMP) during plant operation bounds the possible runoff amounts, characteristics, and impacts that might occur during construction due to unpaved surfaces allowing for greater stormwater infiltration into the ground. The stormwater runoff ponds will be sized so as to prevent fast flowing, sediment laden stormwater from reaching the nearby creeks or Missouri River prior to allowing the sediments to settle out. The flow velocities will be minimized to prevent erosion of creek and stream banks. The allowable flow rates and physical characteristics of stormwater runoff will be specified in the Missouri discharge permits. Additional information regarding PMP can be found in FSAR Section 2.4.2.

The results of the probable maximum flood (PMF) analysis for Auxvasse Creek Watershed (refer to FSAR Section 2.4.3) indicate a maximum PMF water surface elevation of 697 ft (212 m) for Logan Creek, 590.6 ft (180 m) for Mud Creek and 707 ft (215 m) for Auxvasse Creek. All safety-related structures, systems, and components of Callaway Plant Unit 2 are on an upland plateau at about El. 846.0 ft (257.9 m). Thus, the Callaway Plant Unit 2 site is about 149.0 ft (45.4 m) above the Logan Creek PMF, 255.4 ft (77.8 m) above the Mud Creek PMF and 139.0 ft (42.4 m) above the Auxvasse Creek PMF. As a result, the plant site is dry with respect to major flooding on the Auxvasse Creek, Logan Creek and Mud Creek. As described in FSAR Section 2.4.1, the highest flood of record on the Missouri River near the site at Chamois was 33.3 ft (10.1 m) on July 31, 1993, bringing the water level at Chamois to El. 535.8 ft (163.3 m) (gauge datum is set to 502.5 ft (153.2 m)). The Callaway site is still about 309.2 ft (94.2 m) higher. The plant site is dry with respect to major flooding on the Missouri River, and only a localized PMP storm was considered for flood design protection of safety-related facilities.

4.2.1.5 Construction Impacts

Surface Water Impacts

Construction of Callaway Plant Unit 2 with its associated cooling towers will impact several of the current drainages and impoundments at the Callaway site. Runoff from the finished grade of the Callaway Plant Unit 2 power block, switchyard, cooling towers, parking areas, and permanent laydown areas will be directed by sloping towards the stormwater runoff ponds. The site grading plan is shown in Figure 2.3-3. The information related to drainage at the Callaway Plant Unit 2 construction site is provided in ER Section 2.3.1.

Construction-related impacts to aquatic resources include 10,359 linear ft (3,157 m) of intermittent streams which are unnamed tributaries of Logan Creek, Mud Creek, and Auxvasse Creek that drain stormwater away from the Callaway site. These streams were impounded during construction of Callaway Plant Unit 1 to create settling ponds or catch basins (Figure 4.3-4 through Figure 4.3-6). These drainages are mapped by the U.S. Geological Survey (USGS) as dashed blue-line streams and are thus assumed to be under the jurisdictional authority of the USACE. Although they all have a significant nexus with the traditionally navigable waters of the Missouri River, some of these upland drainages lack bed, bank, or a consistent ordinary high water mark (OHWM). As such, a jurisdictional determination by the USACE would be required to evaluate the extent of jurisdictional stream. Therefore, stream impacts may be revised at a later date. Impacts to jurisdictional streams are presented in ~~Figure 4.3-4 through Figure 4.3-6~~ Table 4.3-3 and will require compensatory measures in accordance with USACE permit conditions.

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Eight ponds, designated as P-1 through P-8 in Figure 4.3-4 through Figure 4.3-6, surround the Callaway site. As stated above, six of the stormwater runoff ponds were constructed as impoundments or catch basins during construction of Callaway Plant Unit 1 facilities and two existed prior to Unit 1 construction. Construction-related impacts are expected to be limited to one jurisdictional stormwater runoff pond (P-4) that will be permanently converted to structures, pavement, or other maintained exterior grounds to accommodate the power block, cooling towers, roadways, construction lay down area, borrow area, retention basins, and permanent parking lots. Altogether, construction activities will impact 4.3 acres (1.7 hectares) of impoundments or stormwater runoff ponds (~~Figure 4.3-4 through Figure 4.3-6~~ Table 4.3-2). This represents 10.4% of the total pond surface area at the site. All other stormwater runoff ponds are expected to remain after construction. Should construction requirements dictate that additional ponds be filled, appropriate control measures will be implemented. MDC actively manages P-2, P-7, and P-8, which will remain open to the public for fishing. Furthermore, two additional stormwater runoff ponds may be constructed, one north of P-4 near the northeast corner of the laydown area and the other near the northwest corner of the laydown area, as needed, during construction of Callaway Plant Unit 2 facilities. These may be included as part of the overall control measures required for impacts to jurisdictional waters of the U.S.

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Although not directly impacted by construction, stormwater runoff pond P-7 could be indirectly impacted with additional sedimentation and turbidity due to work upstream in intermittent drainages that feed into the pond. Downstream reaches of the impacted intermittent streams are also at risk to receive additional sediment deposition as a result of construction activities at the Callaway site. Therefore, sediment and erosion control practices such as temporary seeding, mulching, silt fences, and check dams will be used in order to minimize the indirect impacts of construction.

The overall site drainage areas are not directly affected by the site grading plan. Since the plant facilities are located on the crest of a plateau that has a well-developed natural drainage system, and because final grading of the site area is integrated with this natural system, potential local flooding, even from extremely heavy rainfall, will be controlled by the plant site drainage system. The runoff from Callaway Plant Unit 1 will not impact Unit 2 because of the grade elevation difference between Callaway Plant Unit 1 (El. 840 ft (256 m) msl) and Unit 2 (El. 845 ft (258 m) msl). Likewise, the 72-hr PMP evaluation of the Callaway Plant Unit 2 site drainage concludes that there is no adverse impact to Unit 1 from the runoff results.

The Nuclear Island Buildings are located in the center and along the high point of the Callaway Plant Unit 2 power block area. From the high point, site grading is sloped to stormwater runoff ponds located near the construction lay down area.

Drainages are constructed with base materials that promote infiltration of runoff from low intensity rainfall events. However, for large storms, the infiltration capacity of the base materials would be exceeded and overflow pipes are provided to direct the runoff to the storm water basin located to the east of the Callaway Plant Unit 2 power block. FSAR Section 2.4.2 evaluates the impacts of a localized intense precipitation on the site drainage.

These impacts to surface water bodies are MODERATE, primarily due to the loss of wetlands and wetland buffers, and the stormwater runoff ponds covering the area of approximately ~~8.3~~ 10.04 acres (~~3.4~~ 4.1 hectares) of the Callaway Plant Unit 2 wetland assessment area. Therefore, they will require measures to minimize the impacts. The preventive measures associated with the wetlands and wetland buffers, and stormwater runoff ponds are described in Section 4.3.1.6.

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Groundwater Impacts

The hydrologic alterations to groundwater that could result from the project related construction activities are:

- Creation of a local and temporary depression in the Graydon Chert aquifer potentiometric surface due to dewatering for foundation excavations (although the aquifer yield is very low, seepage is expected to be minimal, and groundwater dewatering is expected to be controlled by sump pumps and drainage);

- Disruption of the current Graydon Chert aquifer recharge and discharge areas by plant construction is not a concern. The construction area is relatively flat and clear of vegetated areas. Runoff is currently directed toward stormwater runoff ponds and during construction, runoff and water from dewatering of excavations will be directed toward these ponds and two additionally planned stormwater runoff ponds. Due to low-permeability soils, groundwater recharge is minimal, and construction activities are not expected to significantly alter groundwater recharge or discharge;

- Additional stress on the Cambrian-Ordovician aquifer is expected when the water needed for Callaway Plant Unit 2 construction is supplied by the Callaway onsite wells. Normal operation of Callaway Plant Unit 1 consumes 50 gpm (190 lpm) groundwater supplied from a single onsite well (refer to Section 4.2.1.3). Average construction potable water usage is estimated at 250 gpm (946 lpm) to be supplied by 3 onsite wells. Considering that the combined yield of three wells is approximately 965 gpm (3,650 lpm), it is estimated that approximately 26% of the onsite well capacity will be used for Callaway Plant Unit 2 construction. Therefore, the impact of potable water use on Cambrian-Ordovician aquifer during construction is expected to be SMALL; and

- No significant hydrologic alteration of the Missouri River Alluvial Aquifer during construction of the collector well system is anticipated. The caisson is constructed "wet" and during projection and development of the lateral intake lines, flow to the caisson will be significantly less (not more than 300 gpm (1,136 lpm)) than what occurs during normal operation (average Callaway Plant Unit 2 water use is 24,160 gpm (91,446 lpm)). Operational changes to the alluvial aquifer are described in ER Section 2.3.1.

4.2.1.6 Identification of Surface Water and Groundwater Users

In the Callaway site area, the predominant water withdrawal from the Missouri River is for power generation by Callaway Plant Unit 1 and the Central Electric Power Cooperative Chamois Plant. Callaway Plant Unit 1 is the largest consumptive water user in the area; the Central Electric Power Cooperative Chamois Plant is the second largest user. Callaway Plant Unit 1 pumps 8.04E+09 gal per yr (3.04E+07 m^3 per yr) and Central Electric Power Cooperative Chamois Plant withdraws 2.49E+10 gal per yr (9.43E+07 m^3 per yr). Even though Central Electric Power Cooperative Chamois Plant withdraws more water than Callaway Plant Unit 1, the 2.40E+10 gal per yr (9.09E+7 m^3 per yr) of water pumped is largely returned to Missouri River after passing through the condenser.

Local streams are presently used for recreational purposes only. The major non-consumptive surface water uses of the Missouri River in the vicinity of the site are recreation, fishing, and navigation. The recreational activities include swimming, fishing, and boating along the Missouri River as discussed in Section 2.3.2.

Groundwater users in the vicinity of the Callaway site are identified in Section 2.3.2. Figure 2.3-63 shows the locations of the individual public and private water wells within the hydrogeologic study area boundary and within approximately 1 mile (1.6 km) of the boundary. The distance from Callaway Plant Unit 2 to the local groundwater wells is shown in Table 2.3-31. The closest non-AmerenUE well is an irrigation well that is located approximately 0.8 miles (1.3 km) north (and downgradient) of Callaway Plant Unit 2. This well is 375 ft (114.3 m) deep and is likely drawing water from the Cotter-Jefferson City aquifer.

4.2.1.7 Practices to Limit or Minimize Hydrologic Alterations

The following actions will be used to limit or minimize expected hydrologic alterations during construction:

- Replacing stormwater runoff ponds lost to construction with ponds of equivalent capacity as necessary for runoff control;
- Limiting wetland removal and disruptions to the areas where necessary;
- Minimizing disturbed areas by controlling and delineating the area; and
- Implementation of Best Management Practices (BMPs) as described in Section 4.2.1.9.

4.2.1.8 Compliance with Applicable Hydrological Standards and Regulations

The regulations guiding the implementation of Best Management Practices (BMPs) are provided by the Missouri Department of Natural Resources (MDNR, 2007). These regulations contain detailed requirements for the land disturbance general permit, through which the state enforces BMPs at construction sites. Monitoring of construction effluents and stormwater

runoff will be performed as required in the stormwater pollution prevention plan, NPDES permit, and other applicable permits obtained for construction.

4.2.1.9 Best Management Practices

Best Management Practices will be implemented in accordance with regulations, as discussed in Section 4.2.2.10.

Monitoring of construction effluents and stormwater runoff would be performed as required in the stormwater management plan, NPDES permit, and other applicable permits obtained for construction.

In addition, Callaway Plant Unit 2 will comply with the requirements and conditions of the various permits issued to support construction. Environmental compliance personnel will monitor construction activities and provide direction to add, modify, or replace site practices to ensure compliance with hydrological standards and regulations.

In summary, the impact of construction on the hydrology and surface water bodies that will be present at the time of construction is SMALL due to design of the surface water retention systems and use of best management practices to control surface water runoff.

4.2.2 WATER USE IMPACTS

This section discusses the construction activities and resulting hydrologic alterations that could impact water use, an evaluation of potential changes in water quality resulting from construction activities and hydrologic changes, an evaluation of practices to minimize adverse impacts, and compliance with applicable Federal, State and local environmental regulations.

4.2.2.1 Description of the Site and Vicinity Water Bodies

The description of Callaway site, and the surface water bodies and groundwater aquifers that could be impacted by the construction of Callaway Plant Unit 2 are presented in Section 4.2.1.1.

4.2.2.2 Hydrologic Alterations and Related Construction Activities

Construction impacts to the existing surface water bodies and hydrologic alterations to groundwater that could result from the construction activities are described in Section 4.2.1.5.

A further discussion of related construction activities is provided in Section 4.2.1.2.

4.2.2.3 Physical Effects of Hydrologic Alterations

Impacts from the construction of Callaway Plant Unit 2 are similar to those associated with any large construction project. The construction activities that could produce hydrologic alterations to surface water bodies and groundwater aquifers are presented in Section 4.2.1.2. The potentially affected surface water bodies and groundwater aquifers are described in Section 4.2.1.1. The potential construction effects on surface water bodies and groundwater aquifers are presented in Section 4.2.1.5.

Surface Water Impacts

Because of the potential for impacting surface water resources, a number of environmental permits are needed prior to initiating construction. Table 1.3-1 in Chapter 1.0 provides a list of construction-related consultations and permits that have to be obtained prior to initiating construction activities.

The construction activities expected to produce the greatest impacts on the surface water bodies occur from:

- Reducing the available infiltration area;
- Grading and the subsequent covering of the 50 acre (20.2 hectare) Callaway Plant Unit 2 power block foundation (refer to ~~Figure 4.3-4 through Figure 4.3-6~~ Table 4.1-1 for construction areas acreage);
- Grading and covering of the 15 acre (6.1 hectare) Callaway Plant Unit 2 cooling tower pad;
- Grading and covering of the 11 acre (4.5 hectare) Callaway Plant Unit 2 switchyard/substation;
- Vegetation removal and grading of ~~550~~ 505 acres (~~236.7~~ 204.4 hectares) for construction of laydown areas, concrete batch plant, material storage, transmission lines, roads, collector wells, offices, parking, warehouses, and shop preparation areas. This includes all areas except Unit 2 Power Block (including ESWEMS makeup pond, Unit 2 Switchyard and Unit 2 Cooling Tower Area).
- Creation of stormwater runoff ponds;
- Elimination of one or two existing runoff ponds which is within the construction zone; and
- Excavation required to construct the collector wells.

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Site grading and new building foundations will cover existing infiltration and recharge areas. However, the Graydon Chert aquifer recharge is not expected to be greatly altered due to the present minimal groundwater recharge caused by low permeability of shallow soils. Possible increases in runoff volume and velocity in the downstream creeks may cause erosion and adversely affect riparian habitat if not controlled.

Dewatering for the foundation excavations could also impact surface water bodies. Effluent from the dewatering system, and any stormwater accumulating during the excavation, would be pumped to a stormwater discharge point or into onsite stormwater runoff ponds. If pollutants (e.g., oil, hydraulic fluid, concrete slurry) exist in these effluents from construction activities, they could enter the runoff ponds, downstream channel sections, or other surface water bodies. Therefore, best management practices, as described in Section 4.2.1.9, will be implemented to prevent pollutants from entering waters. Monitoring of construction effluents and stormwater runoff would be performed as required in the stormwater management plan, NPDES permit, and other applicable permits obtained for the construction. Depending on the design of the stormwater runoff ponds and discharge systems, outflow rates into the surface streams could be altered.

The water bodies listed in Section 4.2.1.1 are potentially subject to receiving untreated construction effluents directly. It will be necessary to implement proper BMPs under state regulations, such as a General NPDES Permit for Stormwater associated with Construction Activity, Land Disturbance Permit, and a Storm Water Pollution Prevention Plan (SWPPP). Table 1.3-1 lists and presents additional information on the Federal, State and Local Authorizations associated with this project.

If proper BMPs are implemented under these permits, treated construction effluents could be released to the site water bodies without adverse impacts. Flow rates for untreated construction effluents will depend upon the usage of water during site construction activities and the amount of precipitation contacting construction debris during construction activities. Flow rates and physical characteristics of the construction effluents are discussed in Section 4.2.1.4. A quantitative calculation and evaluation of the construction effluents and runoff will be done as part of the state construction permit process. BMPs would be implemented to control runoff, soil erosion, and sediment transport. Good housekeeping practices and engineering controls will be implemented to prevent and contain accidental spills of fuels, lubricants, oily wastes, sanitary wastes, etc.

BMPs are implemented under a Spill Prevention Plan, a SWPPP, and a Land Disturbance Permit, as described in Section 4.2.1.9 and Section 4.2.2.10. Environmental control systems installed to minimize impacts related to construction activities will comply with all Federal, state and local environmental regulations and requirements. Once the initial controls are in place, they are maintained through the completion of construction and during plant operation, as needed.

Surface water use impacts are SMALL primarily since there are few users of surface water as presented in Table 2.3-27. Surface water is not used as potable water for 50 miles (80 km) downstream of Callaway Plant Unit 2. In the Callaway site area, the predominant water withdrawal from the Missouri River is for power generation. However, since the site is located about 5 miles (8 km) away from the Missouri River, any construction impact on surface water use would be SMALL at this distance. The existing and stormwater runoff ponds are also effective in controlling pollution existing in the construction effluents or rainwater/precipitation runoff generated from the construction site. BMPs that will be implemented to control changes to both quantity and quality of runoff will also minimize possible adverse impacts on surface water use.

Groundwater Impacts

Dewatering foundation excavations will produce localized impacts on the Graydon Chert aquifer, although these are expected to be minimal. The deepest excavations anticipated are for the Nuclear Island Building foundations, which will extend approximately 40 ft (12 m) below plant grade. The dewatering system and activities are not expected to have any impact on the deeper Cambrian-Ordovician aquifer.

Increasing groundwater withdrawals for construction needs from the three onsite Cambrian-Ordovician aquifer system production wells could produce a local depression of the potentiometric surface in that aquifer. These increased withdrawals are not expected to exceed the well yields. The wells are open across multiple formations from casing depths of 380 ft to 405 ft (115.8 m to 123.4 m) below ground surface (bgs) to depths of approximately 1,100 ft to 1,510 ft (335 m to 460 m) bgs. These wells likely draw water from the deeper, higher yielding aquifers of the regional system. Generally, private wells in the area are shallower and are open within the top of the Cambrian-Ordovician aquifer system (the Cotter-Jefferson City (CJC) aquifer, which is a minor aquifer that was encountered at approximately 350 ft (107 m) bgs at the top of the plateau). Although ground surface elevations and private well depths vary, it is expected that the lower-yielding CJC aquifer is sufficient for private well supplies and drawdown is localized. It is not expected that withdrawals from the Callaway production wells will impact local private users.

Monitoring of construction effluents and stormwater runoff will be performed as required in the stormwater pollution prevention plan, NPDES permit, and other applicable permits obtained for construction.

The locally lowered Graydon Chert aquifer water level would be expected to eventually recover after the dewatering and other subsurface construction activities are completed. Although infiltration would be altered by buildings and paved areas, rainwater can still potentially recharge the aquifer. The lowered Cambrian-Ordovician aquifer water level would also recover as post-construction groundwater needs are much less than that needed for construction activities.

The impact to groundwater is SMALL and localized since changes to the Graydon Chert and Cambrian-Ordovician aquifer water levels are expected to eventually recover once construction is complete.

4.2.2.4 Water Quantities Available to Other Users

As described in Section 2.3.2.1.2, at present no surface water withdrawals are made in Callaway County for public potable water supply. Water use projections are assessed based on population trends in a given area. Since surface water is not a common source for drinking water in Callaway County, the actual surface water use projection in the county cannot be calculated. Excluding the plant water use of the Callaway Plant Unit 2, the future additional use of surface water will be extremely limited. The surface water use rate in the future will change with the additional withdrawal for Callaway Plant Unit 2, but there are still limited uses for water that principally comprise surface water in Callaway County, such as recreation, fishing and navigation.

Groundwater use and trends in central Missouri and at the Callaway site are presented in ER Section 2.3.2.2 and in FSAR Section 2.4.12.

Peak water demand for Callaway Plant Unit 2 construction is estimated at 700 gpm (2,660 lpm). This water is expected to come from the existing onsite wells into the Cambrian-Ordovician aquifer at the Callaway site.

The Graydon Chert aquifer is not used as a potable water source in the vicinity of the Callaway site. The impacts expected from foundation dewatering or other construction activities will not impact any local users.

4.2.2.5 Water Bodies Receiving Construction Effluents

Surface water bodies that could receive effluents during Callaway Plant Unit 2 construction are described in Section 4.2.1.1 and related discussion on the impacts of the construction effluents on these water bodies is presented in Section 4.2.1.4.

4.2.2.6 Baseline Water Quality Data

Baseline water quality data for surface water bodies is provided and discussed in Section 2.3.3. A summary of the water quality data for the onsite surface water bodies is presented in Table 2.3-33. Baseline water quality data for groundwater is provided in Section 2.3.3 and summarized in Table 2.3-34.

4.2.2.7 Potential Changes to Surface Water and Groundwater Quality

The following section describes the potential water quality impacts resulting from the construction of Callaway Plant Unit 2.

The Callaway site is a private facility and does not have any municipal water supplies with the exception of the Emergency Operations Facility (EOF). All water currently used onsite is drawn

from the Missouri River or subsurface aquifers. There are three groundwater supply wells onsite. The wells are listed in Table 2.3-31. Figure 2.3-63 shows the locations of the onsite supply wells. The groundwater supply wells to be used during the construction of Callaway Plant Unit 2 are provided in Section 4.2.1.3.

Potential Changes to Surface Water Quality

Potential surface water quality impacts are associated only with the site clearing and grading activities.

Without the use of BMPs, the addition of sediment and organic debris to the local streams resulting from clearing, grubbing, and grading could decrease water quality. Organic debris could dam or clog existing streams, increase sediment deposition, and increase potential for future flooding. Organic debris decomposing in streams can cause dissolved oxygen and pH imbalances and subsequent releases of other organic and inorganic compounds from the stream sediments. Sediment laden waters are prone to reduced oxygen levels, algal growth, and increases in pathogens. If heavy metals or chemical compounds spill and/or wash into surface waters, there could be a direct toxicity to aquatic organisms. These potential pollutant releases could impact aquatic species and in turn affect the recreational aspects associated with fishing, boating, or swimming.

Without the use of BMPs, the water bodies downstream of the construction areas could be directly and indirectly affected by construction activities onsite. Construction debris residing on the pads and temporary staging areas could mix with construction wash-down water or stormwater, exit the site via untreated runoff, and produce chemical reactions adverse to downstream ecology. Possible contaminants include sediment, alkaline byproducts from concrete production, concrete sealants, acidic byproducts, heavy metals, nutrients, solvents, and hydrocarbons (fuels, oils, and greases). There could be the potential for contaminants to mix with site wash-down water or rainwater/precipitation runoff and be washed downstream into surface water bodies existing on the Callaway site during summer and spring periods when precipitation might be intense. There could also be the potential for spills within the construction areas consisting of fuels, solvents, sealants, paints, or glues. Unsuppressed construction dusts could drift outside of the construction zones and contaminate nearby water supplies. If these contaminants were to enter the surface water bodies unchecked, there could be the potential for infiltration and subsequent groundwater contamination.

The removal of onsite wetlands could reduce the ability of microbiotic organisms and fauna to naturally attenuate contaminants and pollutants produced onsite. However, as discussed in Section 4.3.1, only a small percentage of wetlands (approximately 0.04% of site wetlands and ponds available on the Callaway site) are to be removed during the construction of Callaway Plant Unit 2.

The impacts to surface water quality downstream of the construction site are SMALL due to the use of BMPs to control dust, runoff, and spills; the small amount of wetlands impacted, and the use of surface water only for power generation purposes and some recreation.

Potential Changes to Groundwater Quality

No change to groundwater quality as a result of foundation excavations is expected.

4.2.2.8 Surface Water and Groundwater Users

Surface water users at, and in the vicinity of, the Callaway site area are discussed in ER Section 2.3.2. Surface water users downstream of the site may experience impacts from potential water quality changes if construction effluent concentrations and volumes are large enough and the release enters directly into a surface water body bypassing the stormwater runoff ponds. There will be no surface water users in ponds or on tributaries during construction of Callaway Plant Unit 2; therefore, possible water quality variations will not impact any users.

Groundwater users in vicinity of the Callaway site are identified in ER Section 2.3.2.

4.2.2.9 Predicted Impacts on Water Users

The impact of potential increased sediment loads in site runoff during construction would result in SMALL or no impacts to surface water users and affected areas as discussed in Section 4.2.2.3, Section 4.2.2.7 and Section 4.2.2.8.

Groundwater from Callaway Plant Unit 1 onsite wells will be used for construction, but this water is withdrawn from deeper, high yielding aquifers of the Cambrian-Ordovician aquifer system. Local groundwater users utilize the Cotter-Jefferson City aquifer, which is the uppermost aquifer of the Cambrian-Ordovician system. It is a minor aquifer that is separated from the deeper aquifers by an aquitard. Therefore, it is not anticipated that local users will experience an impact from Callaway Plant Unit 2 withdrawals from the Cambrian-Ordovician aquifer.

Potential construction effluent impacts on aquifer groundwater quality would first be manifested in the Graydon Chert aquifer. Construction activities are only expected to produce limited and temporary impacts in the Graydon Chert aquifer. As described in Section 2.3.1, the Graydon Chert aquifer is not used as a potable water source in the vicinity of the Callaway site. Therefore, potential groundwater quality changes would not be expected to have any impact on possible users. Potential impacts to the deeper aquifers are dependent on the nature of the hydraulic connection between aquifers described in Section 4.2.1.1. Groundwater quality impacts on users of the deeper aquifer users are minimal due to dilution and other contaminant attenuation effects that could occur along any effluent plume migration path.

Based on the above, the impacts of groundwater withdrawal and potential changes on groundwater quality during construction would result in SMALL impacts to groundwater users.

4.2.2.10 Measures to Control Construction Related Impacts

The following measures may be taken to avoid runoff from the construction areas entering and potentially impacting downstream surface water bodies and groundwater, as applicable:

- Implementation of a Stormwater Pollution Prevention Plan (SWPPP);
- Controlling runoff and potential spills using dikes, earthen berms, seeded ditches, and impoundments;
- Monitoring for contaminants within construction area impoundments and impoundments downstream of disturbed areas;

- Implementation of BMPs to protect against accidental discharge of contaminants (fuel spills, other fluids and solids that could degrade groundwater and surface water resources); and
- Performing additional onsite surface and groundwater monitoring compared to established water quality benchmarks and historical site data.
- Maintaining clean working areas;
- Removing excess debris and trash from construction areas;
- Properly containing and cleaning up all fuel and chemical spills;
- Installing erosion prevention devices in areas with exposed soils;
- Installing sediment control devices at the edges of construction areas;

Following the acquisition of the required permits and authorizations, site preparation activities include the installation or establishment of environmental controls to assist in controlling construction impacts to groundwater. These environmental controls may include:

- Stormwater management systems;
- Spill containment controls;
- Silt screens;
- Stormwater runoff ponds; and
- Dust suppression systems.

These controls assist in protecting the Graydon Chert aquifer by minimizing the potential for construction effluents to infiltrate directly into the subsurface or to carry possible contaminants to aquifer recharge areas.

Control measures for dredging in the area in front of the barge slip (if required) may include (as applicable to the selected dredging method):

- Restricting dredging only during certain times of the year to minimize impacts to aquatic species;
- Restricting dredging to only the areas identified for dredging;
- Installing a silt curtain around each dredge or active dredge area to minimize sediment release, as far as practicable;
- Ensuring clam-shell dredges are fully closed and hoisted slowly to limit the amount of spillage;
- Not filling spoils barges to levels which will cause overflowing of materials during loading and moving;

- Not allowing vessel decks to be washed in such a way that allows material to be released overboard; and
- Carrying out monitoring in accordance with any permit requirements.

Additional measures to minimize or contain accidental releases of contaminants may include the establishment, maintenance, and monitoring of:

- Solid waste storage areas;
- Backfill borrow, spoils, and topsoil storage areas; and
- Site drainage patterns.

Groundwater monitoring may be performed with selected existing onsite monitoring wells in accordance with the site-dewatering plan during construction.

Temporary construction groundwater use impacts are expected in the Cambrian-Ordovician aquifer and the groundwater withdrawals and potentiometric surface depression will be monitored. As explained in Section 4.2.2.9, any contamination that might be introduced into the Graydon Chert aquifer would be attenuated by the time it potentially reaches the deeper aquifer.

4.2.2.11 Consultation with Federal, State and Local Environmental Organizations

AmerenUE has had several meetings with MDNR to discuss the use of surface water and groundwater for construction and operation purposes, and has commenced discussions on revising the NPDES permit.

4.2.2.12 Compliance with Water Quality Standards and Regulations

The regulations guiding the implementation of Best Management Practices (BMPs) are provided by the Missouri Department of Natural Resources (MDNR, 2007). Monitoring of construction effluents and stormwater runoff would be performed as required in the stormwater management plan, NPDES permit, and other applicable permits obtained for the construction. The integrated permitting process for the applicable environmental permits will proceed independent of NRC review of the combined license application.

4.2.2.13 Water Quality Requirements for Aquatic Ecosystems and Domestic Users

Section 4.3.2 discusses information pertaining to water quality requirements for aquatic ecosystems. The Missouri River is considered to be an important aquatic habitat. Most of the species of concern within the ecological study area are residents of the Missouri River. Even so, none of them are endemic to the segment of the Missouri River near the plant. There is little or no submerged aquatic vegetation near the area, which would be important habitat for the larval and young-of-the-year fish. Existing impairments to the aquatic ecosystem including habitat degradation, establishment of TMDLs, or the resulting fish advisories are unrelated to Callaway Plant activities. In MDNR's 2006 Water Quality Report, the Missouri River (where the primary county is Callaway) was declared among potentially impaired classified waters due to habitat degradation. According to this classification, there is some indication that an impairment to some designated use may exist, but the current data or information indicating the impairment do not meet the data requirements set out by Missouri's Section 303(d) Listing Methodology. MDNR will conduct further monitoring on the potentially impaired classified waters in order to determine whether or not these impairments actually exist (MDNR, 2006).

Domestic users of groundwater, except for private well users, need to meet the State water quality standards for potable water systems. There are no water withdrawals from the Missouri River for domestic use within 25 miles upstream or 50 miles downstream of the Callaway Plant.

4.2.2.14 References

MDNR, 2006. Missouri Water Quality Report (Section 305(b) Report), Missouri Department of Natural Resources, Water Protection Program, Published in April 1, 2007.

MDNR, 2007. State of Missouri, Department of Natural Resources, Missouri Clean Water Commission, Missouri Land Disturbance General Permit MO-R101000.

Table 4.2-1—Estimated Amounts of Potable Water by Construction Year Needed for Callaway Plant Unit 2

Construction Year	1	2	3	4	5	6
People	8,550,000[a] gal (32,365,000 L)	25,650,000[b] gal (97,096,000 L)	25,650,000[b] gal (97,096,000 L)	25,650,000[b] gal (97,096,000 L)	25,650,000[b] gal (97,096,000 L)	
Concrete Mixing and Curing[c]	2,219,844 gal (8,403,000 L)	2,219,844 gal (8,403,000 L)	2,219,844 gal (8,403,000 L)	2,219,844 gal (8,403,000 L)	2,219,844 gal (8,403,000 L)	
Dust Control[d]	11,400,000 gal (43,154,000 L)	11,400,000 gal (43,154,000 L)	11,400,000 gal (43,154,000 L)	11,400,000 gal (43,154,000 L)	11,400,000 gal (43,154,000 L)	
Subtotal	22,169,844 gal (83,922,000 L)	39,269,844 gal (148,650,000 L)	39,269,844 gal (148,650,000 L)	39,269,844 gal (148,650,000 L)	39,269,844 gal (148,650,000 L)	26,179,896[e] gal (99,102,000 L)

Notes:

Water for construction would come from the existing onsite groundwater production wells, Well#1, #2 and #3 (DGLS#027975, 028076 and 028347, respectively).

(a) Estimated at 1,000 persons using 30 gal (113.6 L) per day for 285 days per year.
(b) Estimated at 3,000 persons using 30 gal (113.6 L) per day for 285 days per year.
(c) Estimated at 6,700 cubic yards (5,122.5 m3) per month using 27.61 gal (104.5 L) per cubic yard and 12 months per year.
(d) Estimated at 40,000 gal (151,400 L) per day for 285 days per year.
(e) Estimated at two-thirds of the amount used in any year 2 through 5.

4.3 ECOLOGICAL IMPACT

4.3.1 TERRESTRIAL ECOSYSTEMS

This section describes the impacts of construction on the terrestrial ecosystem. The anticipated construction schedule is discussed in Section 1.2.7. Construction would require the permanent or temporary disturbance of ~~more than 600 acres~~ approximately 581 (~~243~~ 235 hectares) on the AmerenUE property as presented in Figure 4.3-1 through Figure 4.3-3. This area is assumed to be the maximum area of disturbed soil to be exposed at any time. Approximately ~~435~~ 401 acres (~~176~~ 162 hectares) of the affected terrestrial habitat (does not include Impervious, High Intensity Urban, or Low Intensity Urban cover types from ~~Figure 4.3-4 through Figure 4.3-6)~~ Table 4.3-1 would be permanently converted to structures, pavement, or other intensively-maintained exterior grounds to accommodate the proposed power block, cooling tower, roadways, permanent construction lay-down area, borrow area, retention basins, permanent parking lots, collector wells, and transmission line facilities. Approximately 119.5 acres (48.4 hectares) of the permanent impacts will occur within developed areas of the AmerenUE property and thus will not affect natural terrestrial ecosystems.

In accordance with ~~Figure 4.3-4 through Figure 4.3-6~~ Table 4.3-1 a total of ~~55.5~~ 58.0 acres (~~22.5~~ 23.5 hectares) of impacts are considered temporary. Approximately 14 acres (6 hectares) of impacts will be considered temporary impacts associated with material storage and concrete batch plant. This area is already located within developed areas of the AmerenUE property and thus would not affect natural communities at the site. An additional 41.5 acres (16.8 hectares) of impacts will be considered temporary impacts associated with construction of the new overhead transmission line facility. Approximately 16 acres (6.5 hectares) of the temporary impacts will occur within developed areas of the site and will not affect natural terrestrial ecosystems. Impacts to terrestrial ecosystems and wetlands are summarized in ~~Figure 4.3-4 through Figure 4.3-6~~ Table 4.3-1 and ~~Figure 4.3-4 through Figure 4.3-6~~ Table 4.3-2, respectively.

The construction footprint was designed to minimize impacts to terrestrial and wetland ecosystems and any important species as identified in Section 2.4.1.2. The Unit 2 construction zone at the AmerenUE property was specifically designed to balance the need for efficient construction operations with the need to minimize impacts to terrestrial ecosystems, especially the large tracts of deciduous forest to the south of the plant.

It is not possible to construct the facilities without impacting terrestrial ecosystems, including wetlands. Construction activities will commence after the appropriate permits are acquired to start clearing and grading of the site. Construction is expected to be complete by 2017. The general schedule of construction activities is discussed in Section 1.2.7.

4.3.1.1 Vegetation

Impacts to site vegetation and vegetative communities are anticipated as a result of site clearing, grading and construction. Trees within the construction zone will be felled, stumps, shrubs, and saplings would be grubbed, and the groundcover and leaf litter would then be cleared to prepare the land surface for grading, as needed. Felled trees, stumps, and other woody material would be disposed of by burning, chipping (and spreading the chips), and/or disposal off site. Opportunities to recycle woody material for use elsewhere on the AmerenUE property will be considered. Recycling opportunities could include firewood, using wood chips for mulch or sediment/erosion control, and piling logs and brush in open fields to provide additional wildlife cover and habitat.

Clearing of forested wetlands for construction of the overhead transmission line will consist of cutting trees off at ground level followed by spot application of herbicide to the trunk as

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needed. Although transmission line support towers have not yet been located, they will be strategically sited in order to avoid impacts to wetlands as much as possible. Clearing of forested wetlands within the transmission line corridor will not include grubbing or grading in order to minimize impacts. As such, wetland types within the transmission line corridor may be converted from forested to emergent but the wetlands themselves will remain.

Erosion control devices will be installed around the perimeter of the construction footprint to reduce the potential for sediment mobilization and transport into surrounding wetlands, ponds and streams. Detailed specifications for the erosion control and soil conservation measures will be presented in a soil erosion and sediment control plan which will be written in association with the site-specific construction plans. Monitoring of stormwater effluents during construction will be performed in accordance with the Land Disturbance Permit, NPDES Permit, and other applicable permits obtained for construction.

Construction activities would result in impacts to terrestrial habitat as presented in Figure 4.3-1 through Figure 4.3-3 and summarized in ~~Figure 4.3-4 through Figure 4.3-6~~ Table 4.3-1. Both permanent and potentially permanent impacts are presented in Figure 4.3-1 through Figure 4.3-3. Permanent impacts include those areas that will be converted to infrastructure associated with the Callaway Plant Unit 2 project whereas potentially permanent impacts include a larger footprint of impact in case additional development is desired or needed. Impacts to terrestrial vegetation include:

Cropland – Croplands occupy 1,220 acres (494 hectares) of the AmerenUE property and 11,370 acres (4,601 hectares) of the ecological study area. Approximately 114 acres (46.1 hectares) will be impacted within the Callaway Plant Unit 2 construction zone and an additional ~~76~~ 58.5 acres (~~30.8~~ 23.7 hectares) will be impacted within the collector well area for a total of ~~190~~ 172.5 acres (~~76.9~~ 69.8 hectares) of permanent impacts to cropland. An additional 38 acres (15.4 hectares) of site cropland will be traversed by the Callaway Plant Unit 2 transmission line. The transmission line will consist of overhead lines and thus only small portions, if any, of the 38 acres (15.4 hectares) will actually be impacted by installation of the support towers. Row crops will still be planted and harvested underneath the overhead transmission line, a practice that is in current use under the existing transmission lines around the site. As such, impacts to cropland as a result of transmission line construction are considered temporary. A total of ~~228~~ 212.7 acres (~~92.3~~ 86.1 hectares) or ~~nearly 19%~~ 17% of the site's cropland will be either temporarily or permanently impacted. Cropland is a very common cover type within both the site and ecological study area and ample cropland will remain after construction.

Grassland – Grasslands occupy approximately 415 acres (168 hectares) of the AmerenUE property and 12,025 acres (4,866 hectares) of the ecological study area. Approximately 11 acres (4.5 hectares) of grassland will be impacted within the Callaway Plant Unit 2 construction zone and an additional ~~15~~ 5.4 acres (~~6.1~~ 2.2 hectares) of grassland will be impacted within the collector well area for a total of ~~26~~ 16.4 acres (~~10.5~~ 6.6 hectares) of permanent impacts to grassland. An additional 1.5 acres (0.6 hectare) of grassland may be affected within the Callaway Plant Unit 2 overhead transmission line and are thus considered temporary impacts. Altogether ~~27.5~~ 18.3 acres (~~11.1~~ 7.4 hectares) or nearly ~~7%~~ 4% of the site's grassland will be either temporarily or permanently impacted. Impacts to grassland within the Callaway Plant Unit 2 construction zone consist of small patches of mostly non-native cool season grassland and are not associated with the large tracts of native warm season grassland to the east of the plant. These impacts will be permanent conversions to industrial facilities and thus will not be restored after construction. Grassland within the transmission line corridor consists of a mixture of native and non-native species and is more representative of low-quality old field than high-quality native warm season grasslands.

Deciduous Forest –Deciduous Forest at the site consists primarily of upland deciduous oak-hickory forest as described in Section 2.4.1.1. This cover type occupies 3,542 acres (1,433 hectares) of the AmerenUE property and 36,934 acres (14,947 hectares) of the ecological study area and was the most common cover type identified. In total, ~~78.1~~ 77.0 acres (~~31.6~~ 31.2 hectares) or 2% of on-site deciduous forest will be cleared as a result of project activities. Approximately 43 acres (17.4 hectares) of deciduous forest will be impacted within the Callaway Plant Unit 2 construction zone and permanently converted to industrial facilities associated with Callaway Plant Unit 2. The vast majority of these impacts will occur within the small patches of deciduous forest immediately surrounding the existing Callaway Plant Unit 1. Approximately ~~1.1 acres (0.5 hectares) of deciduous forest will be permanently converted to infrastructure associated with the development of the collector wells and an additional~~ 34 acres (13.8 hectares) of deciduous forest will be cleared for installation of the Callaway Plant Unit 2 transmission line. Areas affected by transmission line construction however, will be restored and maintained to other non-forested cover types and will therefore provide post-construction habitat functions. The transmission line to be cleared will be approximately 150 ft (45.7 m) in width and will parallel the existing transmission line corridor.

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Evergreen Forest –This cover type occupies 13.5 acres (5.5 hectares) of the AmerenUE property and 2,027 acres (820 hectares) of the ecological study area. On site this vegetative cover type exists solely in the form of a pine plantation located adjacent to and northwest of the restricted access portion of the AmerenUE property. It was intentionally planted in the 1930s with red pine (Pinus resinosa) and eastern white pine (Pinus strobus) and is described in Section 2.4.1.1. The entire 13.5-acre (33.4 hectare) pine plantation will be removed and converted permanently to industrial facilities associated with Callaway Plant Unit 2. Since there are no pine trees native to Callaway County, the pine plantation is a man-made vegetative community. The 13.5-acre (33.4 hectare) impact to the pine plantation will be considered a permanent impact.

Deciduous Woody/Herbaceous – The Deciduous Woody/Herbaceous cover type consists of open woodland, including early successional forest, with less than 60% cover of deciduous trees and occupies 1,230 acres (498 hectares) of the AmerenUE property and 1,084 (439 hectares) acres of the ecological study area. Approximately 28 acres (11.3 hectares) of this cover type will be permanently impacted within the Callaway Plant Unit 2 construction zone, ~~1.0 acre (0.4 hectare) will be permanently impacted in the collector well area,~~ and an additional 27 acres (10.9 hectares) will be cleared and maintained for installation of the Unit 2 transmission line. The transmission line to be cleared will be approximately 150 ft (45.7 m) in width and will parallel the existing transmission line corridor. In total, ~~56~~ 55 acres (~~22.7~~ 22.3 hectares) or ~~almost 5%~~ 4% of the site's deciduous woody/herbaceous cover type will be cleared during construction of Callaway Plant Unit 2 and associated transmission line.

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Evergreen Woody/Herbaceous – The Evergreen Woody/Herbaceous cover type consists of open woodland, including early successional forest, with less than 60% cover of evergreen trees and occupies 340 acres (138 hectares) of the AmerenUE property. There are no areas mapped as Evergreen Woody/Herbaceous within the ecological study area. At the site this land cover type consists primarily of eastern red cedar thickets that have invaded forest openings, pasture and old field habitat. Approximately 42 acres (17 hectares) of this vegetative community will be permanently impacted within the Callaway Plant Unit 2 construction zone and an additional 1 acre (0.4 hectare) will be cleared for installation of the Callaway Plant Unit 2 transmission line and maintained as a non-forested herbaceous cover type. In total, 43 acres (17.4 hectares) or nearly 13% of the evergreen woody/herbaceous cover type on site will be cleared during construction of Callaway Plant Unit 2 and associated transmission line.

Woody-Dominated Wetland – The Woody-Dominated Wetland cover type consists of forests with greater than 60% cover of trees with semi-permanent or permanent flood waters and occupies 166 acres (67 ha) of the AmerenUE property and 2,108 acres (853 hectares) of the ecological study area. At the AmerenUE property this land cover type includes both floodplain forests and true jurisdictional forested wetlands as defined in the 1987 Corps of Engineers Wetlands Delineation Manual. Approximately 8.5 acres (3.4 hectares) of this vegetative cover type will be cleared and permanently maintained for installation of the Callaway Plant Unit 2 transmission line and an additional ~~16.6~~ 12.2 acres (~~6.7~~4.9 hectares) will be permanently converted to infrastructure associated with collector well construction. Impacts within the Callaway Plant Unit 2 construction zone are not anticipated. Altogether, approximately ~~25.1~~20.7 acres (~~10.2~~ 8.4 hectares) or ~~15%~~5-12% of the woody-dominated wetland cover type on site will be permanently impacted. Impacts to jurisdictional wetlands are discussed in Section 4.3.1.3.

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Herbaceous-Dominated Wetland - The Herbaceous-Dominated Wetland cover type consists of woody shrub land with less than 60% cover of trees with semi-permanent or permanent flood waters and occupies over 24 acres (9.7 hectares) of the AmerenUE property and 154 acres (62 hectares) of the ecological study area. At the AmerenUE property this cover type includes portions of the four settling ponds south of the existing Callaway Plant Unit 1 facilities as well as the emergent- and shrub-dominated wetlands delineated on site and on the fringe of the stormwater runoff ponds. Approximately 2 acres (0.8 hectares) of this cover type will be impacted within the Callaway Plant Unit 2 construction zone, ~~0.5~~ 0.4 acres (0.2 hectares) will be impacted within the collector well area, and an additional 0.6 acres (0.2 hectares) will be cleared for installation of the Callaway Plant Unit 2 transmission line. In total, ~~3.1~~ 3.0 acres (~~1.3~~ 1.2 hectares), or 13% of the herbaceous-dominated wetland cover type on the AmerenUE property will be impacted. Impacts to jurisdictional wetlands are discussed in Section 4.3.1.3.

Limestone Glade – In accordance with Section 2.4.1.2.5, two terrestrial habitat types have been identified as important habitats at the AmerenUE property: limestone glade and USACE jurisdictional wetlands (see Figure 2.4-4). Impacts to jurisdictional wetlands are discussed in Section 4.3.1.3. Limestone glades occupy approximately 4 acres (1.6 hectares) of the AmerenUE property and are situated on narrow midslope bands on southwest-facing slopes within openings of upland deciduous oak-hickory forest. These glades are located more than one mile (1.6 km) south of the Unit 2 construction zone and are approximately 0.5 miles (0.8 km) east of Callaway Plant Unit 2 transmission line corridor. As such, no impacts to limestone glades are anticipated. In addition, there will be no impacts to glades within the ecological study area including the glade complex recently purchased by the MDC to the west of the plant.

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Important Plant Species – There were no important plant species identified in Section 2.4 thus impacts to important plant species are not anticipated.

Summary of Impacts to Site Vegetation – The overall impact to site vegetation as a result of Callaway Plant Unit 2 construction activities is anticipated to be small due to the fact that there are no important plant species identified and because of the relatively low percentage of impacts to the various plant communities on site as shown in Figure 4.3-4 through Figure 4.3-6. Although 100% of the site's evergreen forest will be removed, this plant community is relatively small (13.5 acres or 5.5 hectares) and consists of pine species that are not native to either Callaway County or the state. In terms of impact area, cropland is the community with the greatest impact at ~~228~~ 212.7 acres (~~92.3~~ 86.1 hectares) but this plant community, consisting primarily of row crop monocultures, will remain plentiful after construction. Impacts to grasslands are located primarily within plant communities consisting of non-native cool-season grasses whereas the higher quality native warm-season grasslands located to the east of the plant will not be impacted.

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4.3.1.2 Fauna

Impacts to terrestrial vegetation, as discussed above, will manifest as a reduction in available habitat for mammals, birds and other fauna that inhabit the AmerenUE property. Some smaller, less mobile fauna such as small rodents, frogs, and box turtles could be killed by heavy equipment used in clearing, grubbing and site grading. Larger, more mobile fauna will be displaced to adjoining terrestrial habitats. These adjoining habitats may therefore experience temporary increases in population density which could potentially result in localized competition for shared resources. Potential impacts to specific faunal species identified as important species in Section 2.4.1are discussed below.

White-Tail Deer: White-tail deer are considered an important species due to their game species status and recreational value to hunters. This important species is abundant throughout the site and ecological study area. Impacts occur within a variety of vegetative cover types as discussed in Section 4.3.1.1 at the AmerenUE property. However, a portion of the area to be impacted is located near the existing facility where buildings, pavement, and the noise of operations provide unsuitable wildlife habitat. Construction activities may also increase the potential for additional white-tail deer mortality due to vehicle collisions related to displacement. Due to the long-term habitat loss across a wide variety of habitat cover types and because of the potential for short-term displacement effects, construction-related impacts to the white-tailed deer are anticipated to be MODERATE.

Gray Bat: The gray bat is considered an important species at the AmerenUE property because it is listed as an endangered species by both the State of Missouri and the U.S. Fish and Wildlife Service (USFWS). This is the only species of bat in Missouri that lives in caves throughout the entire year. Winter hibernation caves typically have vertical openings creating lower temperatures necessary for slowing their metabolism during hibernation. In spring, female gray bats move to warmer maternity caves (MDC, 2000). Although gray bats were not observed in any of the 2007 field surveys, they have been observed historically in a cave along Auxvasse Creek which is approximately 3 miles (4.8 km) west of the Callaway Plant Unit 2 construction zone. Since there are no known caves located within the AmerenUE property and certainly none exist within the Callaway Plant Unit 2 construction zone, project-related impacts to potential maternity, bachelor or hibernation caves (hibernacula) are not anticipated.

Gray bats forage up to 12 miles (20.0 km) from their summer roosts and feed on aquatic and terrestrial flying insects generally over water or in adjacent riparian vegetation (MDC, 2008a). Foraging habitat for the gray bat is assumed to include riparian areas along Auxvasse Creek, Logan Creek, Mud Creek, Molly Dozier Chute, and the Missouri River. Appropriate best management practices (BMPs) will be implemented in accordance with Section 4.2 of this document in order to minimize construction-related impacts to gray bat foraging habitat. There are no plans to remove trees within the riparian zones of any of the above named streams except for small isolated areas where the 150 ft (46 meter) wide transmission line corridor crosses Logan Creek, the Mollie Dozier Chute and the Missouri River and in isolated areas where the new collector well system will be installed near the Missouri River. Measures that are beneficial in preserving foraging habitat for gray bat include avoidance of impacts to aquatic ecosystems, maintenance of buffer zones, and avoidance of pesticide application in riparian buffers and aquatic environments (MDC, 2008a). Ample undisturbed riparian habitat will remain within the large foraging range of the gray bat after project completion. Furthermore, herbicide use will be minimized in potential foraging areas and will be restricted to the 150 ft (45.7 meter) width of riparian zone at Logan Creek, Mollie Dozier Chute, and Missouri River that will be cleared for the new transmission line. Additionally, pesticides will not be used in these areas. Avoidance of impacts to aquatic ecosystems and minimization of

impacts to riparian zones will ensure that the proposed project will not adversely affect foraging habitat for the gray bat.

Due to the limited tree-clearing zone along the Missouri River and Mollie Dozier Chute, and because there are no anticipated impacts to the hibernacula along Auxvasse Creek, construction-related impacts to the gray bat are anticipated to be SMALL.

Indiana Bat: The Indiana bat is considered an important species at the AmerenUE property because it is listed as an endangered species by both the State of Missouri and the USFWS. Although Indiana bats were not observed during any of the 2007 field surveys, they are known to hibernate in the caves of the Ozarks and Ozark Border Natural Divisions of Missouri and thus could potentially exist within the AmerenUE property or ecological study area. Caves and karst habitat are used for winter hibernation sites, or hibernacula. Because there are no known caves located within the AmerenUE property, and certainly none exist within the Callaway Plant Unit 2 construction zone, project-related impacts to Indiana bat hibernacula are not anticipated.

Studies have shown that Indiana bats prefer riparian forested habitat for maternity roosts; however, they may also use upland forest habitat (MDC, 2008b). Foraging habitat for the Indiana bat is assumed to include riparian areas along Auxvasse Creek, Logan Creek, Mud Creek, Molly Dozier Chute, and the Missouri River. Appropriate BMPs will be implemented in order to minimize construction-related impacts to roosting and foraging habitat. There are no plans to remove trees within the riparian zones of any of the above named streams except for small isolated areas where the 150 ft (45.7 m) wide transmission line corridor crosses Logan Creek, the Mollie Dozier Chute and the Missouri River. Measures that are beneficial in preserving roosting and foraging habitat for Indiana bat include avoidance of impacts to riparian zones and preservation of shagbark hickory trees and other potential tree cavity roost sites (MDC, 2008b).

Construction activities associated with the proposed project will minimize alteration of upland habitats and riparian zones potentially used by Indiana bat for foraging. Due to the limited tree-clearing zone along the Missouri River and Mollie Dozier Chute thus minimizing effects to foraging habitat, and because there are no known hibernacula on site, construction-related impacts to the Indiana bat are anticipated to be SMALL.

Bald Eagle: Due to its successful recovery the bald eagle has been de-listed and is no longer a federally listed species by the USFWS. It is still protected, however, under the federal Bald Eagle Protection Act and the bald eagle is listed as endangered in the State of Missouri. Bald eagles have been observed at the AmerenUE property and are thus considered an important species. Although bald eagles were observed foraging in the riparian zone and floodplain of the Missouri River, there are no known bald eagle nests at the AmerenUE property. Should active nests be discovered, the Missouri Department of Conservation would be consulted and construction activities would cease within 1,500 meters of the active nests from January 1 st through July 15th in accordance with MDC recommendations (MDC, 2008c).

The AmerenUE property project is not expected to significantly impact any bald eagle roosting habitat which typically includes tall, mature trees within the floodplains and riparian zones of large rivers like the Missouri. Construction activities planned for the Missouri River floodplain include the 150 ft (45.7 m) wide transmission line corridor (adjacent to the existing transmission line) and installation of facilities associated with the new collector well system. Since the vast majority of the Missouri River floodplain in this area is agricultural, only a small amount of tree clearing will be required along the banks of the Mollie Dozier Chute and the Missouri River. Additionally, there is ample roost habitat upstream and downstream of the

project site on the Missouri River. Wintering eagles typically use a wide variety of habitat, display variable behavior, and are less faithful than nesting eagles in their use of particular roost sites (USFWS, 1983).

Due to the limited clearing of potential roost trees along the Missouri River and Mollie Dozier Chute, construction-related impacts to the bald eagle are anticipated to be SMALL. Ample roost habitat will remain after project completion.

Northern Harrier: Although the northern harrier is not a federally listed species, it is considered an important species because it is state listed in Missouri as an endangered breeding species. Their preferred habitat includes pastures, prairies, open fields, grasslands, marsh, and shrubby areas. Two northern harriers were observed within cropland in the Missouri River floodplain during the 2007 bird surveys at the AmerenUE property. Although northern harriers were observed foraging at the site, there are no known nesting sites.

Measures that are beneficial in preserving nesting and foraging habitat for northern harrier include maintenance of prairie, grassland and cropland habitats for nesting, avoidance of mowing prior to August 1, and avoidance of application of insecticides and rodenticides in nesting habitats (MDC, 2008d).

Most of the construction associated with the Callaway Plant Unit 2 project is located adjacent to the existing plant where periodic mowing and other plant activities do not provide ideal habitat for northern harriers. Although construction within the Missouri River floodplain will convert some forested land into maintained transmission line and collector well facilities, forest cover is not the preferred habitat for the northern harrier. Pasture and native grasslands to the east of the existing plant site will not be impacted by project-related construction activities. Furthermore, ample cropland will remain within the Missouri River floodplain after project completion. Because foraging and potential nesting habitats will not be significantly altered, construction-related impacts to the northern harrier are anticipated to be SMALL.

Northern Bobwhite Quail: Due to its game bird status, the northern bobwhite quail is considered an important species at the AmerenUE property. Preferred habitat includes tall grasslands, brushland, agricultural fields, and open woodlands. Construction impacts also include the conversion of 34 acres (13.8 hectares) of upland deciduous forest to grassland or old field habitat for installation of the new transmission line which could actually benefit bobwhites in the long term. Although construction activities will result in some permanent impacts to bobwhite habitat, their high reproductive rate (MDC, 2007e) coupled with the exploitation of newly available habitat associated with the conversion of forested habitats to old field habitats along the new transmission line corridor will provide some off-set of effects. Furthermore, there is ample preferred habitat, such as the native warm season grasslands to the east of the plant where there will be no impacts. Construction-related impacts to the northern bobwhite quail and its preferred habitat are therefore, anticipated to be SMALL.

Wild Turkey: Wild turkey is considered an important species due to its status as a game bird. Winter turkey habitat includes upland forests with acorns and other hard mast whereas summer/fall habitat usually consists of mowed hay fields, grazed pasture, grasslands, glades, or open woods. A portion of the construction area will be located near the existing facility where existing buildings, pavement, and the noise of operations do not provide ideal wildlife habitat. Wild turkeys are abundant within the AmerenUE property and were observed frequently during the 2007 bird surveys. Due to the long-term habitat loss across a variety of habitat cover types and the potential for short-term displacement effects, construction-related impacts to the wild turkey are anticipated to be MODERATE.

Mourning Dove: The mourning dove is a common game bird frequently observed at the AmerenUE property and is therefore considered an important species. This species utilizes a wide variety of habitat types for nesting, roosting, and foraging including grassland, cropland, and woodland. Ample mourning dove habitat should remain at the AmerenUE property after construction of Callaway Plant Unit 2. Mourning doves have been very successful at adapting to and prospering from human influence. The changes in land use that came with white man's arrival in North America actually increased the abundance of mourning doves. Agricultural practices such as crop farming, livestock grazing, forest clearing, burning and the introduction of exotic seed-bearing plants have been beneficial to dove populations (MDC, 2007f).

Due to the long-term habitat loss across a variety of habitat cover types and the potential for short-term displacement effects, construction-related impacts to the mourning dove are anticipated to be MODERATE.

4.3.1.3 Wetlands

The construction footprint for the proposed Callaway Plant Unit 2 facilities, including the new transmission line and the new collector wells, has been designed to minimize encroachment into areas delineated as waters of the U.S., including wetlands. Construction of the proposed facilities would not be possible, however, without permanently filling approximately 6,938 linear feet (2,115 m) of intermittent streams and approximately 10.04 acres (4.1 hectares) of wetlands and ponds. Impacts to intermittent streams are discussed in Section 4.3.2.1. Approximately 9.11 acres (3.7 hectares) of wetlands and ponds are considered jurisdictional waters of the U.S. (Figure 4.3-4 through Figure 4.3-6). This area of impact represents approximately 4.6% of the total of site intermittent streams (based on USGS mapping) and 4.7% of site wetlands and ponds (based on NWI mapping) available on the AmerenUE property. The project would therefore require an individual permit under Section 404 of the Clean Water Act from the Kansas City District of the U.S. Army Corps of Engineers (USACE). The project would not qualify for a nationwide permit because of the extent of the project and associated impacts to jurisdictional waters of the U.S. The project would also require a Section 401 water quality certification from the Missouri Department of Natural Resources.

Most of the impacts to jurisdictional wetlands occur within the Callaway Plant Unit 2 construction zone and the collector well system on the Missouri River floodplain. Because the proposed transmission line will consist of overhead facilities, most of the wetlands and streams located within the transmission line corridor will be avoided. Impacts to jurisdictional streams are described in Section 4.3.2.1. Wetland impacts are described below and are presented in Figure 4.3-4 through Figure 4.3-6.

Callaway Plant Unit 2 – The Callaway Plant Unit 2 construction zone is the area contiguous with Callaway Plant Unit 1 wherein Callaway Plant Unit 2 facilities – power block, switchyard, cooling towers, lay-down areas, parking areas, access roads, construction landfill, stormwater ponds, and borrow area – will be located. Both permanent and potentially permanent impacts are presented in Figure 4.3-1 through Figure 4.3-3. Permanent impacts include those areas that will be converted to infrastructure associated with the Callaway Plant Unit 2 project whereas potentially permanent impacts include a larger footprint of impact in case additional development is desired or needed. Permanent impacts within this assessment area include seven (7) non-jurisdictional isolated wetlands, one jurisdictional wetland (C4-WT-01), and one jurisdictional stormwater runoff pond (P-4).

The seven isolated wetlands are small and represent a total of 0.93 acres (0.4 hectares) of impacts. Because these wetlands are not connected via a significant nexus to the traditionally navigable waters of the Missouri River, they are not considered jurisdictional waters of the U.S.

and would not be regulated by the USACE. These isolated wetlands are classified by Cowardin et al. (1979) as palustrine unconsolidated bottom (PUB) wetlands. Most were constructed as small farm ponds and some have developed a fringe community of wetland vegetation as described in Section 2.4.2.1.1.4. These PUB wetlands are small vernal pools that do not support fish but do provide valuable breeding habitat for salamander, frog and toad species. Isolated ponds are scattered all over the AmerenUE property and ecological study area and these resources will remain abundant after construction.

Eight ponds, designated as P-1 through P-8 in Figure 4.3-4 through Figure 4.3-6, surround Callaway Plant Unit 1 and were constructed on the small unnamed drainages radiating away from the plant. Most of the stormwater runoff ponds were constructed as impoundments or catch basins during construction of Callaway Plant Unit 1. Pond P-1 does not have an organized surface water connection to other jurisdictional waters and is thus not considered a jurisdictional water of the U.S. The remaining Ponds (P-2 through P-8) do have a significant nexus with the traditionally navigable waters of the Missouri River and are thus within the jurisdiction of the USACE. Some of the stormwater runoff ponds have developed an emergent (PEM) or scrub-shrub (PSS) wetland fringe as described in Section 2.4.2.1.1.4. Because they are located in the headwaters of the various stream systems in the area, the settling ponds have played a valuable role in controlling runoff and retaining sediment.

It is anticipated that the entire 4.3 acres (1.7 hectares) of stormwater runoff pond P-4 will be drained and filled as a result of Callaway Plant Unit 2 construction activities. P-4 is a jurisdictional water of the U.S. and thus would be regulated by the USACE but this pond is not managed by MDC and is not open to the public for fishing. MDC actively manages P-1, P-2, P-7, and P-8 which will not be impacted by the project and will remain open to the public for fishing.

Wetland C4-WT-01 is a small 0.4-acre (0.2 hectare) jurisdictional emergent wetland that is hydraulically connected to stormwater runoff pond P-5 by a culvert pipe under the gravel road that separates the two resources. Because this wetland has a significant nexus to the traditionally navigable waters of the Missouri River it is under the jurisdiction of the USACE. This wetland is located within the potentially permanent impact area (Figure 4.3-4 ~~through Figure 4.3-6~~) but permanent impacts to wetland C4-WT-01 is not anticipated as noted in ~~Figure 4.3-4 through Figure 4.3-6~~ Table 4.3-2.

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Altogether, approximately 4.3 acres (1.7 hectares) of jurisdictional wetlands and 0.93 acres (0.4 hectares) of non-jurisdictional wetlands will be permanently impacted within the Callaway Plant Unit 2 wetland assessment area. Wetland impacts are provided in Figure 4.3-4 through Figure 4.3-6 and Table 4.3-2.

Secondary wetland impacts as a result of Callaway Plant Unit 2 construction activities may include sedimentation as a result of soil erosion, sediment mobilization and surface water runoff. Such secondary impacts will be minimized by implementing best management practices in accordance with Section 4.2 of this document, such as seeding, mulching, erosion control blankets, and silt fences. Measures used to minimize secondary impacts to wetlands are described in Section 4.3.1.6.

Transmission Line – One new overhead transmission line will be constructed in conjunction with the Callaway Plant Unit 2 project. This new facility will be approximately 6.7 miles (10.8 km) in length and constructed in a corridor 150 ft (45.7 m) in width, and will be located immediately adjacent to (and on the west side of) the existing transmission line which extends southward out of the plant and crosses the Missouri River (Figure 4.3-4 through Figure 4.3-6).

The new transmission line will terminate at the tie-in point with the Loose Creek transmission line in Osage County.

Six wetlands (H5-WT-01, H5-WT-02, H5-WT-03, I6-WT-01, J7-WT-01, and J7-WT-02) will be traversed by the new overhead transmission line proposed for Callaway Plant Unit 2 at the AmerenUE property (Figure 4.3-4 through Figure 4.3-6). Three of these wetlands are located within the Logan Creek floodplain and three are located within the Missouri River floodplain. Because they have a significant nexus with the traditionally navigable waters of the Missouri River, all six wetlands are under the jurisdictional authority of the USACE.

Although the locations of the support towers for the overhead transmission line have not yet been established, their locations will be designed to avoid and minimize impacts to wetlands within the transmission line corridor. Some trees may need to be cut off at ground level in order to clear the transmission line corridor but the root balls will not be grubbed out. As such, there may be a conversion of wetland types at H5-WT-01, H5-WT-02, H5-WT-03, I6-WT-01, and J7-WT-01 from forested to scrub shrub or emergent cover types but the wetlands themselves will remain.

The only wetland that may be impacted by construction of the transmission line is J7-WT-02 which is located on the south or right descending bank of the Missouri River. A support tower for the existing transmission line is located adjacent to this wetland and is built on fill. It is assumed that the support tower for the new transmission line will be built within this wetland and that approximately 1.2 acres (0.5 hectares) would be filled to create a stable foundation for tower construction. The corresponding transmission line tower on the north or left descending bank of the Missouri River in Callaway County will be located on the landward side of the levee in an agriculture field and therefore will not impact wetlands.

Altogether, approximately 1.2 acres (0.5 hectares) of jurisdictional wetlands will be permanently impacted within the transmission line wetland assessment area. Wetland impacts are provided in Figure 4.3-4 through Figure 4.3-6.

Secondary wetland impacts as a result of transmission line construction activities may include sedimentation as a result of soil erosion, sediment mobilization and surface water runoff. Secondary impacts will be minimized by implementing best management practices in accordance with Section 4.2 of this document, such as seeding, mulching, and the use of erosion control blankets and silt fences. Measures used to minimize secondary impacts to wetlands are described in Section 4.3.1.6.

Collector Wells

Project impacts to waters of the U.S. associated with collector well construction will primarily be associated with fill placed within wetlands during construction of the new collector well supply structures and associated access road.

Careful siting of the collector wells balanced the need for proximity to the Missouri River with avoidance and/or minimization of impacts to jurisdictional waters of the U.S. including the Missouri River and adjacent wetlands. Best management practices such as silt fence will be used to protect the Missouri River and control sediment runoff from construction activities. Because of the use of best management practices, impacts to the Missouri River are not anticipated. The narrow wetland complex adjacent to the collector wells will be protected with similar best management practices to avoid impacts. Best management practices are described in Section 4.2.

One of the three collector wells will be sited on the land side of the levee due to inadequate room between the levee and river to accommodate construction. At this collector well, the levee itself will act as a sediment control barrier between the construction site and the river.

The pipeline will be installed using traditional trenching methods except for the crossing of Highway 94 and Logan Creek. Directional boring techniques are anticipated to be used to install the pipe in these locations in order to avoid impacts to Logan Creek.

The access road will cross the Mollie Dozier Chute using culverts and then will traverse to the ~~west~~ east of the large wetland complex (H6-WT-02) just north of the chute in order to ~~minimize~~ avoid impacts to this jurisdictional water of the U.S. Approximately ~~2.9~~ 3.1 acres (~~1.2~~ 1.3 hectares) of wetland impacts will be incurred at the Mollie Dozier Chute (wetland I6-WT-01) as a result of culvert and utility installation. ~~Construction of the access road will also require the 0.04 acres (0.01 hectares) of impact at wetland H6-WT-02 and 0.6 acres (0.2 hectares) of impact at 6-WT-01, a degraded farmed wetland.~~ In addition, construction of ~~one of~~ the ~~three~~ collector wells will require approximately ~~0.07~~ 0.6-acres (~~0.03~~ 0.2-hectares) of impact at wetland J6-WT-01. Refer to Figure 4.3-6~~)~~ for the location of wetland impacts in the collector well area. LBDCR 09-0158

Altogether approximately ~~3.61~~ 3.7-acres (1.5 hectares) of wetlands will be impacted by construction of the collector wells and associated intake line and access road.

Summary of Impacts to Wetlands – Construction of Unit 2 facilities, including the new transmission line and collector well system, is anticipated to incur 0.93 acres (0.4 hectares) of non-jurisdictional wetland impacts and ~~9.11~~ 9.2 acres (3.7 hectares) of impacts to wetlands under the jurisdiction of the USACE for a total of ~~10.04~~ 10.13-acres (4.1 hectares) of impacts. These impacts are moderately sized for a project of this magnitude and the project will require an individual permit from the USACE. As such, the overall construction-related impacts to wetlands at the AmerenUE property are anticipated to be MODERATE.

4.3.1.4 Other Projects within the Area with Potential Impacts

Callaway County is a rural county in central Missouri and there are no other known large construction projects within the area that would manifest additional impacts to terrestrial and wetland ecosystems.

4.3.1.5 Consultation

Affected Federal, State and Regional agencies will be contacted regarding the potential impacts to the terrestrial ecosystems resulting from plant construction. The Missouri Natural Heritage Program, operated by the Missouri Department of Conservation (MDC), was consulted for information on known occurrences of State-listed threatened, endangered, or special status species and habitat (~~Cave, 2007~~ MDC, 2007g). The U.S. Fish and Wildlife Service (USFWS) was consulted via letter dated October 9, 2007 to which the USFWS replied on October 18, 2007 (~~Scott, 2007~~ USFWS, 2007). Important species are identified in Section 2.4.1.2 (Terrestrial) and Section 2.4.2.2 (Aquatic) and impacts are discussed herein. LBDCR 09-0158

As project designs are finalized, the U.S. Army Corps of Engineers (USACE) will be consulted regarding the potential impacts to jurisdictional waters of the U.S., including wetlands and streams. The project will likely require an individual Clean Water Act Section 404 permit from the Kansas City District of the USACE and will also require a Section 401 water quality certification from the Missouri Department of Natural Resources.

4.3.1.6 Mitigation Measures

Opportunities for mitigating unavoidable impacts to terrestrial and wetland ecosystems involve restoration of natural habitats temporarily disturbed by construction, creation of new habitat types in formerly disturbed areas, as well as enhancement of undisturbed natural habitats. Mitigation plans will be developed in consultation with the applicable Federal, State and local resource agencies and will be implemented on the AmerenUE property site to the extent practicable. The description of mitigation measures is addressed below for upland areas (flora and fauna) and wetland areas.

Flora and Fauna: Mitigation of temporary and permanent impacts to upland areas (Figure 4.3-4 through Figure 4.3-6) may consist of reforestation as well as the planting of other habitat types such as native grassland and scrub shrub communities. Additional MDC wildlife management practices within the Reform Conservation Area may also be considered to enhance wildlife habitats. Potential mitigation sites at the AmerenUE property may include lawns, fallow agriculture fields, and fragmented forested areas that will be cleared for temporary construction access and lay down areas.

Reforestation is designed to ultimately generate a mature upland deciduous oak-hickory forest which is the climax vegetative community for uplands in Callaway County. Natural succession is the process by which cleared (unvegetated) land returns to the climax vegetative community. Left undisturbed, fallow agricultural land in central Missouri typically passes through a series of intermediate successional stages. In the early successional stages the vegetation is dominated by annual grasses and forbs which over time become mixed with perennial herbaceous species; then shrub and tree saplings including eastern red cedar and gray dogwood; then larger trees dominated by sycamore, sassafras, and black locust that grow rapidly in full sunlight; and finally a forest community dominated primarily by oak and hickory species.

An optimal mix of tree species for planting may include white oak, black oak, red oak, bur oak, and shagbark hickory. These species are slow growers and could be supplemented with faster growing species such as shingle oak and white ash. These tree species are available commercially and when planting 3-gallon container root production method (RPM) trees – a process of air root pruning that creates a dense fibrous root system – on 20-ft centers, the above species could possibly form a closed canopy in as little as 15 to 20 years (Lovelace, 2007). It is anticipated that understory trees and shrubs, such as flowering dogwood and service berry, would voluntarily establish over time but they could also be included in the mix of species planted. Reforestation areas would also be seeded with a native grass mixture to provide erosion control and cover while the trees are becoming established.

Native grassland is not the climax upland plant community in Callaway County but it does persist with occasional burning or mowing to remove encroaching woody species. Although nearly a third of the state was prairie prior to European settlement, only a fraction of a single percent of the original prairie remains today. In Callaway County, 139 square miles (88,960 acres or 36,000 hectares) of prairie existed in pre-settlement times (Schroeder, 1982). Prior to settlement of the area, Coate's Prairie was historically located in the northern half of the Reform Conservation Area before these lands were plowed and farmed (Newbold, 2007). Additional native warm season grassland or prairie plantings would add to the 481 acres of grassland already present at the site and would diversify and enhance the habitat for a number of faunal species. The fauna of native and restored tallgrass prairies includes several species of insects, amphibians, reptiles, birds, and mammals. Prairie landscapes with included wetland habitats provide excellent habitat for common waterfowl including mallard and blue-winged teal and upland birds like the dickcissel, killdeer, red-tailed hawk, eastern meadowlark, and field sparrows. Several species of butterflies, toads, snakes and grasshoppers thrive in prairie habitat.

Important terrestrial species identified at the AmerenUE property that would benefit most from native warm season grass or prairie plantings include the white-tailed deer, northern harrier (State endangered), northern bobwhite quail, wild turkey, and the mourning dove. An optimal mix of species that could be planted include big bluestem, little bluestem, Indian grass, side oats grama, switchgrass, Illinois bundleflower, round-headed lespedeza, compass plant, prairie doc, rattlesnake master, wild bergamot, and various coneflowers.

Wetlands

Wetland mitigation in Missouri is primarily driven by conditions established within permits (Sections 404 and 401 of the Clean Water Act) issued by the USACE and MDNR. Prior to engaging in mitigation activities to offset wetland impacts, AmerenUE must demonstrate an attempt to first avoid and then minimize project-related wetland impacts. Callaway Plant Unit 2 and collector well facilities are being sited in a manner that will avoid and minimize wetland impacts to the extent that is possible. Efforts undertaken to avoid and minimize impacts to wetlands have included the following: early identification of wetland resources prior to final facility site layout, siting Callaway Plant Unit 2 facilities in the proximity of Callaway Plant Unit 1, siting the new transmission line adjacent to the existing transmission line corridor, and siting the new collector well access road to avoid wetlands where possible. As such, the wetland impacts detailed in Section 4.3.1.3 are considered unavoidable. Specific avoidance and minimization efforts will be discussed with the USACE during the permitting phase of the project.

Several measures may be taken to minimize and control construction-related secondary impacts to site wetlands. The use of erosion control barriers, temporary and permanent vegetative stabilization, mulching, erosion control blankets, stormwater detention basins, and other soil erosion and sediment control practices may be used, as appropriate, to reduce the risk of sediment runoff into intact wetlands adjoining construction zones. The stormwater retention basins would be unlined impoundments, vegetated with native wetland herbaceous plant material, with simple earth-fill closure on the downstream end and could include discharge pipes as an outlet to adjacent watercourses.

Wetland mitigation methods may include creation compensation via construction of wetlands in upland areas, restoration or enhancement of degraded wetlands, and preservation of existing wetland areas. The USACE prefers and thus gives more credit for wetland creation. Restoration or enhancement of existing wetlands is less preferred and thus full compensatory wetland mitigation credits are not given. Preservation of existing wetlands as a mitigation measure is rarely allowed and is considered only when other mitigation methods are not feasible and when existing wetlands to be preserved are of such high quality that the USACE would desire preservation. Because creation and/or enhancement mitigation opportunities exist on site, and because existing high-quality wetlands do not exist on site, preservation is not considered a viable mitigation option at the AmerenUE property.

Opportunities for wetland creation exist in various locations throughout the AmerenUE property. Factors that may influence site selection for wetland creation include topography, soil types, watershed size, and the presence of adjacent streams as a source of additional hydrology. Various wetland types including emergent, scrub-shrub, forested, and open water could be constructed on site within the floodplains of Logan Creek or the Missouri River. Wetland creation could also occur in higher elevations of the site provided that sufficient hydrology is provided by a large watershed drainage area or through site runoff of impervious areas of the plant. Opportunities for wetland creation may also exist adjacent to one of the drainages that radiate away from the plant. The soils and hydrology of any candidate site for

wetland creation would require a detailed evaluation to determine the feasibility of constructing and maintaining a wetland system.

Because only partial credits are awarded for wetland enhancement, opportunities for this type of mitigation may only exist in the larger wetland systems along the Mollie Dozier Chute or within the floodplain of the Missouri River. Enhancement efforts may include modifying wetland hydroperiod, and management of plant communities including controlling exotic or invasive species such as reed canary grass (Phalaris arundinacea), Johnson grass (Sorghum halpense), or cattails (Typha sp.). Enhancement efforts may also include providing additional hydrology or planting several native species to increase native cover and species diversity.

Because wetland mitigation in Missouri is primarily driven by conditions established within Clean Water Act Section 404 permits issued by the USACE and Section 401 Water Quality Certifications issued by the MDNR, specific wetland mitigation efforts will be determined after such authorizations have been issued.

4.3.2 AQUATIC ECOSYSTEMS

Impacts to aquatic ecosystems have been assessed within the Unit 2 construction zone, the Unit 2 transmission line corridor, and within the area designated for the development of collector well facilities on the floodplain of the Missouri River. Because the transmission line will consist of overhead facilities, the support towers as practicable will be strategically located to avoid impacts to aquatic resources such as ponds and streams. As stated in Section 4.3.1.3, only one wetland (J7-WT-02) will be impacted as a result of transmission line construction. This wetland occasionally functions as aquatic habitat under conditions of high river stage when it may be needed for fish for feeding and/or reproduction.

Section 4.2 includes a footprint of the construction area and a description of the construction process. Construction activities associated with non-safety-related systems and structures may begin after the appropriate permits are issued for clearing and grading. The NRC combined license must be issued prior to commencement of construction activities associated with safety-related systems and structures. Construction activities for non-safety related systems and structures are expected to begin after all required permits are received. Construction is expected to be complete by 2017.

4.3.2.1 Impacts to Impoundments and Streams

Construction-related impacts to aquatic resources include 6,938 linear feet (2,115 m) of intermittent streams which are unnamed tributaries of Logan Creek, Mud Creek, and Auxvasse Creek that drain stormwater away from the AmerenUE property. These streams were impounded during construction of Callaway Plant Unit 1 to create stormwater runoff ponds or catch basins (Figure 4.3-4 through Figure 4.3-6). These drainages are mapped by the U.S. Geological Society (USGS) as dashed blue-line streams and are thus assumed to be under the jurisdictional authority of the USACE. Some of these upland intermittent streams lack a consistent bed, bank or ordinary high water mark (OHWM). As such, a jurisdictional determination by the USACE may be required to verify the extent of jurisdictional streams. Since site design details are not yet finalized, stream impacts may be revised at a later date. Impacts to jurisdictional streams are presented in Figure 4.3-4 through Figure 4.3-6 and will require compensatory mitigation in accordance with USACE permit conditions. Potential impacts will consist of permanently filling the small stream beds to accommodate the construction of roadways, parking lots, construction lay down areas, or other structures associated with the construction of Unit 2.

Eight ponds, designated as P-1 through P-8 in Figure 4.3-4 through Figure 4.3-6, surround the AmerenUE property and were constructed on the small unnamed drainages radiating away from the plant. As stated above, some of the stormwater runoff ponds were constructed as impoundments or catch basins during construction of Unit 1 facilities. Construction-related impacts will include one jurisdictional stormwater runoff pond (P-4) that will be permanently converted to structures, pavement, or other maintained exterior grounds to accommodate the proposed power block, cooling towers, roadways, construction lay down area, borrow area, retention basins, and permanent parking lots. The pond will be drained and filled in the following sequence. The dam will be notched, and the water level will be lowered in a slow, controlled manner in order to prevent or minimize scour downstream. If lake sturgeon are present, they will be relocated to the Missouri River. After the pond is drained, it will be filled with material appropriate for the construction of areas listed above. Impacts are quantified in Table 4.3-2. Additional stormwater runoff pond will be constructed north or downstream of P-4, as needed, during construction of Unit 2 facilities. This may be included as part of the overall mitigation required for impacts to jurisdictional waters of the U.S. The other seven stormwater runoff ponds remain after construction. MDC actively manages P-2, P-7, and P-8 which will remain open to the public for fishing. The other seven stormwater runoff ponds will remain after construction. MDC actively manages P-2, P-7, and P-8 which will remain open to the public for fishing. Furthermore, an additional stormwater runoff pond may be constructed north or downstream of P-4, as needed, during construction of Unit 2 facilities. This may be included as part of the overall mitigation required for impacts to jurisdictional waters of the U.S.

Although not directly impacted by construction, stormwater runoff pond P-7 could be indirectly impacted with additional sedimentation and turbidity due to work upstream in intermittent drainages that feed into the pond. Downstream reaches of the impacted intermittent streams are also at risk to receive additional sediment deposition as a result of construction activities at the AmerenUE property. Therefore, sediment and erosion control practices such as temporary seeding, mulching, silt fences, and check dams will be used in order to minimize the indirect impacts of construction.

As described in Section 4.2.2.2, construction at the AmerenUE property will permanently destroy some of the existing surface water bodies. Anticipated impacts to the water bodies listed above are summarized as follows:

- Infilling and eliminating stormwater runoff pond P-4 to the northwest of the plant;
- Eliminating the upper reaches of several unnamed intermittent tributaries in the Auxvasse, Mud and Logan Creek watersheds; and
- Potentially increasing sediment loads into other down-gradient intermittent streams and ponds.

However, it is possible that these activities will be changed in the final design.

When a small impoundment is filled by construction activities, impacts to aquatic life will be substantial. If the pond has an outlet, and the water level is lowered gradually, some fish may migrate out of the impact zone. However, construction impacts to the pond will invariably result in the loss of the fish and invertebrates due to draining and filling activities. Likewise, construction activity that fills an area formerly drained by an intermittent stream will potentially result in the loss of organisms, if any are present in the hyporheic zone. Impacts of construction activities on the upper sections of intermittent streams depend on whether the stream is holding water at the time. If the intermittent stream is dry, losses of fish and

invertebrates will be minimal. Some individuals of populations that are able to diapause in the egg or larval stage during dry periods may also be lost. Conversely, if the stream contains water, early successional stages of invertebrate and/or fish assemblages may be present. If construction impacts are gradual, some emigration of fish may occur but construction related activities will likely result in the mortality of less mobile invertebrates. Alternatively, if construction impacts are abrupt, both fish and invertebrates will likely be lost.

As discussed in Section 2.4.2, surveys of the onsite streams were conducted, and did not document the presence of rare or unique aquatic species in the construction zone. Only one of the three unnamed intermittent tributaries anticipated to be impacted consistently contained water during the sampling periods, and it was dominated by pollution-tolerant invertebrate taxa (worms, gastropods) and pioneering generalist fish species (stoneroller, creek chub, green sunfish). These species are common and readily found in other nearby aquatic habitats.

The only pond (P4) that will likely be drained and filled did not appear to contain substantial fish populations in the November gill net survey. Other impoundments that could potentially be indirectly affected by runoff or sedimentation from construction contain species (channel catfish, bluegill, and largemouth bass) that are readily found in ponds nearby and throughout much of Missouri. Additionally, lake sturgeon were stocked into five of the ponds in 1984. However, these ponds were surveyed for this species in November 2007 using gill nets, and no sturgeon were found. Since the habitat requirements for lake sturgeon are silt-free sand or gravel substrates (Evers, 1994), and extensive amounts of silt were present in these ponds, it is possible that the sturgeon may not have persisted. However, as discussed previously with MDC, if any sturgeon are found during construction activities, the MDC will be notified so that relocation of individuals into the Missouri River may be accomplished.

Proposed construction activities that will potentially affect impoundments and/or streams that are outside the construction footprint are described in Section 4.2. Effects to aquatic ecosystems will most likely result from sedimentation due to erosion of surface soil. The detrimental effects of increased sediment deposition on stream biological communities have been well documented (Gurtz, 1981; Noel et al., 1986; Christie and Fletcher, 1999). Three major groups of aquatic organisms are typically affected by the deposition of sediment in streams: aquatic plants, benthic macroinvertebrates, and fish. The effects of sedimentation correspond to particle size. Finer particles may remain suspended, blocking light necessary for photosynthesis by primary producers such as periphyton and/or rooted aquatic plants (Waters, 1995). Suspended sediments may also interfere with respiration, and reduce feeding efficiency by lowering visibility. Larger sediment particles will fall out of suspension and may fill the interstitial spaces between natural substrate particles, eliminating habitats for benthic macroinvertebrates and young fish. Losses in fish forage (macroinvertebrates) and decreases in reproductive success can lead to subsequent reductions in fish populations.

Soil erosion associated with construction activities can be prevented or minimized by using best management practices, in accordance with Section 4.2 of this document. Covering disturbed areas with straw or matting is a preferred method of controlling sedimentation. Silt fences, temporary or permanent vegetative stabilization, and/or retention ditches or ponds can be effective in intercepting and retaining sediment before it reaches stream segments.

The potential for sedimentation into streams in or near the AmerenUE property is generally dependant on the proximity of the stream to construction activities and is inversely proportional to the size and permanence of the stream. Segments that are the closest to construction activities are intermittent. Sediment that is not captured through best management practices will most likely be deposited in these stream segments. While

intermittent headwater streams are considered important, there is nothing of regional significance about these particular streams. Aquatic species encountered in surveys of these areas are common in the region. Thus, no loss of unique habitat is anticipated. Permanent segments of Logan Creek, Mud Creek, and Auxvasse Creek are relatively distant from proposed construction activities. It is unlikely, therefore, that significant amounts of sediment will be deposited in these segments. Moreover, the Missouri River, into which each of these streams empties, is even further from proposed construction activities.

Important Species within Ponds and Streams

Important species that were either collected from, or are considered to potentially reside in, streams near the AmerenUE property include the state and/or federally listed Topeka shiner, blacknose shiner, and plains topminnow. Three recreationally important species - channel catfish, bluegill, and largemouth bass - have been stocked into ponds P2, P7, and P8. Lake sturgeon, a state endangered species, was stocked in 1984 into ponds P-1, P-2, P-4, P-6, and P-7. Pond P-4 is anticipated to be completely filled and removed. It is assumed that lake sturgeon are no longer present in the stormwater runoff ponds because they were not collected during 2007 surveys and because the ponds do not provide ideal habitat for this species. Even so, it is possible that some individuals may still reside in one or more of ponds. If individuals are present, they would be killed by draining and filling activities unless they are transported to another location, most appropriately the Missouri River. Should any specimens be observed during the dewatering process, appropriate MDC personnel will be notified.

Topeka shiner (federal and state listed as endangered), blacknose shiner (listed as imperiled (S2) in Missouri), and plains topminnow (listed as vulnerable (S3) in Missouri) have not been collected in any fish surveys of the streams – Logan and Mud Creeks, and intermittent tributaries of Logan, Mud, and Auxvasse Creeks – near the AmerenUE property. However, the Topeka shiner and blacknose shiner have been collected from Auxvasse Creek within the ecological study area approximately 3 miles (4.8 km) west of the site. Plains topminnow has been collected from Tavern Creek within the ecological study area approximately 5 miles (8 km) east of the site. Since the creek segments where these species have been collected are relatively distant from construction activities, coupled with the commitment to utilize best management practices in accordance with Section 4.2 of this document in reducing runoff to intermittent streams of the plant site, it is unlikely that they will be negatively impacted.

Other important species include recreational species that are found in the permanent and intermittent stream segments on the AmerenUE property. These include channel catfish, bluegill, spotted bass, and largemouth bass. A portion of the stream habitat within the site is anticipated to be impacted by construction activities; however it consists entirely of intermittent stream segments that fish populations use only opportunistically. It is unlikely, therefore, that these species will be substantially harmed by construction activities. Moreover, an abundance of unimpacted stream habitat in the site and ecological study area will still be available for these species.

Summary of Impacts to Ponds and Streams

Impacts to ponds and streams in the AmerenUE property are anticipated to be small. Pond and stream permanent impacts are quantified in Table 4.3-2 and Table 4.3-3. With regard to direct impacts, the specific pond (P-4) is shallow and the stream sections are ephemeral, flowing only for short periods after rain events. No important species were encountered in either of these areas. Species resident in these habitats are generally opportunistic residents, and are common in similar habitats throughout the region. In the unlikely event that lake sturgeon are encountered while draining P-4, they will be relocated to the Missouri River.

In terms of indirect effects, impacts are likewise anticipated to be small. Soil erosion and consequent sedimentation effects should be inversely proportional to the size and permanence of the stream. Specifically, the aquatic communities are the least complex, and comprised of tolerant generalist taxa, nearest where construction activities are planned. It is unlikely that significant amounts of sediment will be deposited in more distant permanent segments.

4.3.2.2 Impacts to the Missouri River

As discussed in Section 2.4.2, the Missouri River is considered to be an important aquatic habitat. Most of the species of concern within the ecological study area are residents of the Missouri River. Even so, none of them are endemic to the segment of the river near the plant. There is little or no submerged aquatic vegetation near the area, which would be important habitat for larval and young-of-the-year fish.

Minimal effects of sedimentation on the Missouri River are expected with the construction of the collector well system. Additionally, sediment transport from tributary streams and subsequent deposition within the Missouri River is expected to be minimal due to the use of best management practices in controlling site runoff and due to the relatively great distance of the construction activities from the Missouri River.

Dredging is a construction activity that will potentially occur on the Missouri River in conjunction with the use of the barge unloading facility. If it is performed at all, dredging activity will be confined to a localized area near the shoreline. Fish will be able to avoid direct impacts of dredging. Benthic invertebrates, however, will not, and those in the sediment that is removed from the water will be killed. Collections taken from the near-shore sediments in 2007-2008 surveys did not find rare organisms in this habitat. Indeed, the macroinvertebrate populations typically found in these habitats are predominantly chironomids and oligochaetes that are tolerant of sub-optimum environmental conditions, and frequently increase in abundance in disturbed systems. Indirect effects of dredging will primarily be temporary suspension of sediment particles into the water column. Since the fish and macroinvertebrate communities in the consistently turbid Missouri River have presumably adapted to these conditions, indirect impacts are not anticipated to be substantial.

Important Species within the Missouri River

Important species that have been collected from the Missouri River in either the current study or in previous surveys include seven federal and/or state listed species and 14 species of sport or commercial importance. The listed species are lake sturgeon and flathead chubs (Missouri endangered), pallid sturgeon (federal and Missouri endangered), sturgeon chub and sicklefin chub (federal and Missouri vulnerable (G3 and S3)), and paddlefish and blue sucker (Missouri vulnerable (S3)). The species of sport or commercial importance are shovelnose sturgeon, smallmouth buffalo, bigmouth buffalo, blue catfish, channel catfish, flathead catfish, white bass, bluegill, spotted bass, largemouth bass, white crappie, black crappie, sauger, and freshwater drum.

Due to the use of best management practices in accordance with Section 4.2 of this document in controlling site runoff and the relatively great distance of the construction activities from the Missouri River, minimal adverse impacts to aquatic important species are anticipated. Further, none of the important species listed above are endemic to the segment of the Missouri River near the plant. An abundance of large river habitat would remain available to these species, even in the unlikely event of secondary construction-related impacts such as slightly increased levels of turbidity and sedimentation.

Summary of Impacts to the Missouri River

Impacts to the Missouri River near the AmerenUE property are anticipated to be small. The only direct impacts would be associated with dredging, which may not be performed. If dredging does occur, fish will likely temporarily avoid the area and will be minimally affected. Macroinvertebrates residing in the material removed, however, will be destroyed. Even so, these populations primarily consist of pollution-tolerant species that are adapted to sediment-rich, oxygen-poor depositional habitats, and they will continue to be common or abundant in the extensive areas of this type of habitat that will remain in the river.

With regard to indirect effects, impacts are likewise anticipated to be small. Soil erosion and consequent sedimentation effects should be minimized by best management practices, and those that remain are anticipated to occur in intermittent segments of streams far removed from the Missouri River. The small amount of construction-related sediment that reached the river would make little difference in an already turbid water system. And the resident organisms of the system, adapted to such conditions, should be minimally affected.

4.3.2.3 Other Construction Impacts

There is potential for birds to be involved in collisions with tall structures such as the containment building and cooling towers. The degree of risk varies with different species, depending on preferred habitat, flight corridors, weather conditions, etc. Large scale aviar mortality has not been observed at the Callaway site. The Unit 2 structures will be located relatively close to the existing Unit 1 structures, and will be similar in size and form. Therefore, based on current operating experience, the potential for extensive aviar mortality is small.

The noise to be expected during construction is discussed in Section 4.4.1. The noise levels may be as high as 102 dba at 50 ft (15 m) from the source. Animals and birds will tend to avoid construction activities. At 400 ft (122 m), the noise level is less than 80 dba, about the same as freeway traffic. It is possible that some small mammals and insects may be close to equipment when it starts up, and may be negatively impacted. These impacts will be occasional since the active construction area is already largely disturbed and not current habitat for wildlife. Therefore, because the potential for noise impact on wildlife is intermittent and temporary, the impact is considered to be SMALL and will not require mitigation.

4.3.2.4 Cumulative Impacts

4.3.2.4.1 Impacts on the Transmission Corridor and Offsite Areas

Impacts as a result of transmission line corridor construction are anticipated to be small. The new transmission line will consist of overhead facilities and thus will traverse but not impact aquatic resources. As stated in Section 4.3.1.3, one wetland on the right descending bank of the Missouri River will be impacted to create a stable foundation for a support tower but permanent aquatic resources will not be impacted as a result of transmission line construction. Although the locations of the support towers for the overhead transmission line have not yet been established, their locations will be designed to avoid and minimize impacts to aquatic resources within the transmission line corridor.

4.3.2.4.2 Collector Well Intake System Installation

As discussed in FSAR Section 2.4.12, AmerenUE is planning to construct a collector well intake system along the Missouri River to supply makeup cooling water for Callaway Plant Unit 2 (and water for Callaway Plant Unit 1). Conceptually, each collector well would be constructed of a 20 ft (6.1 m) diameter caisson extending through the alluvial aquifer to bedrock with approximately 14 well-screen laterals extending radially to 200 ft (61 m) from the caisson. Each

collector well could potentially supply 15,000 gpm to 20,000 gpm (57,000 lpm to 76,000 lpm). Three collector wells are being planned for the two units. Water would be pumped through a common line up the corridor and be split for usage by the two plants. The collector wells will be distributed along the edge of the Missouri River separated by approximately 1,500 ft (450 m) to limit interference of water production among wells. It is expected that 85% of the water will be derived from surface water recharge to the aquifer, while 15% will be derived from upgradient sources of groundwater.

The caisson is constructed "wet" in which the aquifer materials are excavated from beneath the caisson through the center. When the caisson reaches bedrock, a concrete floor is poured into the bottom to seal the collector well. During construction and development of the laterals, water enters the caisson one lateral at a time and is removed with a pump. This flow will be much less than what is derived during normal operation.

The construction of the collector well system will be conducted onshore. Precautions will be taken to prevent soil erosion and to control sediment runoff and discharges to the Missouri River. These may include BMPs such as stormwater runoff ponds, berms, check dams, and silt fences. Therefore, the impact on surface water from the collector well system construction is expected to be SMALL.

4.3.2.5 Summary

Construction activities for Callaway Plant Unit 2 which may cause erosion and lead to sediment deposition in aquatic habitats are expected to be of relatively short duration. They will be permitted and overseen by state and federal regulators, and will be guided by an approved Stormwater Pollution Prevention Plan. Best management practices for control of erosion and sedimentation will be applied, as discussed in Section 4.2. Unexpected spills of construction-related hazardous fluids (e.g., petroleum products) would be mitigated according to a Spill Prevention, Control, and Countermeasure Plan.

No important aquatic species are expected to be affected. Impacts to aquatic communities are expected to be small and preventable, in even the intermittent headwater streams by best management practices and even more unlikely in the permanent streams of the site and ecological study area due to their distance from the construction activities.

4.3.3 REFERENCES

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Table 4.3-1—Vegetation (Plant Community) Impacts in Acres (Hectares) from Construction of Proposed Callaway Plant Unit 2

Habitat (Plant Community Type)s	On-Site Area in Acres (Hectares)	Includes USACE Jurisdictional Wetland	Potentially Permanent Impacts			Permanent Impacts			Temporary Impacts			Total Impact†	
			Unit 2	Transmission Line	Collector Wells	Unit 2	Transmission Line	Collector Wells	Unit 2	Transmission Line	Collector Wells	Acres (Hectares)	% of Cover Type Mapped Onsite
Impervious	331 (134)	No	137 (55.4)	0	0	51 (20.6	0	~~1.8 (0.7)~~ 2.2 (0.9)	3.3 (1.3)	2.0 (0.8	0	~~58.1 (23.5)~~ 58.5 (23.7)	18%
High Intensity Urban	114 (46)	No	100 (40.5)	0	0	53 (21.4)	0	0	4.0 (1.6)	0	0	57 (23.1)	50%
Low Intensity Urban	37 (15)	No	17.5 (7.1)[b]	0	0	15.5 (6.3)	0	0	6.7 (2.7)	0	0	22.2 (9.0)	59%
Cropland	1,220 (494)	No	259 (104.8)	0	0	114 (46.1)	0	~~76 (30.8)~~ 58.5 (23.7)	0	38 (15.4)[a]	~~0~~ 2.2 (0.9)	~~228 (92.3)~~ 212.7 (86.1)	~~19%~~ 17%
Grassland	415 (168)	No	62 (25.1)	0	0	11 (4.5)	0	~~15 (6.1)~~ 5.4 (2.2)	0	1.5 (0.6)[a]	~~0~~ 0.4 (0.2)	~~27.5 (11.1)~~ 18.3 (7.4)	~~7%~~ 4%
Deciduous Forest	3,542 (1,433)	No	101 (41.0)	0	0	43 (17.4)	34 (13.8)	~~1.1 (0.5)~~ 0	0	0	0	~~78.1 (31.6)~~ 77.0 (31.2)	2%
Evergreen Forest	13.5 (5.5)	No	13.5 (5.5)	0	0	13.5 (5.5)	0	0	0	0	0	13.5 (5.5)	100%
Deciduous Woody/Herbaceous	1,230 (498)	No	75 (30.4)	0	0	28 (11.3)	27 (10.9)	~~1.0 (0.4)~~ 0	0	0	0	~~56 (22.7)~~ 55.0 (22.3)	~~5%~~ 4%
Evergreen Woody/Herbaceous	340 (138)	No	69 (28.0)	0	0	42 (17)	1 (0.4)	0	0	0	0	43 (17.4)	13%
Woody-Dominated Wetland	166 (67.2)	Yes	0	0	0	0	8.5 (3.4)	~~16.6 (6.7)~~ 12.2 (4.9)	0	0	0	~~25.1 (10.2)~~ 20.7 (8.4)	~~15%~~ 12%
Herbaceous-Dominated Wetland	24 (9.7)	Yes	5.0 (2.0)	0	0	2 (0.8)	0.6 (0.2)	~~0.5 (0.2)~~ 0.4 (0.2)	0	0	0	~~3.1 (1.3)~~ 3.0 (1.2)	13%
Limestone Glade	4 (1.6)	No	0	0	0	0	0	0	0	0	0	0	0
Total			839 (339.5)	0	0	373 (151)	71.1 (28.8)[c]	~~112 (45.3)~~ 78.8 (31.9)	14.0 (5.7)	41.5 (16.8)[c]	~~0~~ 2.5 (1.0)		
			Total Potentially Permanent Impacts: 839 (339.5)			Total Permanent Impacts ~~556.1 (225)~~ 522.9(211.6)			Total Temporary Impacts ~~55.5 (22.5~~ 58.0 (23.5))			~~611.6 (247.6)~~ 580.9 (235.1)	

(a) Impacts due to the overhead transmission line within cropland and grassland will depend on support tower locations which have not yet been designed. Impacts shown are considered temporary since cropland and grassland can persist under transmission lines.
(b) Includes approximately 10 acres (4.1 ha) for future borrow area within potentially permanent impact category
(c) Note: Total transmission line impact values do not include open water as open water will be spanned
† Temporary plus Permanent Impacts (does not include Potentially Permanent Impacts).

Table 4.3-2— Wetland Impacts in Acres (Hectares) from Construction of Proposed Callaway Plant Unit 2

(Page 1 of 2)

Wetland Assessment Area	Wetland ID	Potentially Permanent Impacts				Permanent Impacts				[2]Conversion of PFO (Clearing Transmission Line)	Total Permanent Impacts	
											Acres (Hectares)	% of Wetlands Mapped Onsite*
		[1]PFO	[1]PEM	[1]PSS	[1]PUB	[1]PFO	[1]PEM	[1]PSS	[1]PUB	PFO		
Non-Jurisdictional Wetlands												
Unit 2 Construction Zone	B3-WT-02				0.1 (0.04)				0		0	
	C3-WT-01				0.7 (0.28)				0		0	
	C3-WT-02				0.2 (0.08)				0.2 (0.08)		0.2 (0.08)	
	C3-WT-03				0.3 (0.12)				0.3 (0.12)		0.3 (0.12)	
	C4-WT-02				0.1 (0.04)				0.1 (0.04)		0.1 (0.04)	
	C5-WT-01				0.1 (0.04)				0		0	
	C5-WT-02				1.4 (0.6)				0		0	
	C5-WT-03				0.1 (0.04)				0.1 (0.04)		0.1 (0.04)	
	D4-WT-02				0.1 (0.04)				0		0	
	D4-WT-03				0.03 (0.01)				0.03 (0.01)		0.03 (0.01)	
	D4-WT-04				0.2 (0.08)				0.2 (0.08)		0.2 (0.08)	
	Subtotal	**0**	**0**	**0**	**3.3 (1.3)**	**0**	**0**	**0**	**0.93 (0.4)**	**0**	**0.93 (0.4)**	**0.4%**
Transmission Line Corridor											0	
	Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**
Collector Wells[3]												
	Subtotal	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0%**
Non-Jurisdictional Total					**0**				**0.93 (0.4)**		**0.93 (0.4)**	**0.4%**
Jurisdictional Waters of the U.S.												
Unit 2 Construction Zone	C4-WT-01		0.4 (0.2)								~~0.4 (0.2)~~ 0	
	P-4								4.3 (1.7)		4.3 (1.7)	
	Subtotal	**0**	**0.4 (0.2)**	**0**	**0**	**0**	**0**	**0**	**4.3 (1.7)**	**0**	**4.3 (1.7)**	**2.0%**

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Table 4.3-2— Wetland Impacts in Acres (Hectares) from Construction of Proposed Callaway Plant Unit 2

(Page 2 of 2)

Wetland Assessment Area	Wetland ID	Potentially Permanent Impacts				Permanent Impacts				[2]Conversion of PFO (Clearing Transmission Line)	Total Permanent Impacts	
											Acres (Hectares)	% of Wetlands Mapped Onsite*
Transmission Line Corridor	H5-WT-01									0.2 (0.1)	0	
	H5-WT-02									0.6 (0.2)	0	
	H5-WT-03									0.04 (0.02)	0	
	I6-WT-01									1.6 (0.6)	0	
	J7-WT-01									0.2 (0.1)	0	
	J7-WT-02					1.2 (0.5)					1.2 (0.5)	
	Subtotal	**0**	**0**	**0**	**0**	**1.2 (0.5)**	**0**	**0**	**0**	**0**	**1.2 (0.5)**	**0.6%**
Collector Wells	~~H6-WT-01~~						~~0.6 (0.2)~~				~~0.6 (0.2)~~	
	~~H6-WT-02~~					~~0.04 (0.01)~~					~~0.04 (0.01)~~	
	I6-WT-01					~~2.9 (1.2)~~ 3.1 (1.3)					~~2.90 (1.2)~~ 3.1 (1.3)	
	J6-WT-01					~~0.07 (0.03)~~ 0.6 (0.2)					~~0.07 (0.03)~~ 0.6 (0.2)	
	Subtotal	**0**	**0**	**0**	**0**	**~~3.01 (1.2)~~ 3.7 (1.5)**	**~~0.6 (0.2)~~ 0**	**0**	**0**	**0**	**~~3.61~~ 3.7 (1.5)**	**~~0%~~ 1.7%**
	Jurisdictional Wetland Total	**0**	**0.4 (0.2)**	**0**	**0**	**~~4.21 (1.7)~~ 4.9 (2.0)**	**~~0.6 (0.2)~~ 0**	**0**	**4.3 (1.7)**	**0**	**~~9.11 (3.7)~~ 9.2 (3.7)**	**4.3%**
	Total Jurisdictional & Non-Jurisdictional	**0**	**0.4 (0.2)**	**0**	**3.3 (1.3)**	**~~4.21 (1.7)~~ 4.9 (2.0)**	**~~0.6 (0.2)~~ 0**	**0**	**5.23 (2.1)**	**0**	**~~10.04 (4.1)~~ 10.13 (4.1)**	**4.7%**

(1) PFO = Palustrine Forested Wetland; PEM = Palustrine Emergent Wetland; PSS = Palustrine Scrub Shrub Wetland
PUB = Palustrine Unconsolidated Bottom Wetlands including ponds <ac (8 ha) with a water depth <6.6'(2 m) and lacking an active wave-formed shoreline. This includes small "farm ponds" and stormwater runoff ponds P-1 - P-8.

(2) Represents a conversion from PFO wetland to PEM but does not constitute a loss of jurisdictional wetland.

* Based on 214 acres (86.6 hectares) NWI wetlands mapped onsite.

Table 4.3-3— Stream Impacts from Construction of Proposed Callaway Plant Unit 2

Assessment Area	Stream ID	Potentially Permanent Impacts		Permanent Impacts		
		feet	meters	feet	meters	% of Site Streams*
Unit 2 Construction Zone	C3-SC-01	232	70.7	0	0	
	C3-SC-02	3615	1102	2765	843	
	C4-SC-01	1176	358.4	1136	346.3	
	C4-SC-02	1835	559.3	1095	333.8	
	C5-SC-01	704	214.6	0	0	
	C5-SC-03	2145	163.7	1611	491	
	C6-SC-01	204	62.2	0	0	
	D3-SC-01	448	97.5	128	39	
	Subtotal	**10,359**	**2,628.4**	**6,735**	**2,053.1**	**4.4**
Transmission Line Corridor		0	0	0	0	
	Subtotal	**0**	**0**	**0**	**0**	**0**
Collector Wells	H5-SC-01	0	0	203	61.9	
	Subtotal	**0**	**0**	**203**	**61.9**	**0.1**
	Total Stream Impacts			**6,938**	**2,115**	**4.6**

* Based on 151,757 linear feet (46,730 m) of USGS streams mapped on site.

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Figure 4.3-1—Land Cover Impacts (Sheet 1)

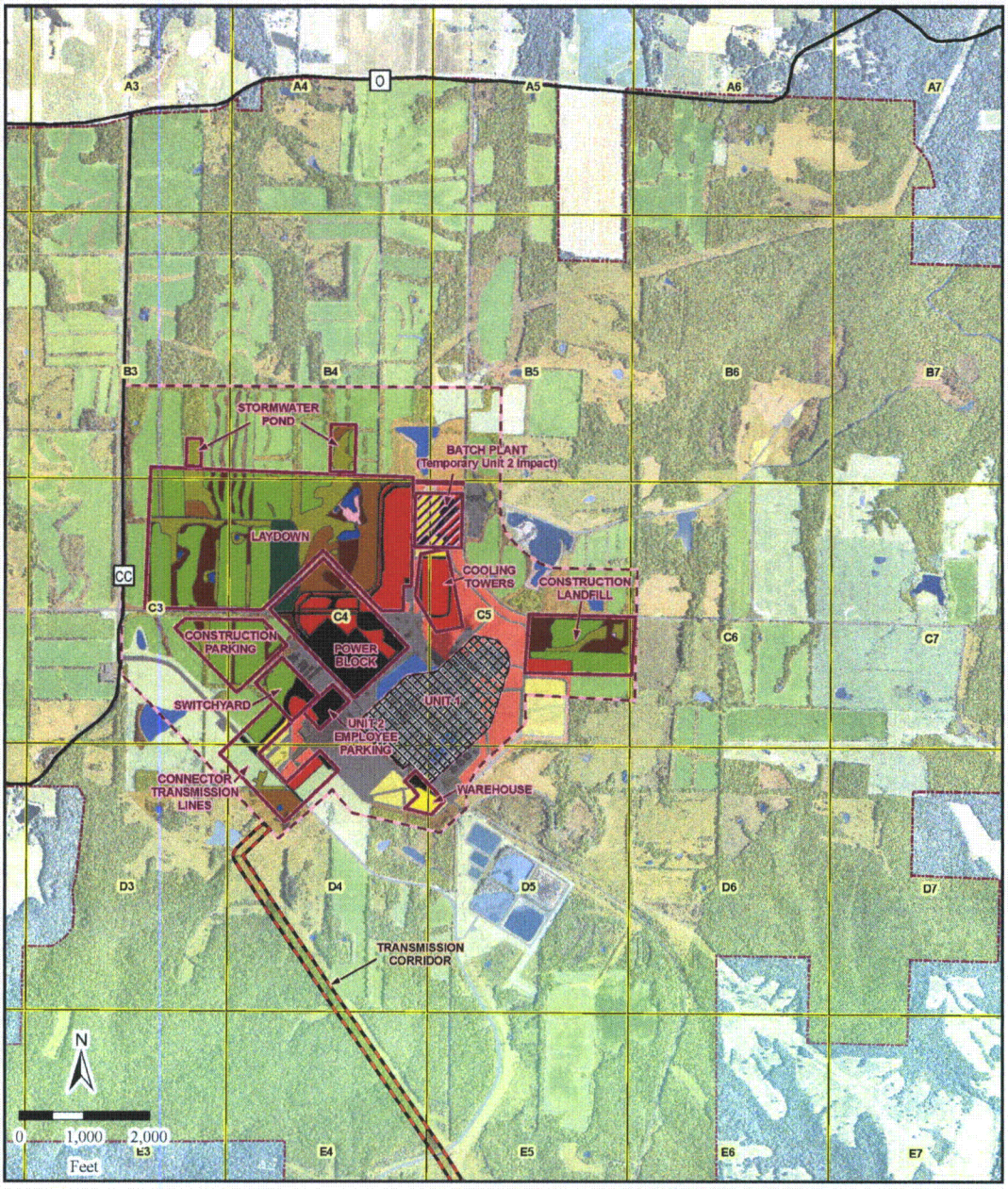

Figure 4.3-2—Land Cover Impacts (Sheet 2)

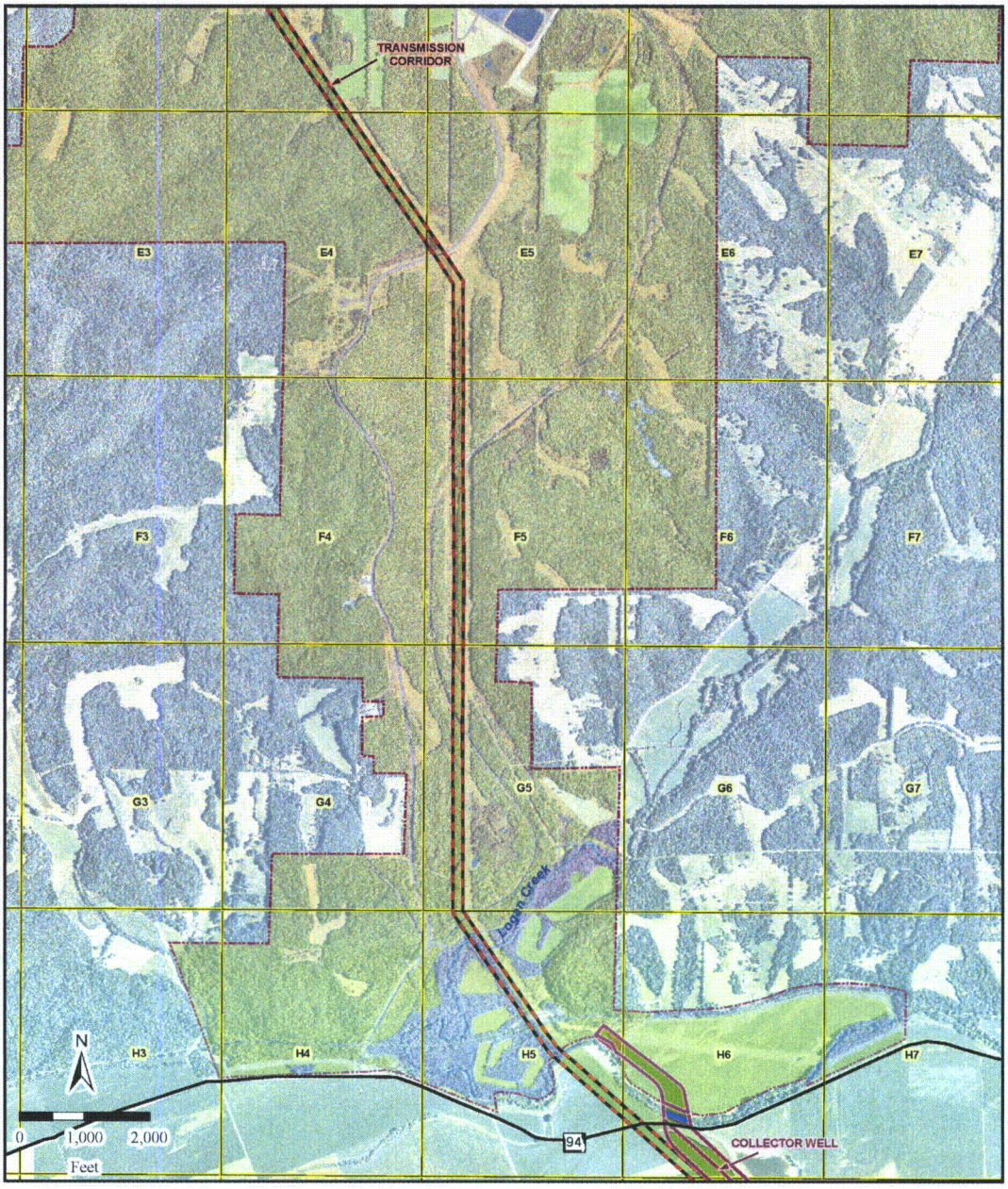

Figure 4.3-3—Land Cover Impacts (Sheet 3)

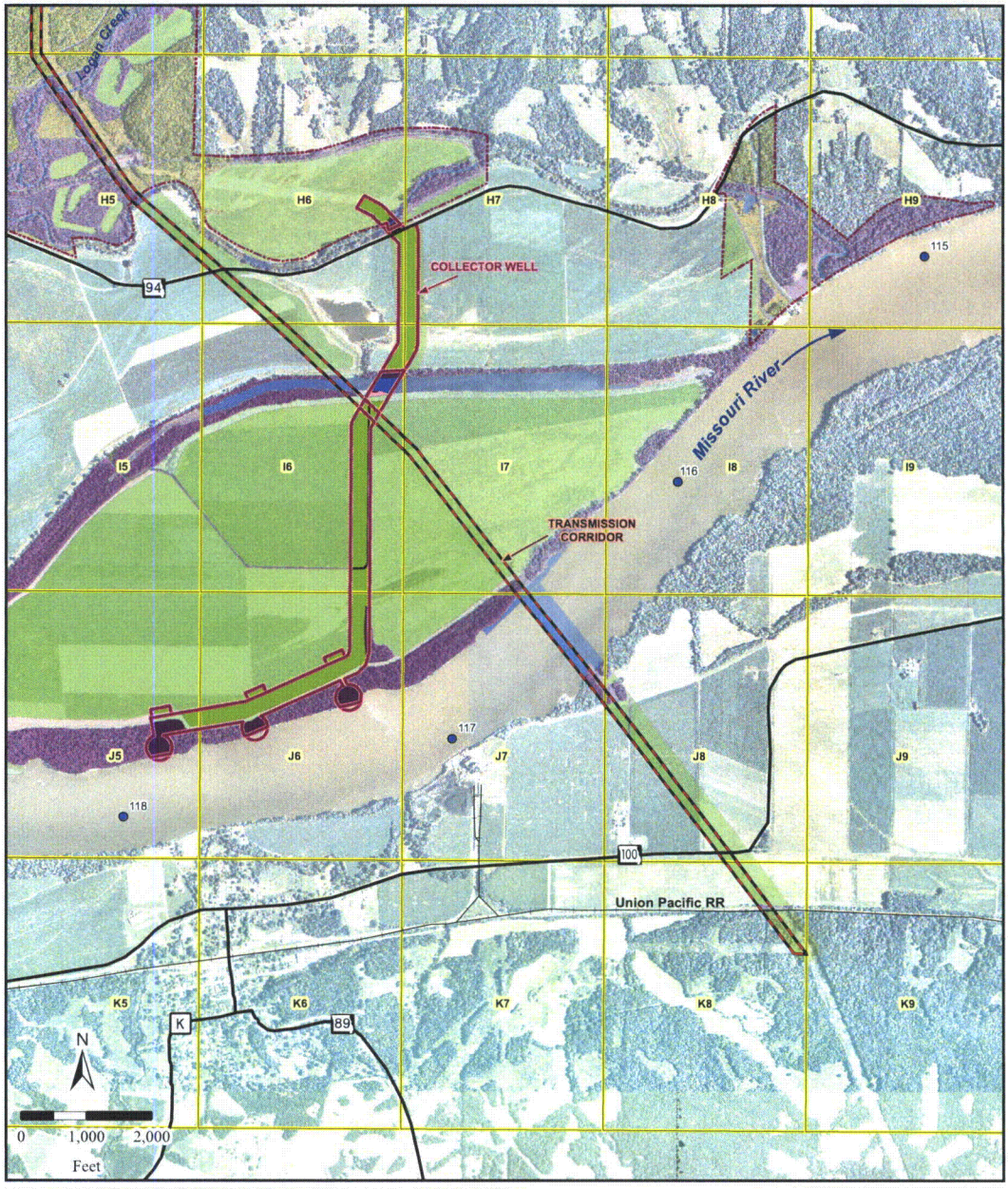

Figure 4.3-4—Waters of the U.S. Impacts (Sheet 1)

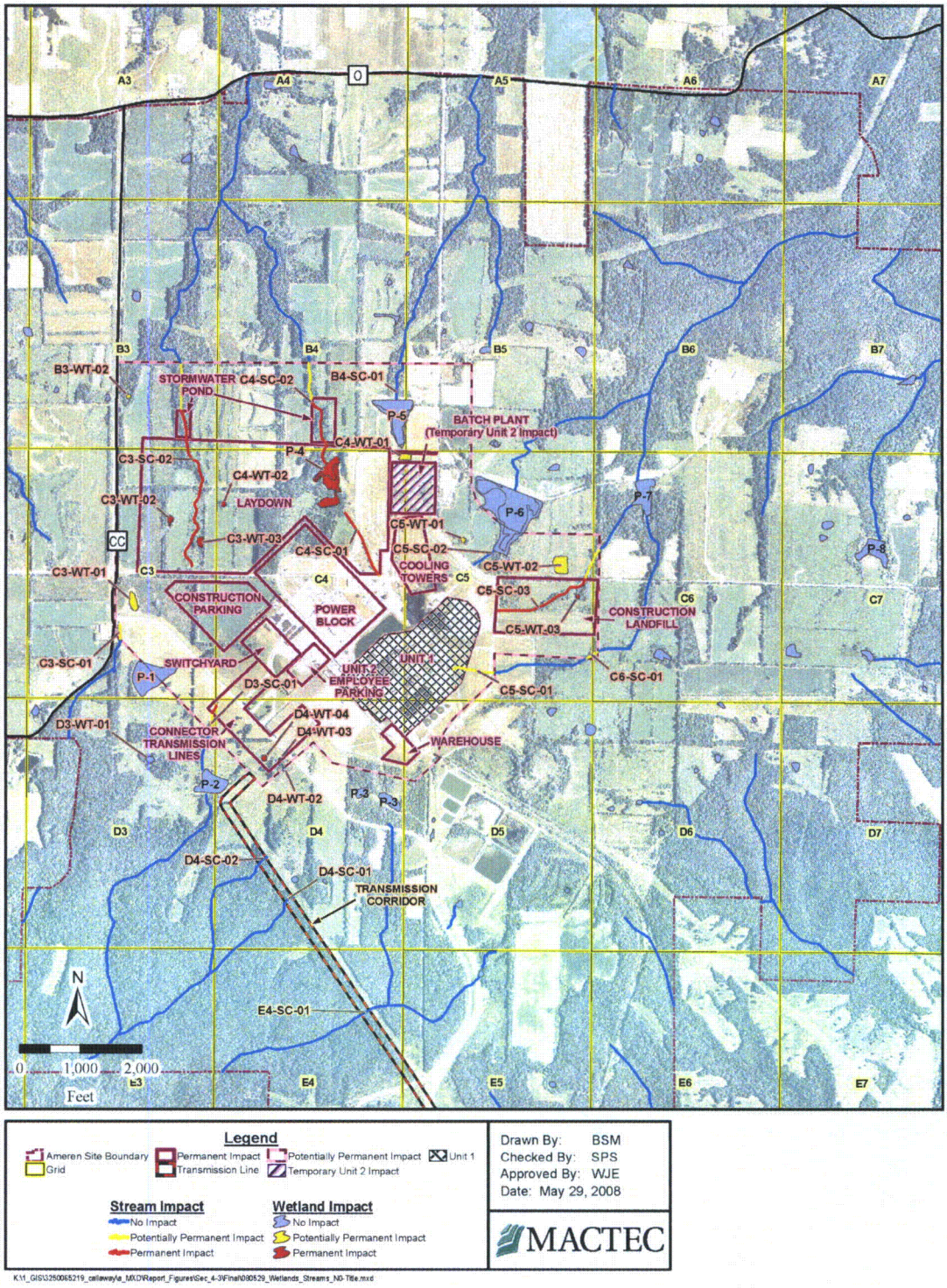

Figure 4.3-5—Waters of the U.S. Impacts (Sheet 2)

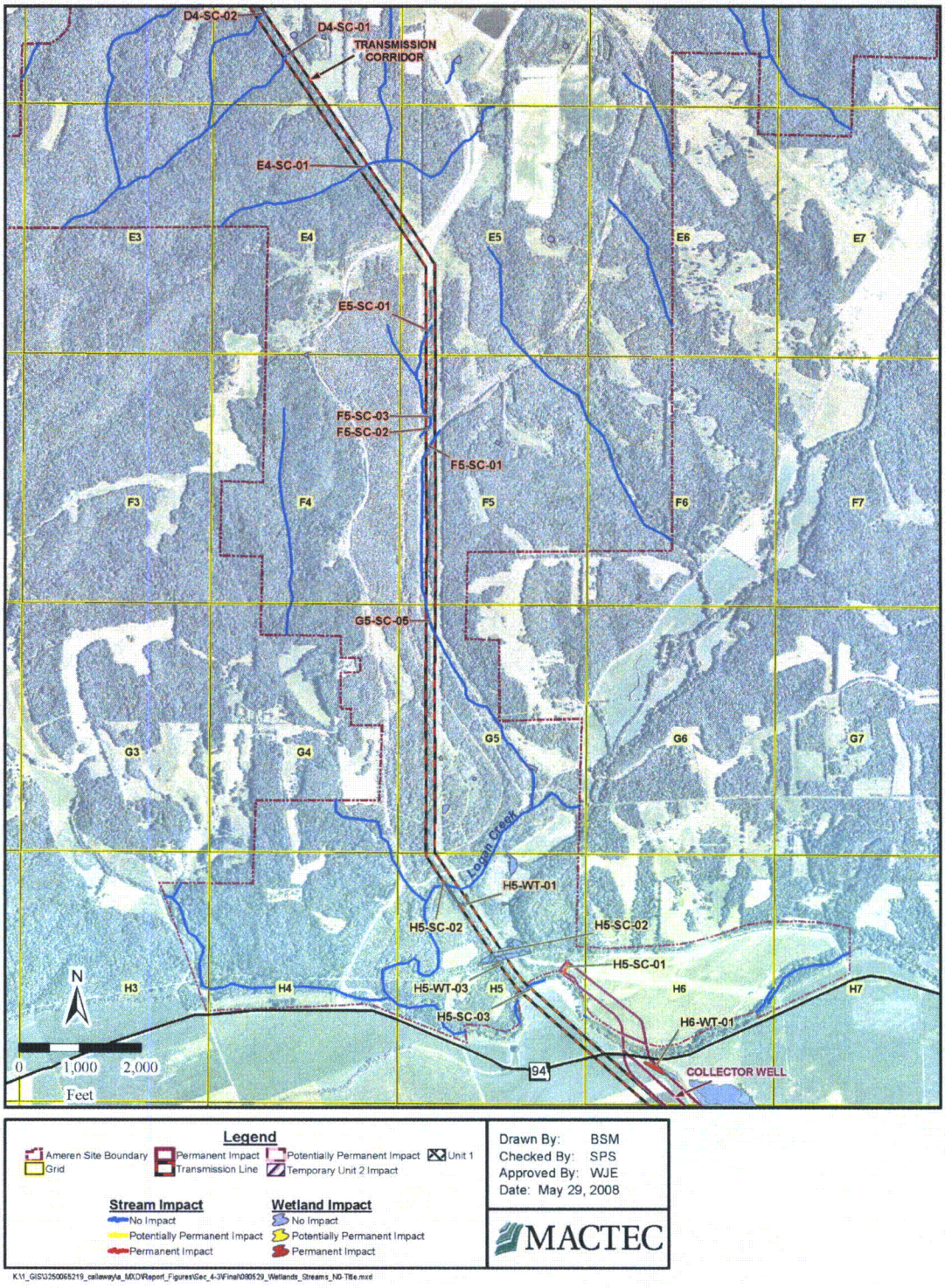

Figure 4.3-6—Waters of the U.S. Impacts (Sheet 3)