CONSERVATION PLAN
(Application for an Incidental Take Authorization)
Per 520 ILCS 10/5.5 and 17 Ill. Adm. Code 1080

PROJECT APPLICANT:	Spire STL Pipeline LLC ("Spire")
PROJECT NAME:	Spire STL Pipeline Project ("Project")
COUNTY:	Scott, Greene, and Jersey
AMOUNT OF IMPACT AREA:	30.4 acres of state-listed species habitat

The incidental taking of endangered and threatened species shall be authorized by the Illinois Department of Natural Resources (IDNR) only if an applicant submits a conservation plan to the IDNR Incidental Take Coordinator that meets the following criteria:

1. A **description of the impact likely to result** from the proposed taking of the species that would be covered by the authorization, including but not limited to -

> A) Identification of the **area to be affected** by the proposed action, include a legal description and a detailed description including street address, map(s), and GIS shapefile. Include an indication of ownership or control of affected property. Attach photos of the project area.

Area to be Affected

The portion of the proposed Project in Illinois consists of approximately 46 miles of new, greenfield, 24-inch-diameter steel pipeline, originating from a new interconnect with the Rockies Express Pipeline LLC ("REX") in Scott County, Illinois, and extending south through Greene and Jersey Counties in Illinois before crossing the Mississippi River (Figure 1, Attachment 1). The portion of the Project in Illinois also includes the construction of a new metering and regulating station in Scott County that provides an interconnect with REX. Additionally, two mainline valves will be installed along the pipeline in Illinois; one in Greene County (MLV 1), and one in Jersey County (MLV 2). The overall design capacity of the Project pipeline is expected to be 400,000 dekatherms per day ("Dth/d"). No compression will be required. As part of the overall Project, the 24-inch pipeline continues into St. Charles County, Missouri and continues through a portion of St. Louis County to connect to a second proposed pipeline segment referred to as the "North County Extension."

The Project will utilize a typical 90-foot-wide temporary construction right-of-way workspace, which includes a 50-foot permanent right-of-way that will be maintained following construction. An additional 25 feet of additional temporary workspace ("ATWS") will be required through agricultural areas and other ATWS will be required to facilitate construction in certain areas, such as crossings of roads, railroads, waterbodies, wetlands, etc. The

construction right-of-way will generally be reduced in width to 75 feet at waterbody and wetland crossings. The portion of the Project in Illinois will include approximately 3.1 miles of access roads with an anticipated width of 25 feet. Of these, approximately 3.1 miles are proposed for temporary use, and less than 0.1-mile will be permanently maintained for operation.

The majority of the Project is located in agricultural fields. The Project includes the construction right-of-way (including temporary workspaces, the permanent easement, and ATWS), aboveground facilities, temporary and permanent access roads, and staging areas, and will total approximately 690.1 acres in Illinois.

Listed species that could potentially occur near the Project were identified through consultation with the IDNR and review of IDNR species lists. Spire initiated consultation with the IDNR in June 2016. As part of those consultations, Spire performed a 0.5-mile-wide Project review search through the IDNR's Natural Heritage Program Ecological Compliance Assessment Tool ("EcoCAT," Attachment 2).

Based on a review of the species list and electronic data received from the Natural Heritage Program, no state-listed species were present on the EcoCAT search receipt for Scott and Greene Counties (Attachment 2). The EcoCat search receipt included the following state-listed species for Jersey County: timber rattlesnake (*Crotalus horridus*), large ground plum (*Astragalus crassicarpus* var. *trichocalyx*), Great Plains rat snake (*Pantherophis emoryi*), black sandshell mussel (*Ligumia recta*), butterfly mussel (*Ellipsaria lineolata*), and ebonyshell mussel (*Fusconaia ebena*).

The IDNR indicated a potential for occurrences of large ground-plum could exist in one location. Surveys conducted in June 2017 identified no individual plants or suitable habitat. The report (GAI 2017b) was submitted to the IDNR. If ground plum is found during construction, the landowner will be notified as per IDNR direction.

The Project is in the range of the Great Plains rat snake; however, no sightings or records exist on properties where the Project crosses the species' potential habitat (bluffs and hill prairies). The Great Plains rat snake is presumed to be absent from the Project and will not be affected by the Project.

Effects to the black sandshell, butterfly, and ebonyshell mussel species that would be associated with the Project at the Mississippi River crossing will be avoided by the use of a horizontal directional drill ("HDD"). In order to determine that a HDD is a sufficient minimization measure to reach a determination that the Project is not likely to adversely affect these species, a review of the HDD geotechnical borings was completed. Two main aspects of the HDD design indicate that the approach for completing the Mississippi River crossing via HDD is deemed highly feasible based on the following factors:

Geological Features and Construction Methods

Spire conducted four geotechnical borings at the Mississippi River; land-based bores and bores conducted within the river. Soil conditions on the north side drill site (the HDD will be advanced from the north side of the crossing towards the south side) was composed of a 23.5-foot-thick layer of soils consisting of soft to medium stiff clayey silt with fine gravel, loose rock fragments and silts. When borings drilled straight down, bedrock was encountered

at approximate elevation of 423.5 feet. Bedrock consisted of predominately limestone and shale with layers of mudstone, siltstone and sandstone.

When soils are present in a soft or loose state, it presents difficulty in providing sufficient strength to resist the required fluid pressures necessary to complete an HDD installation. These conditions are present at the beginning and end of the HDD. When these materials are present, the required drilling fluid pressures can exceed the strength of the soil resulting in the formation of hydraulic fracturing. To mitigate this potential issue, Spire has incorporated temporary conductor casings on the entry and exit locations due to the presence of loose soils near the ground surface. Casings will be installed a minimum length of 85 feet on the north side of the river and 275 feet on the south side of the river. The temporary conductor casings will terminate in favorable soils at depth and will provide an open pathway for drilling fluid flow back to the HDD entry/exit locations. Once the HDD installation is completed, the temporary conductor casings will be removed from the bore. These casings will be removed and grouted upon the completion of pullback operations.

Bedrock materials are also important for a successful drill. Rock quality designations ("RQD") is a technique for determining the quality of rock that is recovered when taking core samples. Heavily weathered, jointed, fractured bedrock with RQDs less than 60 percent present challenges in terms of constructability of an HDD installation. The bedrock recovered from the bores along the HDD alignment presented at RQDs of over 60 percent which indicates that the bedrock along the alignment of the pipeline is well suited for HDD installation providing decreased installation risks associated with bore instability, raveling, and loss of drilling fluids to the overlaying geotechnical materials.

Drilling Fluid Pressure

Spire evaluated the potential for hydraulic fracturing along the proposed HDD crossing of the Mississippi River by completing drilling fluid pressure calculations. Spire applied a factor of safety of 2.0 to the cavity expansion calculation, per the recommendations of the United States Army Corps of Engineers. Based on those calculations Spire has determined that the required drilling fluid pressure for the installation is below the recommended allowable pressure for installation. For the Mississippi River crossing, the allowable drilling fluid pressure was found to be significantly higher than the required drilling fluid pressure for the installation. This indicates that the risk for hydraulic fracturing is greatly reduced because the rock type that the drill will be conducted in is able to support the HDD and associated mud pressures. As part of standard construction practice, Spire has developed an HDD Contingency Plan in the event of an inadvertent release of drilling mud. As part of the HDD Contingency Plan, drilling pressures would be monitored at all times. In the event of an inadvertent release, Spire would implement the procedures in its plan and coordinate with the IDNR and the United States Fish and Wildlife Service "USFWS" as appropriate.

HDD Summary

No fatal deterrents have been identified with the alignment or the proposed HDD at the Mississippi River. Based on the required installation length and diameter, there are nine successfully completed HDD installations of similar lengths within North America for the Mississippi River crossing. The proposed HDD installation has been designed based on the use of the drill and intersect method of construction, where drill rig spreads are established on both sides of the crossing to drill individual pilot bores that meet within a target intersect zone beneath the Mississippi River. While not anticipated, if an attempted HDD installation is unsuccessful, the proposed HDD alignment could be modified beneath the Mississippi River using the same general location to accommodate an additional HDD attempt, depending on the condition/cause contributing to the original HDD failure. Prior to attempting a second HDD crossing, a risk mitigation workshop should be held with all parties to determine the cause of the initial failure and any mitigation measures that could be adopted to reduce the risk(s) during the second HDD attempt. The HDD contingency Plan is included as Attachment 3.

Plan Area

Through additional consultation with the IDNR, the following state-listed species were identified for inclusion in this Conservation Plan: the state-endangered Indiana bat (*Myotis sodalis*), the state-threatened northern long-eared bat (*Myotis septentrionalis*), and the state-threatened timber rattlesnake. Presence/absence bat surveys conducted for the Project in May and June 2017 confirmed the presence of the Indiana bat and the northern long-eared bat. The timber rattlesnake is known to occur within the Principia Hill Prairies West Natural Area Inventory Site. In total, the Project contains approximately 30.4 acres of forest that may be considered habitat for these species. This area is referred to as the "Plan Area" for the purposes of this Conservation Plan.

The Plan Area is located in areas with the following legal land descriptions:

- Scott County, Township 13 N, Range 12 W, Sections 22, 27, 28, and 33;
- Greene County, Township 12 N, Range 12 W, Sections 3, 4, 9, 10, 15, and 16;
- Greene County, Township 10 N, Range 12 W, Sections 28, 33, and 34;
- Greene County, Township 9 N, Range 12 W, Sections 3, 10, 11, 14, and 23;
- Jersey County, Township 8 N, Range 12 W, Sections 24, 25, and 36;
- Jersey County, Township 7 N, Range 12 W, Sections 1, 2, 11, 12, 13, 14, 24, 25, and 36; and
- Jersey County, Township 6 N, Range 11 W, Sections 6, 7, 18, and 19.

Figure 2 and Figure 3 (Attachment 1) show habitat for state-listed species that composes the Plan Area. Geographic Information Systems ("GIS") shapefiles were provided to the IDNR with the submission of this application.

Indicia of Ownership or Control

On August 3, 2018, Spire received from the Federal Energy Regulation Commission ("FERC") its certificate of public convenience and necessity (the "Certificate") pursuant to Section 7(c) of the Natural Gas Act. The FERC Certificate authorizes Spire to construct, own, and operate the Project, which includes the grant to Spire of federal eminent domain power. Spire has federal condemnation authority and the corresponding right to possession. This right to possession is Spire's primary indicia of ownership or control.

Spire is presently obtaining and will continue to negotiate easements with landowners along the Project route. Spire has already obtained several easements. For those parcels, Spire's indicia of ownership or control is Spire's right to access the parcel as reflected in the easement.

Photographs

Photographs of the Plan Area are included in Attachment 4. Note that photographs are representative of the habitat types crossed by the Project and may be adjacent to, but not directly within, the Plan Area.

> B) **Biological data** on the affected species including life history needs and habitat characteristics. Attach all pre-construction biological survey reports.

Indiana Bat

The Indiana bat is a temperate, insectivorous, migratory bat that hibernates in caves and mines, and summers in wooded areas. It was not described as a separate species until 1928 (Miller and Allen) due to its strong resemblance to the little brown bat (*Myotis lucifugus*). The Indiana bat is a medium sized bat with a mass of five to 11 grams and a right forearm length of 36 to 41 millimeters. The Indiana bat can be best distinguished from similar *Myotis* by its short inconspicuous toe hairs, smaller foot, distinctly keeled calcar, and more uniform dull fur (Barbour and Davis 1974; and Whitaker and Hamilton 1998).

Life History Needs

The Indiana bat's summer range includes most of the eastern woodlands from the central Mississippi Valley, eastern Alabama, and northern Florida to New England, but not along the Atlantic Coast (Barbour and Davis 1974). The majority of the winter population (96 percent) occurs in limestone caves and mines in Indiana, Missouri, Kentucky, and Illinois (USFWS 2017). Smaller winter populations occur in Arkansas, Oklahoma, Ohio, Tennessee, Alabama, Virginia, Michigan, West Virginia, Pennsylvania, North Carolina, New York, New Jersey, and Vermont.

Summer Roosting and Foraging

Female Indiana bats first arrive at maternity roosts in April and early May in the Midwest, with substantial numbers arriving in mid-May (Humphrey et al. 1977). Indiana bats exhibit strong fidelity to their traditional summer maternity habitat (Kurta et al. 2002; Kurta and Murray 2002; Winhold et al. 2005; and Whitaker and Sparks 2008). A variety of suitable roosts are needed within a colony's traditional summer range. Maternity colonies often use multiple roost trees in a season (Kurta et al. 1993; Foster and Kurta 1999; Kurta and Murray 2002; and Whitaker and Sparks 2008), and may switch often. Male Indiana bats either disperse throughout the range or stay near hibernacula and roost individually or in small groups, occasionally in hibernacula (Whitaker and Brack 2002). Males have shown summer site fidelity and have been recaptured in foraging areas from prior years (USFWS 2007).

Females produce one young per year, usually between mid-June and early July. Juveniles begin to fly between early July and early August. Maturity is likely dependent upon weather and the thermal character of the roost (Humphrey et al. 1977; and Kurta et al. 1996).

Indiana bats feed exclusively on flying aquatic and terrestrial insects. Diet varies seasonally and variations exist among different ages, sexes, and reproductive status (USFWS 2007). It is probable that Indiana bats use a combination of both selective and opportunistic feeding to their advantage (Brack and LaVal 1985). Moths (*Lepidoptera*), beetles (*Coleoptera*), midges and flies (*Diptera*), caddisflies (*Trichoptera*), and wasps and ants (*Hymenoptera*) constitute the bulk of the diet (Sparks and Whittaker 2004; and Tuttle et al. 2006).

Autumn Swarming

Both males and females return to hibernacula in late summer or early autumn to mate and enter hibernation during a period known as autumn swarming. Swarming is a critical part of the life cycle when Indiana bats converge at hibernacula, mate, and forage until sufficient fat reserves have been deposited to sustain them through the winter (Hall 1962; Cope and Humphrey 1977; and Laval and Laval 1980). Some males may begin to arrive at hibernacula as early as July. Females typically arrive later, and by September, the numbers of males and females are almost equal. Swarming activity in the Midwest peaks in early September (Cope and Humphrey 1977).

Winter Hibernation

Indiana bats hibernate in caves and mines in the winter. Depending on weather conditions, hibernation for Indiana bats typically lasts from October through April (Hall 1962; and LaVal and LaVal 1980), although it may be extended from September to May in northern areas including New York, Vermont, and Michigan (Kurta et al. 1997; and Hicks 2004). Indiana bats hibernate on cave and mine ceilings and walls in dense clusters of several hundred individuals per square foot. Clusters may protect individuals from temperature change and speed arousal due to disturbance. Like other cave bats, the Indiana bat naturally arouses during hibernation (Brack 1979; Brack and Twente 1985; and Twente et al. 1985). Limited mating occurs throughout the winter and in early April as Indiana bats emerge (USFWS 2007).

Spring Staging and Migration

The period after hibernation but prior to spring migration is known as staging. Female Indiana bats emerge first from hibernation in late March or early April, followed by the males. The timing of emergence may vary depending on latitude and weather conditions. Most populations leave their hibernacula by late April and migrate to summer habitat.

Migration is stressful for the Indiana bat, particularly in the spring when their fat reserves and food supplies are low. As a result, adult mortality may be the highest in late March and April. Females can migrate hundreds of miles from hibernacula (Kurta and Murray 2002; and Winhold and Kurta 2006). During spring staging, males have been found almost 10 miles from their hibernacula (Hobson and Holland 1995).

Habitat Characteristics

Indiana bats form summer maternity colonies under the exfoliating bark of dead trees that retain large, thick slabs of peeling bark. The species overwinters in caves and cave like structures.

Summer Roosting and Foraging

Summering Indiana bats (males and females) roost in trees in riparian, bottomland, and upland forests. Roost trees generally have exfoliating bark, which allows the bat to roost between the bark and bole of the tree, and have solar exposure in an open canopy. Tree cavities, hollow portions of tree boles, crevices, and splits from broken tops have been used on a very limited basis, usually by individual Indiana bats. A variety of tree species are used for roosts (3D/Environmental 1995; Kurta 2004; and Britzke et al. 2003); however, structure is probably more important than species in determining if a tree is a suitable roost site. Suitable roost trees typically have a large diameter, exfoliating bark, and prolonged solar exposure with no apparent importance in regard to the tree species or whether it is upland or bottomland (Whitaker and Brack 2002; Kurta 2004; Winhold 2007; and Whitaker and Sparks 2008).

Roost trees are often located on forest edges or openings with open canopy and open understory (USFWS 2007). Most have been found in forest types similar to oak-hickory and elm-ash-cottonwood communities. Important summer roosting and foraging habitat for the Indiana bat is often in floodplain or riparian forests, but may also be in more upland areas.

Indiana bat maternity sites generally consist of one or more primary maternity roost trees that are used repeatedly by large numbers, and varying numbers of alternate roosts that may be used less frequently and by smaller numbers of bats. Trees in excess of 16 inches diameter at breast height (dbh) are considered optimal for maternity colonies (3D/Environmental 1995), but trees in excess of 9 inches dbh are used as alternate roosts (USFWS 2002). Roost longevity is variable because they are often dead and dying trees. Gardner et al. (1991b) evaluated 39 roost trees and found that 31 percent were no longer suitable the following summer, and 33 percent of those remaining were unavailable by the second summer.

Indiana bats may use upland forest for roosting and upland forest and pastures with scattered trees for foraging. Indiana bats may prefer forests with old growth characteristics, large trees, scattered canopy gaps, and open understories (USFWS 2007). Instances have been documented of bats using forests altered by grazing, swine feedlots, row-crops, hay fields, residences, clear-cut harvests, and shelterwood cuts (Garner and Gardner 1992; and USFWS 1999).

Male Indiana bats have been observed roosting in trees as small as 2.5 inches dbh (Gumbert et al. 2002). Because males typically roost individually or in small groups, the average size of their roost trees tends to be smaller than the roost trees used by maternity colonies.

Indiana bats forage in and around tree canopy and in openings of floodplain, riparian, and upland forests (USFWS 2007). They often utilize streams, trails, old roads, and fencerows as travel corridors (Brown and Brack 2003; and Murray and Kurta 2004). In Illinois, Gardner et al. (1991a) found that forested stream corridors and impounded bodies of water were preferred foraging habitats for pregnant and lactating Indiana bats, which typically flew up to 1.5 miles from upland roosts to forage. However, the same study reported the maximum distance that any female Indiana bat flew (regardless of reproductive status) from her daytime roost to her capture site was 2.5 miles. Females typically utilize larger foraging ranges than males (Garner and Gardner 1992). Foraging also occurs over clearings with successional vegetation, along cropland borders, forest edges, fencerows, and over farm ponds.

Autumn Swarming

During swarming, Indiana bats continue to use multiple roosts, although they are located near hibernacula during this time (Gumbert 2001), which may provide energy advantages (Brack 2006). However, Indiana bats may leave the swarming area for several days to visit other hibernacula (Gumbert 2001; and Brack 2006). Autumn roosts may be located in canopy gaps created by disturbance (logging, blow down, and prescribed burning), along edges (Gumbert et al. 2002), ridge tops, and upper slopes (Kiser and Elliott 1996).

Winter Hibernation

Indiana bat hibernacula must provide a stable and suitable temperature and humidity microclimate (Brack et al. 2009; and USFWS 2007), and only a small percentage of potential hibernacula meet these requirements. Brack et al. (2005) reported hibernacula in Indiana the highest concentrations of Indiana bats were found at sites with mid-winter temperatures of 6° to 7°C. Indiana bat hibernacula may contain large populations of several species of bats (Stihler and Brack 1992).

Spring Staging and Migration

Little information is available on habitat use and needs for Indiana bats during migration (USFWS 2007). Recent spring emergence telemetry studies in New York, Pennsylvania, Kentucky, and Tennessee are beginning to document migratory routes in the Northeast and Midwest.

Status in the Plan Area

The following areas were considered occupied Indiana bat habitat when determining the presence of the species near the Project (USFWS 2011, USFWS 2014):

- within five miles of a known, extant hibernaculum;
- within five miles of a summer maternity capture without a known roost;
- within 2.5 miles of a known maternity roost; and
- within 2.5 miles of a summer non-maternity record (male captures or roosts; USFWS 2016c).

Based on the results of the Project mist net survey (GAI 2017a), Indiana bat summer maternity and summer non-maternity habitat exists near the Project (Figure 2, Attachment 1). The Project mist net survey resulted in seven Indiana bats being captured at five net sites, including five adult males and two adult females. Five of the Indiana bats, including three adult males and two adult females, were radio-tagged and tracked to eleven diurnal roosts outside of the Project right-of-way. The mist net report is included in Attachment 5.

Summer maternity habitat was delineated by buffering all roost trees determined to be used by female Indiana bats during the radio-telemetry studies by 2.5 miles. This effort resulted in the apparent presence of two distinct maternity colonies near the Project, including one maternity colony along the border of Scott and Greene Counties, and one in Jersey County (Figure 2, Attachment 1).

Most documented maternity colonies have 50 to 100 adult female bats (USFWS 2007). An average colony size of 80 adult females (Whitaker and Brack 2002) is a widely used estimate (e.g., USFWS 2016a). No examples were found in the literature to suggest techniques for adjusting these estimates to post-White-nose Syndrome ("WNS") levels. During the Project mist net survey (GAI 2017a), a total of 31 and 32 Indiana bats emerged from a roost tree on two consecutive nights. Based on Sparks et al. (2008), these emergence counts from a single major (primary) maternity roost are within boundaries to indicate an estimated maternity colony size of 80 adult females is appropriate when other major (primary) and minor (secondary) roosts used by a maternity colony are taken into consideration. Therefore, in an effort to estimate the size of the Indiana bat population near the Project, it was assumed there are two maternity colonies, each with 80 adult females and a maximum of one pup per female. In addition it was assumed that sympatric adult males are distributed across the landscape at a 1:1 ratio to adult females. Based on these assumptions, it was estimated that 320 adult and 160 juvenile Indiana bats (following the pup season) are associated with the two maternity colonies discovered near the Project.

Northern Long-eared Bat

The northern long-eared bat is a temperate, insectivorous, migratory bat that hibernates in caves and mines, and summers in wooded areas. The northern long-eared bat was first described as *Myotis keenii* by E. L. Trouessart in 1897 from a specimen from Nova Scotia (Miller and Allen 1928). Van Zyll de Jong (1979) later separated the

western group into *keenii* and the eastern group into *septentrionalis*. The northern long-eared bat is a medium-sized bat with a mass of five to ten grams and a right forearm length of 32 to 39 millimeters. Their fur color can be medium to dark brown on the back and tawny to pale-brown on the underside. Northern long-eared bats can be best distinguished from similar *Myotis* by its longer ears, and long, narrow, and pointed tragus (Barbour and Davis 1974; Schwartz and Schwartz 1981; and Whitaker and Hamilton 1998). The species can be distinguished from the western long-eared bat by its darker pelage and paler membranes (Caceres and Barclay 2000).

Life History Needs

The northern long-eared bat ranges across much of the eastern and northcentral United States, and all Canadian provinces west to the southern Yukon Territory and eastern British Columbia. In the United States, the species has been documented in hibernacula in 29 of the 37 states in its range, while other states may have no suitable hibernacula present, lack of survey effort, or existence of unknown retreats. The majority of the known hibernacula occur within the species' Eastern (39 percent) and the Midwest range (38 percent), followed by 21 percent in the Southern range, and two percent in the Western range. Many hibernacula contain only a few (one to three) individuals (Whitaker and Hamilton 1998).

Summer Roosting and Foraging

Female northern long-eared bats actively form colonies in the summer (Foster and Kurta 1999). Maternity colonies have been reported to range in size from seven to 100 individuals (Owen et al. 2002; Whitaker and Mumford 2009), whereas 30 to 60 individuals per maternity colony may be most common (Whitaker and Mumford 2009; Caceres and Barclay 2000; USFWS 2014). Female northern long-eared bats have a strong fidelity to maternity areas and roosts from year to year (USFWS 2016b) and generation to generation (Arnold 2007). Reproductive and non-reproductive female northern long-eared bats have been shown to utilize multiple roosts in which they exhibit fission-fusion behavior (Garroway and Broders 2007), where members frequently coalesce to form a group, and where the composition of the group is in flux (Barclay and Kurta 2007). Individual females typically change roosts every two to three days (Foster and Kurta 1999; Owen et al. 2002; Carter and Feldhamer 2005; Timpone et al. 2010). They tend to utilize a network of roost trees in which one or more central-node roost trees are surrounded by multiple alternate roost trees (Johnson et al. 2012).

Females are capable of bearing one offspring annually (Caceres and Pybus 1997; and Caceres and Barclay 2000). Northern long-eared bats are typically born in late-May or early June, with the lactation period lasting three to five weeks, and pups becoming volant between early July and early August (USFWS 2016b).

The northern long-eared bat is an opportunistic feeder, using both hawking and gleaning to forage on a variety of small insects, primarily moths (Lepidoptera), but midges and flies (Diptera), leaf hoppers (Hemiptera), caddisflies (Trichoptera), and beetles (Coleoptera) are also consumed (Nagorsen and Brigham 1993; Brack and Whitaker 2001; and Dodd et al. 2012). Northern long-eared bats tend to have a longer tail and larger wing area than aerial

hawking *Myotis* of similar size. These adaptations are associated with gleaning prey on foliage (Faure et al. 1993) and allow northern long-eared bats to be more maneuverable during slow flight, a benefit for bats that is advantageous when foraging in cluttered areas (Norberg and Rayner 1987).

Autumn Swarming

Both male and female northern long-eared bats are present at swarming sites (often with other species of bats). During this period, northern long-eared bats congregate, mate, and may begin bouts of torpor prior to winter hibernation (Fenton 1969; Parsons et al. 2003; and Davis and Hitchcock 1965). The purposes of swarming behavior may also include introduction of juveniles to potential hibernacula and stopping over sites on migratory pathways between summer and winter regions (Kurta et al. 1997, Parsons et al. 2003, Lowe 2012, Randall and Broders 2014).

The swarming season for some species of the genus Myotis begins shortly after females and young depart maternity colonies (Fenton 1969). For the northern long-eared bat, the swarming period may occur between July and early October, depending on latitude within the species' range (Fenton 1969, Kurta et al. 1997, Lowe 2012, Hall and Brenner 1968, Caire et al. 1979). The northern long-eared bat may investigate several cave or mine openings during the transient portion of the swarming period, and some individuals may use these areas as temporary daytime roosts or may roost in forest habitat adjacent to these sites (Kurta et al. 1997, Lowe 2012).

Winter Hibernation

Northern long-eared bats hibernate from October to April depending on local climate, including November-December through March in southern areas with emergence as late as mid-May in some northern areas (USFWS 2016b). They may hibernate solitarily or in multispecies hibernacula, and are commonly found in caves and cave-like structures or abandoned mines, and generally constitute less than 25 percent of the total number of individuals present in multispecies hibernacula (Barbour and Davis 1969; and Caceres and Pybus 1997).

Spring Staging and Migration

The staging period for the northern long-eared bat is likely short in duration (Whitaker and Hamilton 1998, Caire et al. 1979). In Missouri, Caire et al. (1979) found that northern long-eared bats moved into the staging period in mid-March through early May. In Michigan, Kurta et al. (1997) determined that by early May, two thirds of the Myotis species, including the northern long-eared bat, had dispersed to summer habitat.

The spring migration period typically runs from mid-March to mid-May (Caire et al. 1979; Easterla 1968; Whitaker and Mumford 2009). The northern long-eared bat is not considered to be a long distance migrant, typically traveling 40 to 50 miles from hibernacula. Males and non-reproductive females may summer near hibernacula, or migrate to summer habitat some distance from their hibernacula.

Habitat Characteristics

Northern long-eared bats form summer maternity colonies under the exfoliating bark of dead trees, as well as in cracks and hollows of live and dead trees. The species overwinters in caves and cave-like structures.

Summer Roosting and Foraging

Summer roost habitat for northern long-eared bats is defined variably across the species' range, from mature forests (Sasse and Perkins 1996; and Caceres and Pybus 1997), to second-growth forests in Kentucky (Lacki et al. 2009), to highly fragmented agricultural landscapes in Michigan (Foster and Kurta 1999). Compared to Indiana bats, northern long-eared bats are more flexible in roost selection and may select roost trees opportunistically rather than by species preference (Foster and Kurta 1999; and Carter and Feldhamer 2005). Males and non-reproductive females may use cooler locations including caves and mines (Amelon and Burhans 2006). In Missouri, maternity roosts of northern long-eared bats were shorter and had more canopy cover than Indiana bats, and included a barn and equipment shed (Timpone et al. 2010).

Roosts of northern long-eared bats have been recorded in both live trees and snags (Perry and Thill 2007), in tree cavities and crevices (Menzel et al. 2002; and Lacki et al. 2009), under exfoliating bark (Foster and Kurta 1999), and occasionally in stumps, in bat houses, behind shutters, or in structures like buildings, barns, sheds, houses, and bridges (Benedict and Howell 2008; Krochmal and Sparks 2007; Timpone et al. 2010; USFWS 2014; and Whitaker and Mumford 2009). In one study, 21 species of trees were reportedly utilized by northern long-eared bats as maternity roosts (Silvis et al. 2012). In the northern portion of the range, females tend to prefer shade-tolerant deciduous trees of mid-stage decay in mature stands, whereas males prefer to typically roost singly and in coniferous trees within conifer-dominated stands. (Broders and Forbes 2004). Maternity sites are not as dependent on solar exposure as Indiana bats and are often beneath the canopy (Foster and Kurta 1999; and Carter and Feldhamer 2005).

Northern long-eared bats seem to focus foraging in upland mature forests (Caceres and Pybus 1997), with occasional foraging over forest clearings, water, and along roads (van Zyll de Jong 1985). However, most foraging occurs on forested hillsides and ridges, rather than along riparian areas (Brack and Whitaker 2001; and LaVal et al. 1977). This coincides with data indicating that mature forests are an important habitat type for foraging northern long-eared bats (Caceres and Pybus 1997).

Autumn Swarming

Little is known about northern long-eared bat roost selection outside of caves and mines during the swarming period (Lowe 2012). It is assumed the species is opportunistic and adaptable in roost selection similar to summer roosting behavior.

Winter Hibernation

The species appears to favor small cracks or crevices in cave ceilings, with minimal air flow, preferring relatively constant, cool temperatures (0 – 9°C), and higher humidity areas for hibernation than do many other Myotis species (Barbour and Davis 1969; USFWS 2016b; and Whitaker and Mumford 2009). Within hibernacula, surveyors find northern long-eared bats in small crevices or cracks, often with only the nose and ears visible. This behavior makes estimating winter populations difficult (Whitaker and Rissler 1992).

Spring Staging and Migration

Little information is available on habitat use for northern long-eared bats during migration (USFWS 2016b). It is assumed the species is opportunistic and adaptable in roost selection similar to summer roosting behavior.

Status in the Plan Area

The following areas were considered occupied northern long-eared bat habitat (USFWS 2014) when determining the presence of the species near the Project:

- within five miles of a known, extant hibernaculum;
- within three miles of a summer capture (male or female) without a known roost;
- within 1.5 miles of a known roost (male or female).

Based on the results of the Project mist net survey (GAI 2017a), northern long-eared bat summer maternity habitat exists near the Project (Figure 2, Attachment 1). The Project mist net survey resulted in one adult female northern long-eared bat being captured. The bat was not radio-tagged or tracked.

Northern long-eared bat maternity colonies range widely in size, with reported ranges of seven to 100 adults (Owen et al. 2002; Whitaker and Mumford 2009), although a range of 30 to 60 adults (Whitaker and Mumford 2009; and Caceres and Barclay 2000) is commonly used (USFWS 2014). In an effort to estimate the size of the northern long-population (post-WNS) near the Project, it was assumed there are 39 adult females (USFWS 2016b) present with a maximum of one pup per female. In addition, it was assumed sympatric adult males distributed across the landscape at a 1:1 ratio to adult females. Based on these assumptions, it was estimated that 78 adult and 39 juvenile northern long-eared bats (following the pup season) are associated with the maternity colony discovered near the Project.

Timber Rattlesnake

The timber rattlesnake is a large, venomous snake, measuring three to 4.5 feet or more in length. Despite its size, cryptic coloration allows it to be easily concealed. Two color patterns are commonly found: a yellow phase, which has black or dark brown crossbands on a lighter background color of yellow, brown or gray, and a black phase,

which has dark crossbands on a dark background. Black or dark brown stippling also occurs to varying degrees, to the extent that some individuals appear all black. Scales are ridged, giving this rattlesnake a rough-skinned appearance. The timber rattlesnake has a broadly triangular head with many small scales on the crown of the head bordered by a few large scales. Like other members of the pit-viper family, the timber rattlesnake has a temperature-sensitive pit on either side of the face between and a little below the eye and nostril. This sensory organ is used to detect prey and potential predators. Another feature distinctive of rattlesnakes is the rattle. When vibrated, the rattle makes a buzzing sound characteristic of a disturbed rattlesnake (NYDEC 2017).

Life History Needs

The timber rattlesnakes are distributed widely from New Hampshire southward through the Appalachian Mountains to northern Florida and westward along the Gulf Coast to eastern Texas, Oklahoma, and Kansas. In the Midwest, it is found as far north as Minnesota and Wisconsin within the Mississippi River drainage and in southern Illinois, Indiana, and Ohio (Ernst and Ernst 2003). Timber rattlesnakes are most commonly found in mature forest in rugged, hilly, sometimes rocky terrain, or along rock bluffs and forests surrounding river corridors or riparian areas.

Summer Foraging

Timber rattlesnakes are active from approximately April to October, and are known to bask on rock ledges near winter dens (INHS 2016). They usually mate during late summer and early autumn, and sperm are stored in the oviduct until the following spring, when the eggs are then fertilized. After a gestation period of approximately three months, six to 10 young are born in late summer or early autumn. During the beginning and end of the summer foraging season (spring and early fall), timber rattlesnakes are diurnal, but during the heat of the summer they shift to a crepuscular and nocturnal cycle to prevent overheating (Ernst et al. 1989, Fitch 1982). Timber rattlesnakes forage in upland forests, as well as forest edges, successional habitats, and disturbed areas where rodents are abundant. On The Principia College campus, radio tracking data for 17 timber rattlesnakes from 2015 to 2017 showed that the snakes spent an average of 50 to 60 percent of their time foraging along old-field edges and the remaining time in mature closed canopy forests that they used for hunting, mating, and for transiting between foraging areas (Eckert 2017). The foraging behavior and hunting strategies may differ depending on prey availability, season, and body size. The timber rattlesnake's diet consists primarily of small mammals and birds; less commonly taken prey include insects, lizards, toads, and small snakes (Collins 1982, Wright and Wright 1957). A supply of drinking water is required (Petersen and Fritsch 1986).

Basking and Gestation

After emergence from hibernation, timber rattlesnakes remain near the dens during cool and inconsistent spring weather and temperatures. As temperatures become warmer and more stable, males and non-gravid females may migrate to lowlands, pasture edges, the banks of streams and rivers, and brushy or wooded sties. The migration distance varies depending on sex and reproductive condition. Males migrate farther than non-gravid

females, and gravid females remain close to dens. Migration distances range from 0.5 to one mile for all sex and age classes but may be up to five miles for males seeking mates. Timber rattlesnakes migrate back to dens in the fall for hibernation, in at least some cases following the same routes. In contrast to the rest of the population, gravid females will occupy gestation sites throughout most of the active season. The movements of gravid snakes are not extensive because they do not forage during the later periods of gestation (Reinert et al., 1984).

Winter Hibernation

Timber rattlesnakes are ectotherms and must hibernate below the frost line during winter months to survive. Weather conditions may dictate when timber rattlesnakes enter dens in the fall and emerge from dens in spring. During fall, den entry corresponds with the mean date of first frost and the time when ambient temperatures become too low for foraging (11°C). On The Principia College campus, snakes do not leave their dens until the average daily temperature exceeds approximately 16°C outside the den, and do not move into the woods until ground temperatures also exceed 16°C (Eckert 2017). Seasonal timing for such egress is usually in late March and extends through to early October, though snakes may actually reside near den entrances for one to two weeks prior to denning or just after emergence (Eckert 2017). Den ingress and egress may be affected in part by air and soil temperatures, but a high degree of conformity of denning dates suggests that innate biological rhythms may be partly responsible (Galligan and Dunson 1979, Martin 1992).

Adult timber rattlesnakes hibernate communally and dens may be with other snake species. After den emergence in spring, timber rattlesnakes migrate long distances from their dens to summer ranges to forage, mate, and bask. They migrate back to dens in the fall, following chemical trails left from skin secretions of other individuals. Timber rattlesnakes move seasonally within summer ranges to breed and forage (Rudolph and Burgdorf 1997, Waldron et al. 2006).

Habitat Characteristics

Timber rattlesnake habitat can be described in various ways as it relates to the species' seasonal activities. For the purposes of this Conservation Plan, timber rattlesnake habitat was divided into: summer foraging habitat, basking and gestating habitat, and winter hibernating habitat.

Summer Foraging

Summer foraging habitat includes upland forests and disturbed habitats, including edges of fields where prey is more abundant (INHS 2016; Brannan 2015a; Brannan 2015b). Summer foraging habitat, used by timber rattlesnakes during the peak of the active season, can range from 0.19 to four miles from winter dens, depending on a snake's sex and age. On The Principia College campus, snakes remained with 0.75-mile of their dens (Eckert 2017). This smaller dispersal distance could be due to a number of factors, such as the high quality of the nearby forested habitat, but is also likely due to the boundary effect of local roads (Eckert 2017).

Gravid females may move over smaller areas in summer than males, and use areas that are rocky and open (Reinert 1984). On The Principia College campus, movement patterns (including rates of travel, routes and daily distance traveled) were shown to be influenced by size and sex of the snakes (Eckert 2017). Males and large snakes tended to move more with greater daily travel distances, particularly during mating season (Eckert 2017). Average home range exceeded 148 hectares (365.7 acres) for males and 26 ha (64.2 acres) for females (Eckert 2017). In a study in Minnesota, canopy closure in summer habitat used by these females averaged less than 25 percent, and these areas had increased levels of downed woody debris and rock outcroppings (Reinert and Zapalorti 1988). These areas presumably provided warmer ground temperatures needed for embryo development in gravid females. Adult males and non-gravid females have been found to use areas with greater than 50 to 60 percent canopy closure in mixed deciduous forest, thick leaf litter, and little downed woody debris or rocks (Brown and Greenberg 1992, Reinert, 1984; Reinert and Zapalorti, 1988). Vogt (1981) reported non-gravid females and males using mixed deciduous forests and agricultural fields within a distance of 1.5 miles of winter dens. Similarly, a more recent study showed males and non-gravid females using deciduous forests with greater than 58 percent canopy closure, as well as woodland edges along agricultural fields (Sajdak 1999). Young snakes used more open habitat than adult males, but not as open as gravid females used (Sajdak 1999).

Basking and Gestation

Basking sites have relatively open canopy and expanses of bedrock, scree, or exposed rock ledges. Gravid females may use these areas as gestating sites, if suitable (Martin 1989), but basking sites are more commonly used by transient and staging snakes that are moving toward or away from winter dens, or by pre-molt snakes, newborns, and snakes digesting a meal or attempting to heal from an injury. Basking sites are typically close to winter dens, but can be found in other areas of a timber rattlesnake's home range.

The summer habitat of gravid females is more complex than non-gravid females and males due to the need for suitable gestation sites. These areas can be the den entrance itself, or at rock or grouping of rocks near the den. Common characteristics of gestation sites include sun exposure for at least part of the day, as well as protection from predators and inclement weather, including high temperatures in mid-summer. Since gravid females rarely travel far from the den, adequate gestation sites need to be within close proximity. A single den could have several gestation sites associated with it, and gravid females from two or more dens may share the same gestation site. Martin (1989) found that when birthing occurred away from the den, snakes used gestation sites within 0.02 to 0.78-mile of the den, with a mean distance of 0.10-mile. Additionally, snakes that used the den opening as gestation sites often had alternative sites within 0.06 to 0.19-mile; Martin 1989).

Winter Hibernation

A hibernaculum, or den, is usually located in a rocky area of cliffs, ledges, or talus slopes, with cracks and fissures in the rock where the snakes can retreat below the frost line for the winter (Brown 1993). Dens are typically located on south and west facing slopes, which allow for warmer surface temperatures and perhaps shallower denning (Martin 1989). Den sites can be shared with other snake species including bullsnakes or gopher snakes

(*Pituophis* sp.), racers (*Coluber* sp.), and milk snakes (*Lampropeltis* sp.; Oldfield and Moriarty 1994). During fall ingress, timber rattlesnakes typically return to the same den from which they dispersed in the spring, and use this den year after year (Ditmars 1907; Brown 1989). However, some snakes have been found to use multiple dens within the same area (Adams 2005). A telemetry study in Wisconsin determined that once in the den, some snakes remained within 23 feet of the den entrance, while others moved 64 feet from the entrance. Berg et al. (2005) found evidence of snake movement within the den throughout the winter, with deepest penetration into the den occurring during December and January, and movements toward the den entrance occurring in late March to early April.

Status in the Plan Area

The following area was considered potentially occupied timber rattlesnake habitat ("Potential Timber Rattlesnake Habitat") when determining the presence of the species near the Project:

- All forested areas that include the Principia Hill Prairies West Natural Area Inventory Site and are also bounded by Jersey Avenue, Chautauqua Road, Great River Road, and Elsah Road (Figure 3, Attachment 1).

The timber rattlesnake is known to occur within the Principia Hill Prairies West Natural Area Inventory Site (Figure 3, Attachment 1). Timber rattlesnakes have been documented at bluffs along the Mississippi River in Illinois and locally within the area north of the Mississippi River. Therefore, for the purposes of this Conservation Plan, it was assumed timber rattlesnakes could occupy all contiguous forest in this area, with the local population bounded by roads, which were assumed to be barriers to travel. The Project crosses approximately one mile of the Potential Timber Rattlesnake Habitat, extending from Jersey Avenue southward to Great River Road.

The IDNR provided Spire with timber rattlesnake records for this area, identifying active dens adjacent to an existing ammonia pipeline right-of-way that Spire's proposed pipeline right-of-way (IDNR 2017; Figure 3, Attachment 1) will collocate against. However, very limited information is available regarding the size and distribution of the local timber rattlesnake population in the Potential Timber Rattlesnake Habitat. Although there are known occurrence records dating back decades, intensive and long-term mark-and-recapture studies have not been conducted.

Regardless, the Potential Timber Rattlesnake Habitat is approximately 763.2 acres of relatively undisturbed rolling forested hillsides and forest edge habitat not containing any permanent roads. This area should be able to support numerous timber rattlesnake home ranges. The IDNR data show four den locations ranging from 77 feet to 2,050 feet from the Project (Figure 3, Attachment 1). All four locations are considered extant dens for the purposes of estimating the local timber rattlesnake population. Due to the fact that den suitability is generally limited to the bluff areas, it was also assumed no other extant dens are near the Project. To derive the number of individuals assumed in one den, historical records of communal denning from around the U.S. indicate that dozens (NYDEC 2017) and up to 100+ snakes (St. Louis Zoo 2017) had once been observed denning together, but lower numbers

had been noted more recently as the population of snakes has declined over time. When combined with The Principia College's observations of snakes emerging from known dens in the area (11 captures in 2015 with an additional five captures in 2017; Eckert 2017), an average of 25 snakes per den was considered a conservative estimate. For the purposes of this Conservation Plan, it was estimated that each den could hold of up to 25 timber rattlesnakes for a maximum of 100 timber rattlesnakes in the Potential Timber Rattlesnake Habitat

> C) **Description of project activities** that will result in taking of an endangered or threatened species, including practices and equipment to be used, a timeline of proposed activities, and any permitting reviews, such as a USFWS biological opinion or USACE wetland review. Please consider all potential impacts such as noise, vibration, light, predator/prey alterations, habitat alterations, increased traffic, etc.

Project Activities

Spire will install the pipeline in Illinois utilizing typical conventional pipeline techniques described below, with the exception of the Mississippi River crossing to be installed by trenchless (HDD) methods. Waterbodies and wetlands will be crossed utilizing open cut or dry ditch crossing (flume) crossing methods. Spire reviewed all construction activities and determined the following activities could result in incidental take of state-listed species covered in this Conservation Plan.

Clearing and Grading

Project tree clearing will need to occur as early as October 1, 2018, and will be concluded by April 30, 2019. At no time will Spire or its contractor clear or alter any areas outside the boundaries of the pipeline corridor as shown on the Project construction alignment sheets (without FERC or other applicable agency approval). The alignment sheets are available on Spire's website: at https://www.spireenergy.com/spire-marketing/regulatory-information (Resource Report 1, Appendix 1-B). The Project construction alignment sheets are also available for review on the FERC website (eLibrary under Docket Nos. CP17-40-000 and CP17-40-001, filed October 6, 2017). Trees will be cut and chipped or removed from the Project. Brush and slash will be chipped or removed. All stumps will be disposed of to the satisfaction of the property owner or company representative in accordance with applicable law. When feasible, vegetation in wetlands will be cut to ground level, leaving the root systems intact. Where necessary to contain disturbed soils during clearing and grading in upland areas and to minimize potential impacts of waterbodies and wetlands, temporary erosion control devices will be installed prior to initial ground disturbance and will be maintained throughout construction.

Trenching

Trenching involves excavation of a ditch for pipeline placement, and is accomplished through the use of a track-mounted backhoe, or similar equipment. Large stones in the trench will be broken apart with conventional rock-trenching methods. Further discussion on the potential locations for force assisted excavation, if required, is provided in other sections of this Conservation Plan. Trenching and force assisted excavation activities would only be expected to affect timber rattlesnakes, not Indiana bats or northern long-eared bats. Generally, the trench will be excavated at least 12 inches wider than the diameter of the pipe, though the width may increase depending on the stability of the native soils. Spire's intention is that the trench will be excavated to a sufficient depth to allow five feet of soil cover between the top of the pipe and the final land surface after backfilling. Pipeline cover may be greater than five feet at road, waterbody, wetland, or railroad crossings. In areas prone to flooding, the minimum depth of cover is increased to seven feet to mitigate the buoyancy effect. Per 49 Code of Federal Regulations ("CFR") Part 192, depth of cover will be a minimum of two feet in areas of consolidated rock; however, Spire proposes a minimum depth of three feet of cover in these areas. Excavated soils will typically be stockpiled along the right-of-way on the side of the trench away from the construction traffic and pipe assembly area.

Padding and Backfilling

Previously excavated materials will be pushed back into the trench using bladed equipment or backhoes. The coated pipe, with or without the use of protective products (e.g., rockshield), requires a minimum of six inches of clean backfill padding around all sides of the pipe. A padding bucket or similar soil sifting device will be used to obtain suitable padding material from the subsoil. Topsoil will not be used as padding material.

Where the previously excavated material contains large rocks or other materials that could damage the pipe or coating, clean fill or protective coating will be placed around the pipe prior to backfilling. Segregated topsoil, where applicable, will be placed after backfilling the trench above the subsoil. Following backfilling in agricultural land, grassland, and open land, or in specified areas, a small crown may be left to account for any future soil settling that may occur. Excess soil will be distributed evenly on the right-of-way, only in upland areas, while maintaining existing contours and will be in accordance with landowner and agency requirements.

Force Assisted Excavation

The Project may recommend force assisted excavation in areas containing dense continuous rock formations. Spire will first utilize a rock hammer, and if necessary, may utilize force assisted excavation. Force-assisted excavation, also commonly known as low-charge blasting, can help highly skilled construction crews remove bedrock that is unable to be removed by other methods. A typical force-assisted excavation involves a controlled, small-scale, rolling detonation procedure that results in limited ground upheaval. These types of excavations are typically staggered detonations that use low-force charges specifically designed to dislodge only the rock being affected. The use of low-charge blasting is a common and safe practice in the pipeline construction industry.

Though there are no areas of shallow bedrock crossed, site-specific conditions at certain locations may interfere with conventional rock-trenching methods. These areas include the Limestone-Lacrescent Complex in Jersey County (MP 44.9 to MP 44.95). A Blasting Plan has been developed for the Project in order to minimize adverse impacts, as well as address safety concerns (Attachment 6). Force assisted excavation activities would only be expected to affect timber rattlesnakes, not Indiana bats or northern long-eared bats. Table 1 provides the location along the Project where potential force assisted excavation could occur. This location is shown on Figure 3 (Attachment 1).

Table 1. Locations that may Interfere with Conventional Rock-Trenching Methods[1]

County, State	Begin MP	End MP	Soil Type
Jersey County, Illinois	44.94	44.95	Rock Outcrop, Limestone-Lacrescent Complex

Notes:

1 The delineation to identify locations where force assisted excavation could occur was performed using desktop analysis of the USDA-NRCS Web Soil Surveys for Scott, Green e, and Jersey Counties, Illinois. Force assisted excavation was not assumed to be required in loam soils.

Measures for minimizing potential effects of force assisted excavation on timber rattlesnakes are provided in the Avoidance and Minimization section(s) of this Conservation Plan. Potential effects of force assisted excavation on timber rattlesnakes are discussed in the Effects section(s) of this Conservation Plan.

Timeline of Proposed Activities

Spire anticipates commencing initial construction activities in October 2018 (once all federal authorizations have been obtained), and expects to place the pipelines and facilities into service in 2019. Anticipated construction dates for each Project facility in Illinois are included in Table 2.

Table 2. Anticipated Construction Dates in Illinois

Facility	Anticipated Construction Start	Anticipated Construction End
24-Inch Pipeline[1, 2, 3]	October2018	Spring 2019
REX Receipt Station	September 2018	November 2018

Notes:

1 Construction at the Mississippi River crossing is anticipated to begin in November 2018 and continue through March 2019, assuming regulatory permits are received on schedule.
2 Construction of mainline valves will be completed sequentially.
3 Tree clearing will be completed prior to April 30, 2019, in accordance with approvals by applicable agencies.

Permitting Reviews

A comprehensive list of the required permits, approvals and consultations, administering agencies, and status, for the Project is provided in Table 3.

Table 3. Environmental Permits, Approvals, and Consultations

Agency or Organization	Permit/Approval	Submittal Date[1] (Anticipated)	Receipt Date[1] (Anticipated)
Federal			
Federal Energy Regulatory Commission ("FERC")	Certificate of Public Convenience and Necessity[2]	January 2017 April 2017	August 2018
United States Fish and Wildlife Service ("USFWS"), Rock Island Field Office	Threatened and Endangered Species Consultation; Migratory Bird Treaty Act, Bald and Golden Eagle Act	June 2016	February 2018
USFWS, Columbia Field Office	Threatened and Endangered Species Consultation; Migratory Bird Treaty Act, Bald and Golden Eagle Act	Rock Island will be the lead USFWS office	N/A
United States Army Corps of Engineers ("USACE"), St. Louis District	Section 404, Section 10 [Nationwide Permit ("NWP") 12][3]	January 2017 April 2017 July 2017 December 2017 January 2018	(August 2018)
	Section 408	January 2017	(August 2018)
	Real Estate Agreement	January 2017	(August 2018)
United States Department of Agriculture ("USDA")	Consultation on Lands Enrolled in Conservation Reserve Program	August 2016	February 2018
State-Illinois			
Illinois Department of Natural Resources ("IDNR")	Statewide Permits #6, #8, and #13	No separate submittal required if general conditions are met.	
	State Species Consultation	June 2016	(August 2018)
	Incidental Take Authorization	November 2017	(September 2018)
Illinois Environmental Protection Agency	401 Water Quality Certification (separate submittal required for Section 404 and Section 10 permits; automatic authorization under NWP-12)[3]	January 2017 April 2017 July 2017 December 2017	(August 2018)
	State Operating Permit for Wastewater Discharges	(3rd Quarter 2018)	(4th Quarter 2018)

Table 3. Environmental Permits, Approvals, and Consultations (Continued)

Agency or Organization	Permit/Approval	Submittal Date[1] (Anticipated)	Receipt Date[1] (Anticipated)
State-Illinois (continued)			
Illinois Historic Preservation Agency ("IHPA")	Section 106, National Historic Preservation Act ("NHPA") Clearance	June 2016	June 2018
	Phase I Archaeological with Architectural Resources Survey	January 2017	June 2017
	Phase I Addendum I Archaeological	April 2017	November 2017
	Phase I Addendum II Archaeological	July 2017 August 2017 (revised figures)	November 2017
	Phase II Archaeological Site 11JY751	July 2017	November 2017
	Phase II Archaeological Site 11JY765	July 2017	November 2017
	Phase I Addendum III Archaeological	September 2017	November 2017
	Phase I Addendum IV Archaeological	December 2017	December 2017
	Phase I Addendum V Archaeological	January 2018	March 2018
	Phase I Addendum VI Archaeological	February 2018	March 2018
	Phase I Addendum VII Archaeological	April 2018	June 2018
	Avoidance Plan Site 11JY789	April 2018	June 2018
	Avoidance Plan Site 11JY800	April 2018	June 2018
	Phase II Archaeological Site 11JY801	April 2018	June 2018
Illinois Department of Agriculture ("IDOA")	Agricultural Impact Mitigation Agreement ("AIMA")	September 2016	April 2017
Illinois Department of Transportation ("IDOT")	Utility Permit and Driveway Permit	February 2018	(August 2018)
Scott County Highway Department	Utility Permit and Driveway Permit	September 2017	(August 2018)
Greene County	Floodplain Permit	Activities are exempt from submitting provided Project meets requirements of Statewide Permit 6 and FEMA guidelines.	
Greene County Highway Department	Utility Permit and Driveway Permit	September 2017	(August 2018)
Jersey County	Floodplain Permit (Modification Package)	November 2017 June 2018	December 2017 (August 2018)
	Stormwater Development Permit	Project granted exemption from permit submittal. Copies of drawings will be provided to County.	
Jersey County Highway Department	Utility Permit and Driveway Permit	September 2017	(August 2018)

Table 3. Environmental Permits, Approvals, and Consultations (Continued)

Agency or Organization	Permit/Approval	Submittal Date[1] (Anticipated)	Receipt Date[1] (Anticipated)
Scott County Road District #2	Road Crossing and Road Use Agreement	September 2017	(August 2018)
Roodhouse Township	Road Crossing and Road Use Agreement	September 2017	(August 2018)
Whitehall Township	Road Crossing and Road Use Agreement	September 2017	(August 2018)
Carrollton Township	Road Crossing and Road Use Agreement	September 2017	(August 2018)
Kane Township	Road Crossing and Road Use Agreement	September 2017	(August 2018)
English Township	Road Crossing and Road Use Agreement	September 2017	(August 2018)
Otter Creek Township	Road Crossing and Road Use Agreement	September 2017	(August 2018)
Elsah Township	Road Crossing and Road Use Agreement	September 2017	(August 2018)
Kansas City Southern Railroad	Utility Permit and Right of Entry Permit	October 2017	(Received contract for Spire signature; January 2018)

Notes:

N/A - Not Applicable.

1 Submittal dates and anticipated permit receipt dates are based on schedules discussed with the regulatory agencies.
2 Spire filed an amendment to its FERC certificate application on April 21, 2017.
3 Spire provided supplemental permit information to these agencies in April and July 2017. Additional supplemental information was submitted November 2017.

D) Explanation of the anticipated **adverse effects on listed species**;

Project tree clearing will need to occur as early as October 1, 2018, if necessary, and will be concluded by April 30, 2019. The purpose of this Conservation Plan is to assume tree clearing will occur after September 30 (which is the allowable winter tree clearing window for listed bats) and will potentially occur from April 1 to April 30 which would require an incidental take authorization for potential adverse effects occurring during these times.

Indiana Bat

Indiana bats are expected to occupy summer habitat between approximately April 1 and September 30 (USFWS 2018). Therefore, effects to Indiana bats could occur during the early portion of the summer maternity season (April 1 to April 30) when tree clearing could occur.

Because tree clearing will not occur between May 1 and September 30, (the middle of the maternity season, including the non-volant pup season), any effects during this sensitive time would be considered insignificant and discountable, and therefore not rise to a level where incidental take is expected to occur.

Incidental Mortality

In most cases, individual bat mortality from summer habitat removal would require the bat to be present in a specific tree at the time it is felled. If not struck during the felling, most volant bats would likely have the opportunity to escape the falling tree (Cope et al. 1974; Belwood 2002; USFWS 2015, USFWS 2016b). Although volant Indiana bats would likely fly away from a tree prior to or during felling, females may be less likely to leave if they have non-volant young present (usually between June 1 and July 31). Non-volant young would not be capable of leaving their roost tree and, therefore, the young and any reluctant adult females could be wounded or killed.

Project tree clearing would coincide with small portions of the beginning and end of the summer maternity season (and summer non-maternity season for males), when Indiana bats are volant. Combined, these timeframes would be expected to correspond to a low chance of mortality of an individual Indiana bat, if present in a tree being felled. In addition, no known Indiana bat roost trees are within the Project construction right-of-way or are proposed for clearing. Despite this, a low amount of mortality could occur from felling occupied unknown roosts, primarily occupied by males, based on the proximity of the known male roosts to the Project. The distances of roost trees from the portions of the Project proposed for tree clearing are provided in the Project Mist Net Survey Report (GAI 2017a) and ranged from 88 to 2,344 feet for roosts used by males, and 2,209 to 10,567 feet for roosts used by females.

Disruption of Behavioral Patterns

A low amount of harm or harassment could result from Indiana bats fleeing falling roosts or roosts in the immediate vicinity of tree clearing activities, and then subsequently having to find new roosts.

Northern Long-eared Bat

It is assumed that northern long-eared bats will occupy summer habitat during the same timeframes as Indiana bats (April 1 to September 30, USFWS 2018); therefore, tree clearing could occur during times when northern long-eared bats could occupy the Plan Area. Because tree clearing will not occur between May 1 and September 30, (the middle of the maternity season, including then non-volant pup season), any effects occurring during this sensitive time would be considered insignificant and discountable, and therefore not rise to a level where incidental take is expected to occur.

Incidental Mortality

Similar to Indiana bats, it is expected that most volant northern long-eared bats would likely have the opportunity to escape any falling trees (Cope et al. 1974; Belwood 2002; USFWS 2015, USFWS 2016b). Project tree clearing would coincide with small portions of the beginning and end of the summer maternity season (and summer non-

maternity season for males), when northern long-eared bats are volant. Combined, these timeframes would be expected to correspond to a low chance of mortality of an individual northern long-eared bat, if present in a tree being felled. Despite this, a low amount of mortality could occur from felling occupied unknown roosts.

Disruption of Behavioral Patterns

A low amount of harm or harassment could result from northern long-eared bats fleeing falling roosts or roosts in the immediate vicinity of tree clearing activities, and then subsequently having to find new roosts.

Timber Rattlesnake

Dates that timber rattlesnakes are expected to occupy summer habitat, as provided by regulatory agencies, are not as widely available as they are for listed bat species. Table 4 summarizes some egress and ingress dates from the literature:

Table 4. Timber Rattlesnake Egress and Ingress Dates

Region	Egress	Ingress	Source
Western Virginia	April 18– May 12	October 1 – 21 October 21	Martin (1992)
Northeastern New York	May 7 – May 21	September 14 – October 1	Brown (1992)
Central Connecticut	Mid-April – Early May	Mid-September – Late October	Hammerson and Lemieux (2001)
Eastern West Virginia	May 7 – May 16	September 24 – October 3	Martin (2002)

Based on Table 4, timber rattlesnakes are conservatively expected to occupy summer habitat in the Plan Area between approximately April 15 and October 31. Therefore, effects to timber rattlesnakes could occur during this time as a result of tree clearing (if tree clearing occurs during this time), construction, and maintenance of the Project. Avoidance of effects resulting from other types of construction and maintenance conducted during winter hibernation are discussed in the following paragraphs.

Incidental Mortality

Due to the cryptic coloration and behavior of timber rattlesnakes, incidental mortality could occur during construction due to the presence of construction equipment and open trenches, and the possibility of death associated with vehicle or equipment movement, falls, or entrapment. Isolation of the workspace (using silt

fencing), personnel awareness training, and daily employment of environmental inspectors during construction would abate these possibilities for incidental mortality.

Habitat Alteration

Alterations or effects to dens (regardless of when impacts occur) could render them useless for hibernation, and due to high site fidelity, could result in mortality of all associated individuals. Therefore, it is important to protect the structural integrity of dens. Although no known dens are within the Project construction right-of-way, specific avoidance measures will be implemented to ensure no effects would occur to jeopardize the structural integrity of those dens near the Project. Measures for minimizing potential effects to dens, including effects of potential force assisted excavation, is provided in the Avoidance and Minimization section(s) of this Conservation Plan. Potential effects of force assisted excavation on timber rattlesnakes are discussed in the Effects section(s) of this Conservation Plan.

Timber rattlesnakes forage primarily along forest edges and travel among the forest edges within proximal interior forested habitat. During construction of the Project, habitat availability for prey species would be temporarily reduced, decreasing the foraging potential for rattlesnakes by limiting the locations and abundance of prey. It is assumed construction would increase fragmentation between any requisite habitat areas.

Disruption of Behavioral Patterns

Construction and operation of the Project could affect short-term and long-term behavioral patterns of timber rattlesnakes. Avoidance and minimization measures designed to reduce or eliminate possibility for incidental mortality could lead to aberrations in daily activities such basking, foraging, and traveling. Isolation of the workspace through silt fencing would form a temporary physical barrier (or a deterrent at minimum) to this normal movement, possibly preventing or impeding access to preferred basking, gestating, or foraging areas, as well as egress and ingress to the nearby dens. Presence of an environmental inspector will abate many of these effects by facilitating a process that would allow snakes to be transported across the workspace to allow continued movement or travel on the other side, if necessary.

Movement pathways to and from the species' various requisite habitat types could be altered, potentially inhibiting the ability of snakes to access or find these habitats during or after construction. On a larger scale, it is unknown whether or not timber rattlesnakes cross the existing ammonia pipeline right-of-way; therefore, the cumulative width of the Project and the ammonia pipeline right-of-way could present little additional permanent barriers to movement. Regardless, it is reasonable to assume a low amount of harm or harassment could result from the Project being a temporary and permanent barrier to movement.

The HDD adjacent to the nearest known den will likely continue past October 31, as necessary. It is reasonable to assume that noise and vibration as a result of the HDD conducted after October 31 would result in disturbance to hibernating timber rattlesnakes.

2) Measures the applicant will take to minimize and mitigate that impact and the funding that will be available to undertake those measures, including, but not limited to -

> A) Plans to **minimize the area affected** by the proposed action, the estimated **number of individuals** of each endangered or threatened species that will be taken, and the **amount of habitat** affected (please provide an estimate of area by habitat type for each species).

Minimization of Affected Area

The Project has been routed in open areas and was collocated along existing road and pipeline corridors, where practical, to avoid impacts to forests. Approximately one-third of the Project is collocated with existing rights-of-way. Collocating will further reduce effects to the forest or other land uses, including through the contiguous forest north of the Mississippi River, thereby minimizing new fragmentation to other relatively undisturbed tracts of interior forest.

Amount of Affected Habitat

As described in the following sections, approximately 28.8 acres of Known Indiana Bat Habitat, 1.6 acres of Known Northern Long-eared Bat Habitat, and 9.9 acres of Potential Timber Rattlesnake Habitat will be affected. However, due to overlap of theses species' habitat, the Potential Timber Rattlesnake Habitat is completely within (overlaps with) Known Indiana Bat Habitat and does not contribute to additional acreage. Therefore the total amount of affected habitat is 30.4 acres based on the following formula: 28.8 acres (Indiana bat and timber rattlesnake) + 1.6 acres (northern long-eared bat) = 30.4 acres.

Indiana Bat

Summer maternity and summer non-maternity habitat was delineated by buffering all roost trees used by female and male Indiana bats during the radio-telemetry studies, respectively, by 2.5 miles. Table 5 provides acres of summer maternity and summer non-maternity habitat near the Project before and after construction.

Table 5. Forested Lands within Known Indiana Bat Habitat

Habitat Type	Total Area (acres)	Forested Area (acres)	Forested Area (percent)
All Lands within Known Maternity Habitat[1] (Pre-construction)	25,621.3	11,569.7	45.16
All lands within Known Maternity Habitat[1] (Post-construction)		11,559.1	45.12
Difference		**10.6**	**0.09[3]**
All Lands within Known Non-maternity Habitat[1,4] (Pre-construction)	27,599.8	8,779.9	31.81
All lands within Known Non-maternity Habitat[1,4] (Post-construction)		8,761.7	31.75
Difference		**18.2**	**0.21[3]**
All Lands within Total Known Habitat[2,4] (Pre-construction)	53,221.0	20,349.6	38.24
All lands within Total Known Habitat[2,4] (Post-construction)		20,320.8	38.18
Difference		**28.8**	**0.14[3]**

Notes:

1 Where Known Maternity and Known Non-maternity Habitat overlap (Figure 2, Attachment 1), the habitat was considered Known Maternity Habitat.

2 Total Known Habitat includes Known Maternity Habitat and Known Non-maternity Habitat. Where these two habitat types overlap (Figure 2, Attachment 1), the habitat was considered Known Maternity Habitat.

3 Percent difference is calculated as habitat loss (loss/Pre-construction) rather than the difference in percent forest cover pre and post-construction.

4 The Potential Timber Rattlesnake Habitat is completely within known Indiana Bat Non-maternity Habitat.

Northern Long-eared Bat

Summer maternity habitat was delineated by buffering the northern long-eared bat capture site by three miles. Table 6 provides acres of summer maternity near the Project before and after construction.

Table 6. Forested Lands within Known Northern Long-eared Bat Habitat

Habitat Type	Total Area (acres)	Forested Area (acres)	Forested Area (percent)
All Lands within Known Maternity Habitat[1] (Pre-construction)	18,111.4	4,183.7	23.10
All lands within Known Maternity Habitat[1] (Post-construction)		4,182.1	23.09
Difference		**1.6**	**0.04[2]**

Notes:

1 While male northern long-eared bats are assumed to be present for the purposes of this Conservation Plan, it is assumed they are using the same habitat as the maternity colony assumed to be present based on the capture of a single adult female northern long-eared bat.

2 Percent difference is calculated as habitat loss (loss/Pre-construction) rather than the difference in percent forest cover pre and post-construction.

Timber Rattlesnake

For the purposes of this Conservation Plan, the Potential Timber Rattlesnake Habitat is all forested areas that include the Principia Hill Prairies West Natural Area Inventory Site and are also bounded by Jersey Avenue, Chautauqua Road, Great River Road, and Elsah Road (Figure 3, Attachment 1). Table 7 provides acres of Potential Timber Rattlesnake Habitat near the Project before and after construction.

Table 7. Forested Lands within Potential Timber Rattlesnake Habitat

Habitat Type	Total Area (acres)	Forested Area (acres)	Forested Area (percent)
All Lands within Potential Timber Rattlesnake Habitat[1,2] (Pre-construction)	763.2	668.7	87.62
All lands within Potential Timber Rattlesnake Habitat[1,2] (Post-construction)		658.8	86.32
Difference		**9.9**	**1.48**

Notes:

1 Not differentiated by sex or habitat type due to absence of survey data.

2 The Potential Timber Rattlesnake Habitat is completely within known Indiana Bat Non-maternity Habitat and therefore does not contribute to additional acreage.

Estimated Number of Individuals Taken

The Illinois Endangered Species Act (520 ILCS Part 10) defines take as to harm, hunt, shoot, pursue, lure, wound, kill, destroy, harass, gig, spear, ensnare, trap, capture, collect, or to attempt to engage in such conduct.

Indiana Bat

The estimate of the maximum number of Indiana bats roosting in the Plan Area is based on an assumption that all Indiana bats known and assumed to be near the Project are evenly distributed throughout their known habitat. As shown in Table 5 above, it is assumed that 11,569.7 acres of (forested) maternity habitat and 8,779.9 acres of (forested) non-maternity habitat are near the Project. Project tree-clearing will remove 10.6 acres (0.1%) and 18.2 acres (0.2%) of this habitat, respectively. Assuming proportional effects to Indiana bats, distributed across the two Indiana bat maternity colonies (each consisting of 80 adult females and 80 sympatric males), it would be expected that less than one female or male Indiana bat could be wounded or killed during tree clearing activities. Because these estimates assume equal effect to habitat that is not equally distributed across the landscape (e.g. not all habitat in the Scott/Greene County maternity colony is contiguous, the core of the Jersey County maternity colony is much farther from the Project, males tended to roost closer to the Project, etc.), they were subjectively increased (by a factor of more than 10) to a maximum of two female and four male Indiana bats that could be wounded or killed during tree clearing activities based on the following formulas:

160 female bats (80 per colony) x 0.001 (or 0.1%) mortality rate = 0.16 bats (increased to 2)

160 male bats (80 sympatric per colony) x 0.002 (or 0.2%) mortality rate = 0.32 bats (increased to 4)

This estimate does not account for the assumed ability of the bats to flee falling roosts, but does highlight the extremely low expected chance of injury or death of an Individual Indiana bat, particularly when no known roosts were found inside the Plan Area (GAI 2017a).

These same assumptions were used to estimate any incidental take resulting from harm or harassment associated with Indiana bats fleeing falling roosts or roosts in the immediate vicinity of tree clearing, and then subsequently having to find new roosts. For consistency the number of Indiana bats experiencing harm or harassment was assumed to be the same that was estimated to be in the Plan Area that could also be wounded or killed. If these two female and four male Indiana bats were not wounded or killed, they would likely flee. Although not identified in the Illinois Endangered Species Act or Administrative Code, the Project's effects would need to significantly impair (e.g., 50 CFR 17.3) normal behavioral patterns (such as breeding, feeding, and sheltering) to such a level that take through harm or harassment is reasonably expected to occur. Therefore, the level of incidental take through harm and harassment is expected to be much lower, short in duration, temporary, and not result in mortality. Estimated incidental take of individual Indiana bats is summarized in Table 8.

Table 8. Estimated Maximum Incidental Take of Individual Indiana Bats

Form of Incidental Take	Estimated Maximum Number of Individual Indiana Bats[1]	Total
Injury, Death, Harm, or Harassment[1]	2 Females 4 Males	6 Indiana Bats

Notes:

1 Incidental take of Indiana bats is divided by sex based survey data that provides a better relative understanding of the distribution across the landscape.

Incidental take of Indiana bats would only occur if they are present on the summer landscape during tree clearing phases of Project construction.

Northern Long-eared Bat

Similar to the maximum number of individual Indiana bats incidentally taken, the estimate of individual northern long-eared bats that could be wounded or killed during tree clearing activities is based on the assumption that all northern long-eared bats known and assumed to be present are evenly distributed throughout their known habitat. As shown in Table 6 above, it is assumed that 4,183.7 acres of (forested) maternity habitat is near the Project. No male northern long-eared bats were captured during the mist net survey; however, it is assumed they are present on the landscape at equal proportions to females. For the purposes of this Conservation Plan, it assumed that they are also using the same habitat. Project tree-clearing will remove 1.6 acres (0.04%) of this habitat. Assuming proportional effects northern long-eared bats, distributed across the northern long-eared bat maternity colony (consisting of 39 adult females) and 39 sympatric males, it is expected that less than one female or male northern long-eared bat could be wounded or killed during tree clearing activities. Because this estimate assumes equal effect to habitat that is not extremely well defined (e.g. only one female northern long-eared bat was captured and no males were captured, the species was abundant on the landscape pre-WNS, the species tends to have smaller summer ranges, they display a more adaptive roosting behavior, etc.), they were subjectively increased (by a factor of more than 10) to a maximum of two northern long-eared bats that could be wounded or killed during tree clearing activities based on the following formula:

78 northern long-eared bats x 0.0004 (or 0.04%) mortality rate = 0.031 bats (increased to 2)

This estimate does not account for the assumed ability of the bats to flee falling roosts, but does highlight the extremely low expected chance of injury or death of an individual northern long-eared bat.

Similar to Indiana bats, these same assumptions were used to estimate any incidental take resulting from harm or harassment associated with northern long-eared bats fleeing falling roosts or roosts in the immediate vicinity of tree clearing, and then subsequently having to find new roosts. For consistency the maximum number of northern long-eared bats experiencing harm or harassment was assumed to be the same that was estimated to be in the Plan Area that could also be wounded or killed. If these two female or male northern long-eared bats

were not wounded or killed, they would likely flee. This level of incidental take is expected to be much lower, short in duration, temporary, and not result in mortality. Estimated incidental take of individual northern long-eared bats is summarized in Table 9.

Table 9. Estimated Maximum Incidental Take of Individual Northern Long-eared Bats

Form of Incidental Take	Estimated Maximum Number of Individual Northern Long-eared Bats
Injury, Death, Harm, or Harassment	2

Incidental take of northern long-eared bats would only occur if they are present on the summer landscape during tree clearing phases of Project construction

Timber Rattlesnake

Similar to the incidental take estimates for the bats, it was first assumed that all timber rattlesnakes known and assumed to be present are evenly distributed throughout their known habitat. As shown in Table 7 above, it is assumed that 668.7 acres of (forested) summer habitat is near the Project. Project tree-clearing will remove 9.9 acres (1.48%) of this habitat. However, the Project construction right-of-way within the Potential Timber Rattlesnake Habitat includes open areas, an access road through forested areas, and extra work spaces that involve construction activities that could result in injury or death of a timber rattlesnake as previously discussed in this Conservation Plan. This area covers a total of 17.8 acres (2.66%; Figure 3, Attachment 1). Assuming proportional effects to timber rattlesnakes, distributed across the estimated population (consisting of 100 individuals, as described in the species' Status in the Plan Area section as 25 timber rattlesnakes per each of the four known dens in the Potential Timber Rattlesnake Habitat), it is expected that a maximum of three timber rattlesnakes could be wounded or killed during tree clearing and construction activities based on the following formula:

100 timber rattlesnakes x 0.0266 (or 2.66%) mortality rate = 2.66 timber rattlesnakes (rounded to 3)

However, based on the implementation of active avoidance and minimization measures (including personnel education/training, workspace exclusion, and active monitoring), the estimate of three timber rattlesnakes being wounded or killed during tree clearing and construction is expected to be less, if not completely avoidable.

It is also assumed that all 100 timber rattlesnakes assumed to occupy the known summer habitat could encounter the Project during or after construction. However, the Project's effects would need to significantly impair (e.g., 50 CFR 17.3) normal behavioral patterns (such as breeding, feeding, and sheltering) to such a level that take through harm or harassment is reasonably expected to occur. Therefore it was assumed that only a portion of the timber rattlesnakes in the Potential Timber Rattlesnake Habitat would reasonably experience effects, and others would remain unaffected. It was subjectively estimated that 25 percent of the population would experience take through

harm and harassment. Incidental take from harm or harassment would likely only have temporary effects on fecundity, and is not likely to result in mortality.

The HDD adjacent to the nearest known den will likely continue past October 31, when timber rattlesnakes are hibernating. It is reasonable to assume that noise and vibration as a result of the HDD conducted after October 31 would result in disturbance to hibernating timber rattlesnakes. Again, it was assumed that only a portion of the timber rattlesnakes in the nearest den would reasonably experience potential effects, and others would remain unaffected. It was subjectively estimated that an additional 25 percent of the estimated population of the nearest den would experience take through harm and harassment (i.e., six individuals). Incidental take from harm or harassment would likely only have temporary effects on fecundity, and is not likely to result in mortality.

Similar to the HDD, force assisted excavation, if needed, may need to occur after October 31, when timber rattlesnakes are hibernating. It is assumed that noise and vibration as a result of the force assisted excavation conducted after October 31 would result in disturbance to hibernating timber rattlesnakes. It was assumed that only a portion of the timber rattlesnakes in the nearest two dens (nearly equidistant from the force assisted excavation) could experience potential effects, and others would remain unaffected (unlike HDD, force assisted excavation is expected to transfer more vibration to the substrate and affect two nearly equidistant dens, rather than one). It was subjectively estimated that an additional 25 percent of the estimated population of these dens would experience take through harm and harassment (i.e., approximately 12 individuals). Incidental take from harm or harassment would likely be short in duration and only have temporary effects on fecundity and is not likely to result in mortality. Estimated incidental take of individual timber rattlesnakes is summarized in Table 10.

Table 10. Estimated Maximum Incidental Take of Individual Timber Rattlesnakes

Form of Incidental Take	Estimated Maximum Number of Individual Timber Rattlesnakes
Injury or Death	3
Harm or Harassment	43
Total	46

B) **Plans for management of the area** affected by the proposed action that will enable continued use of the area by endangered or threatened species by maintaining/re-establishing suitable habitat (for example, native species planting, invasive species control, use of other best management practices, restored hydrology, etc.).

Cleanup and Restoration

Spire will adhere to the restoration guidelines as described in the FERC's *Upland Erosion Control, Revegetation, and Maintenance Plan* ("Plan") and FERC's *Wetland and Waterbody Construction and Mitigation Procedures* ("Procedures") (FERC 2013a and FERC 2013b) and applicable permit authorizations. The surface of the construction right-of-way disturbed by construction will be graded to match original contours and to be compatible with surrounding drainage patterns, except at those locations where permanent changes in drainage will be required to prevent erosion, scour and possible exposure of the pipeline. Temporary and permanent erosion and sediment control ("E&SC") measures, including silt fencing, water bars, and vegetation will be installed as necessary. Private and public property, such as fences, gates, driveways, and roads that have been disturbed by pipeline construction will be restored at minimum, to a level meeting their pre-construction condition and function. In most upland locations, excluding actively cultivated cropland, an herbaceous vegetative cover will be reestablished by spreading a grass seed and hydro/straw-mulch mixture over the disturbed surface.

Vegetation Maintenance

Operational vegetation maintenance of Spire's full permanent right-of-way in uplands may be conducted on a frequency of approximately once every three years to maintain an herbaceous to low scrub-shrub cover state. Routine vegetation mowing will be completed outside of the migratory bird nesting season in accordance with FERC's Plan (FERC 2013a), which is April 15 through August 1. Spire will conduct routine vegetation mowing within the Spire right-of-way in the Potential Timber Rattlesnake Habitat outside of April 15 to October 31, in accordance with the timber rattlesnake avoidance measures described in this Conservation Plan.

Within wetlands, Spire will only maintain a 10-foot corridor centered over the pipelines, allowing the balance of Spire's permanent easement to revert to its natural, pre-construction vegetated cover state. Additionally, within wetlands, Spire reserves the right to selectively cut and remove trees located within 15 feet of the pipeline with roots that may compromise the integrity of the pipeline coating. Spire will not use herbicides or pesticides on its right-of-way unless requested by landowners. Spire will utilize herbicides or pesticides at aboveground facilities that are adjacent to agricultural lands in Illinois in accordance with the Agricultural Impact Mitigation Agreement ("AIMA") for construction in Illinois agricultural land. The AIMA establishes best management practices for construction and restoration on agricultural land and was provided to all affected landowners in Illinois. No herbicides or pesticides will be used within 100 feet of a wetland or waterbody unless otherwise approved by applicable federal, state, and local agencies and directly affected landowners.

Based on the characteristics of the Project, Spire has developed seed mixes that will be applied based on site specific conditions including soil types, topography, native plant communities, and land uses (Tables 11, 12, and 13). Three main areas (outside of cultivated agricultural lands) were identified along the Project that may require specialized seed mixes based on site conditions; forested uplands, forested lowlands and non-agricultural meadowlands. Forested uplands include non-cultivated areas with rolling topography that consist of predominately deciduous trees, native understory shrubs and grasses, and steep slopes of greater than 35 percent. Forested lowlands consist of areas that are frequently in close proximity to floodplain and riparian areas and consist of predominately deciduous trees with native understory shrubs, facultative/facultative wetland grasses, and slopes of less than 10 percent. Non-agricultural meadowlands include non-forested lands with minimal changes in topography and consist of predominately native and introduced grasses.

Native grass seed mixes are preferred for revegetation efforts on disturbed lands because they have adapted to local environments giving longevity to successful revegetation efforts. Revegetation using native species provides a diverse vegetative community and habitat for inherent wildlife, improves soil stability, encourages biodiversity, and deters the introduction of noxious or invasive species. Native grass species are also less likely to be invasive or overly competitive with adjacent plants or crops.

Each native seed mix type for each type of area identified along the Project (outside of cultivated agricultural land) was developed using 60 pure live seed ("PLS") per square foot and was developed in consultation with regional USDA-NRCS technical guidelines.

In addition, a nurse crop (annual rye) will also be considered to be added to the native seed mixes at any time of the year to provide quick vegetation establishment and ground cover. These annuals are applied at lower rates, 4.0 pounds per acre, such that competition with the native species is avoided.

Table 11. Recommended Forested Upland Seed Mix

Common Name	Scientific Name	# PLS/acre	PLS/sq ft	Percent of Mix
Little Bluestem	*Schizachyrium scoparium*	2.0	12.0	20
Sideoats Grama	*Bouteloua curtipendula*	2.7	12.0	20
Switchgrass	*Panicum virgatum*	1.0	9.0	15
Blue Grama	*Bouteloua gracilis*	0.48	9.0	15
Canada Wildrye	*Elymus canadensis*	3.4	9.0	15
Rough Dropseed	*Sporobolus clandestinus*	0.52	9.0	15
	Totals	**10.2**	**60.0**	**100**

Table 12. Recommended Forested Lowland Seed Mix

Common Name	Scientific Name	# PLS/acre	PLS/sq ft	Percent of Mix
Big Bluestem	*Andropogon gerardii*	4.0	12.0	20
Indiangrass	*Sorghastrum nutans*	3.4	12.0	20
Switchgrass	*Panicum virgatum*	1.0	9.0	15
Prairie Cordgrass	*Spartina pectinata*	0.87	3.0	5
Canada Wildrye	*Elymus canadensis*	4.6	12.0	20
Virginia Wildrye	*Elymus virginicus*	7.1	12.0	20
	Totals	**20.9**	**60.0**	**100**

Table 13. Recommended Non-Agriculture Meadow Seed Mix

Common Name	Scientific Name	# PLS/acre	PLS/sq ft	Percent of Mix
Indiangrass	*Sorghastrum nutans*	3.4	12.0	20
Big Bluestem	*Andropogon gerardii*	4.0	12.0	20
Little Bluestem	*Schizachyrium scoparium*	1.5	9.0	15
Sideoats Grama	*Bouteloua curtipendula*	2.1	9.0	15
Switchgrass	*Panicum virgatum*	1.0	9.0	15
Virginia Wildrye	*Elymus virginicus*	5.3	9.0	15
	Totals	**17.3**	**60.0**	**100**

Pollinator seed mixes were also developed to be incorporated into native grass seed mixes upon specific landowner request (Table 14). Pollinator vegetation species are known to be good pioneering species, especially when provided native bunchgrass communities to establish within. The pollinator mixes are only intended to be utilized if requested by landowners. The use of pollinator species in a seed mix reduces noxious weed management options since herbicides would impede the establishment of pollinator species.

The following seed mix has been developed and can be incorporated into the native seed mix in forested uplands, forested lowlands, and non-agricultural meadows.

Table 14. Recommended Supplemental Pollinator Seed Mix

Common Name	Scientific Name	# PLS/acre	PLS/sq ft	Percent of Mix
Illinois Bundleflower	*Desmanthus illinoensis*	1.3	2.5	25
Purple Prairie Clover	*Dalea purpurea*	0.52	2.5	25
Partridge Pea	*Chamaecrista fasciculata*	1.8	2.5	25
Purple Coneflower	*Echinacea purpurea*	0.94	2.5	25
Totals		**4.5**	**10.0**	**100**

C) Description of **all measures to be implemented to avoid, minimize, and mitigate** the effects of the proposed action on endangered or threatened species.

Avoidance and Minimization Measures

Indiana Bat and Northern Long-eared Bat

Spire anticipates employing the following measures to avoid and minimize adverse effects to Indiana bats and northern long-eared bats:

- Seasonal tree clearing – Tree clearing will not occur between May 1 and September 30 (the middle of the maternity season, including then non-volant pup season), avoiding any effects during this sensitive time. All future routine vegetation mowing or tree clearing in the Plan Area will occur outside the migratory bird nesting season (April 15 through August 1), as prescribed in the FERC Plan.
- Avoidance of riparian areas and wetlands wherever practical – The Project has been generally reduced to 75 feet wide at streams and wetlands. Stream crossings and impacts have been minimized wherever practical by routing or shifting the Project to avoid paralleling streams.

Timber Rattlesnake

Spire anticipates employing the following measures in portions of the Plan Area within Potential Timber Rattlesnake Habitat to avoid and minimize adverse effects to timber rattlesnakes:

- Seasonal tree clearing – Tree clearing during construction will not occur between May 1 and August 1 (the middle of the mating and gestating season), avoiding any effects during this sensitive time. All future routine vegetation mowing or tree clearing in the Plan Area will occur outside the migratory bird nesting season (April 15 through August 1), as prescribed in the FERC Plan and completed outside of April 15 to October 31 in the Potential Timber Rattlesnake Habitat, in accordance with the timber rattlesnake avoidance measures described in this Plan.
- Obstructive barriers – All portions of the Plan Area within Potential Timber Rattlesnake Habitat will be isolated with silt fence to deter snakes from entering the workspace.
- Construction monitoring – Prior to construction, Spire will develop a timber rattlesnake monitoring protocol that will be implemented by an environmental inspector. The monitoring protocol will identify contact information and channels of communication for responsible parties that the environmental inspector will coordinate with to complete barrier repairs, to stop work within 100 feet from locations where rattlesnakes are encountered, to deploy a qualified rattlesnake biologist to remove rattlesnakes within the workspace, to adapt monitoring techniques, to submit daily and weekly briefings to Spire, and to facilitate necessary modifications to construction practices or best management practices (“BMPs”).

- Within the timber rattlesnake habitat, the obstructive barriers, open trench, and active construction workspaces will be inspected for rattlesnakes each morning prior to work. If any breaches are found in the obstructive barriers, construction work would not commence in those areas until repairs are completed and the surrounding workspace is re-inspected for timber rattlesnakes. Likewise, if the construction contractor recognizes the presence of a timber rattlesnake in active construction workspaces, construction will be halted within a 100-foot distance around the timber rattlesnake and the environmental inspector will be notified to implement the timber rattlesnake monitoring protocol, which would involve a qualified rattlesnake biologist removing the rattlesnake from the workspace.
- Construction equipment, including cabin areas and engine compartments, would be inspected each morning prior to work for timber rattlesnakes that could be utilizing these areas as heat sources.
- Where work is being conducted 24 hours per day (i.e., the HDD site), the inspections of barriers, workspaces, and equipment will be conducted once per 24-hour-period. These inspections would not be limited to morning hours and account for the non-stop nature of the work in this area. Equipment inspections will be conducted as feasible in this area considering equipment will not sit idle overnight.
- The environmental inspector will conduct tailgate safety meetings or briefings and sensitivity/safety sessions as needed.

- Education – Construction personnel will be briefed and provided educational pamphlets on the possibility of encountering timber rattlesnakes in the Plan Area, the system used to mark work areas and avoidance areas, travel restrictions for equipment and vehicles and how to report sightings to the environmental inspector, and the importance of avoiding taking of timber rattlesnakes. Mandatory personnel awareness training will include strict avoidance policies and procedures to be followed during chance encounters.
- Protection of hibernacula – The closest known den is approximately 77 feet from the Plan Area (proposed HDD site; Figure 3, Attachment 1). Clearing and grading, along with the HDD operation, will be confined to the workspace and are not expected to modify the den.
- The remaining known dens range from approximately 215 to 2,050 feet from the Plan Area and are not expected to be affected by the Project.
- Force Assisted Excavation controls – A potential area may interfere with conventional rock-trenching methods occurs in the Limestone-Lacrescent Complex in Jersey County (MP 44.9 to MP 44.95), where force assisted excavation may be recommended, is located approximately 530 feet from the nearest known dens. If force assisted excavation is needed in this area or other locations, it will be conducted in a manner that will not compromise the structural integrity of rock features or alter subsurface hydrology

(e.g., maximum charge of two inches per second ground acceleration avoids impact to nearby structures). All force assisted excavation shall be subject to the following limitations:

  - Maximum peak particle velocity of two inches per second in any of three mutually perpendicular axes, measured at the lesser distance of the nearest facility or the edge of the permanent right-of-way.
  - The force assisted excavation takes into account the Project's proximity to an existing ammonia pipeline that is adjacent to the construction workspace and would utilize the minimum charge necessary to fracture the bedrock for removal. Force assisted excavation for pipeline construction, in this sense, would be considered extremely subdued, limited to the construction workspace, and would not result in a crater or any results resembling a large-scale force assisted excavation operation.
  - Little information is available on the effects of force assisted excavation on timber rattlesnakes. It is assumed any zone where mortality would be possible would be limited to the immediate force assisted excavation area, i.e., the temporary construction workspace, which will be excluded from entry by timber rattlesnakes as per this Plan. Vibrations would attenuate outside of this area at a rate dependent on the charge used and site conditions at the time of force assisted excavation. Any effects outside of this area are expected to be temporary, short in duration, and not result in injury to timber rattlesnakes that may be utilizing the bluff dens during summer. Noise/vibrations from equipment in the construction workspace preceding the force assisted excavation may lead to the snakes' avoidance of this general area during construction at any time of year, regardless of force assisted excavation activities.
  - Maximum drill size shall be 2.5 inches unless approved by Spire.
  - Maximum quantity of explosive per delay shall be governed by the recorded measurements as influenced by work site conditions.
  - Drill holes shall not be left loaded overnight and good stemming material is to be used in all holes.
  - During force assisted excavation operations, excessive vibration will be controlled by limiting the size of charges and by using charge delays which stagger or sequence the detonation times for each charge. All force assisted excavation will be performed by registered licensed excavators and monitored by experienced force assisted excavation inspectors.
  - Force assisted excavation operations shall be conducted during daylight hours. If force assisted excavation is done, the excavation shall be covered with force assisted excavation mats, constructed so that it is capable of preventing rock fragments (or fly rock) from being thrown.

- In lieu of force assisted excavation, rock encountered during trenching would be removed using one of the following techniques: conventional excavation with a backhoe, hammering with a pointed backhoe

attachment or pneumatic rock hammer followed by backhoe excavation, or ripping with a bulldozer. Rock removal techniques would depend upon rock properties such as relative hardness, fracture susceptibility, expected volume, and location.

- Vegetation Maintenance – Operational vegetation maintenance of Spire's permanent right-of-way in uplands may be conducted on a frequency of approximately once every three years to maintain an herbaceous to low scrub-shrub cover state. Routine vegetation mowing will be completed outside of the migratory bird nesting season (April 15 through August 1) in accordance with FERC's Plan (FERC 2013a). Spire will mow outside of the time when snakes are actively foraging and basking away from dens (April 15 to October 31), which would further abate the risk of incidental mortality.

General Avoidance and Minimization Measures

The Project is under the jurisdiction of FERC. As such, Spire will comply with the FERC Plan and Procedures (FERC 2013a and FERC 2013b)

Spire would also implement additional construction, restoration, and mitigation plans prepared for the Project, including its Spill Prevention, Control, and Countermeasures Plan (SPCC Plan); Unanticipated Discovery of Contamination Plan; HDD Contingency Plan (Attachment 3); Unanticipated Discoveries Plans for Cultural Resources in Illinois; Winter Construction Plan; Blasting Plan (Attachment 6); Karst Mitigation Plan (Attachment 7); and Fugitive Dust Control Plan. These plans are available for review on the FERC website (eLibrary under Docket Nos. CP17-40-000 and CP17-40-001). Also, Spire has worked with the Illinois Department of Agriculture to develop a Project-specific AIMA for construction in Illinois agricultural land.

The following additional measures would be implemented:

- Soil segregation – Topsoil would be segregated during earth disturbance activities in accordance with the FERC Plan and AIMA for Illinois. Soil segregation and erosion and sediment controls (described below) are general measures that encourage native plant and animal communities and benefit all species covered in this Conservation Plan. These general measures also protect aquatic-based sources of prey for Indiana bats and northern long-eared bats.
- Erosion and sedimentation controls – The E&SC Plan ("E&SCP") would reduce potential for adverse impacts from stormwater runoff during construction. Erosion and sediment control devices will be outlined in E&SCPs which would incorporate the FERC Plan and state and local regulations.
- Invasive Species Control – Spire has prepared a Noxious Weeds/Invasive Plant Control and Mitigation Plan. Implementation of this plan will avoid and minimize adverse effects from the spread of noxious and invasive plant species.
- Avoidance of Pesticides – The use of herbicides or pesticides will be limited to the aboveground facilities.

Mitigation Measures

Spire proposes to offset unavoidable impacts to the Indiana bat, northern long-eared bat and timber rattlesnake through a contribution in the amount of $513,200 to The Conservation Fund for the management and recovery of affected species. The funds provided to the Conservation Fund will be utilized for the protection of bat species and timber rattlesnakes subject to the USFWS Rock Island District review and IDNR review, respectively, prior to the implementation of conservation programs for each species. Contributions would be based on a 5.5:1 ratio for Project impacts to forested areas within the 50-foot permanent easement along portions of the Project within the Plan Area and a 3:1 ratio for impacts to forested areas within temporary workspaces within the Plan Area. Spire conducted an independent market study to assess land values within the Project and has found that forested land values, similar to those habitats to be affected by construction and covered by this Plan, to be valued at approximately $4,000 per acre. The total contribution amount is based on formula shown in Table 15.

Table 15. Mitigation Ratios

Impact Area	Impact Acres[3]	Mitigation Ratio	Mitigation Acres	Mitigation Cost per Acre	Mitigation Value
Permanent Workspace[1]	14.1	5.5:1	77.6	$4,000	$310,400
Temporary Workspace[2]	16.9	3.0:1	50.7	$4,000	$202,800
Total	**31**	**-**	**-**	**-**	**$513,200**

Notes:

1 Permanent Workspace = the amount of forested clearing within the 50-foot permanent right-of-way in the Plan Area.

2 Temporary workspace = remaining area within the construction footprint outside of the permanent right-of-way in the Plan Area.

3 Note: the mitigation calculation has been rounded up to 31 acres to account of any additional temporary impacts that could result from minor adjustments in the Project alignment during construction.

D) Plans for **monitoring** the effects of the proposed actions on endangered or threatened species, such as monitoring the species' survival rates, reproductive rates, and habitat before and after construction, include a plan for follow-up **reporting to IDNR**. Monitoring surveys should be targeted at reducing the uncertainty identified in Section 1.d.

Post Construction Monitoring

The main goals of post-construction monitoring will be to: 1) detect the presence of the state-listed species covered by this Conservation Plan, and 2) ensure that the previously disturbed areas are restored. Spire will conduct all post-construction monitoring and associated reporting.

Species Presence Monitoring and Reporting

Monitoring would be conducted to document the presence of Indiana bats, northern long-eared bats, and timber rattlesnakes in the Plan Area post-construction. Once the line is operational and post-construction vegetation restoration is considered successful per FERC, Spire would only have access within the 50-foot permanent easement, unless landowner permission outside of this easement is granted. Spire will seek to obtain access outside the permanent easement to conduct the Indiana bat monitoring where necessary; however, access would be limited to landowner discretion and cannot be guaranteed. Any portions of the northern long-eared bat and timber rattlesnake monitoring that can be conducted within Spire's easement will be conducted as such.

Indiana Bat

Spire will monitor presence and habitat use of maternity and non-maternity Indiana bats documented during the 2017 mist net survey by conducting follow-up mist net surveys, radio-tracking, and emergence counts will be conducted during years 2 and 7 post-construction. These surveys will follow the same protocols used in the 2017 survey for the Project and conform to current agency protocols. The surveys will encompass the same scope to ensure scientific comparability. Active maternity roost trees located initially and in follow-up surveys will be monitored in the subsequent years' survey.

Northern Long-eared Bat

Monitoring for the northern long-eared bat will be conducted utilizing mist net and/or acoustic surveys to document the presence of the species. Surveys that are restricted to the permanent easement should be considered sufficient to determine the presence/absence of the species along the Project. Monitoring for the northern long-eared bat will be conducted 2 and 7 years post-construction.

Timber Rattlesnake

Monitoring for timber rattlesnakes that is restricted to the maintained permanent easement would focus on visually detecting the species within the easement and along forest edges, just outside the permanent easement. Monitoring will be conducted 2 and 7 years post-construction.

Monitoring will use the most recent agency protocols for presence/absence surveys for these species. Surveys will be conducted by qualified surveyors who have obtained the proper state and federal permits to conduct the surveys. Any incidental take associated with the monitoring would be covered by the surveyors' permits and are beyond the scope of this Conservation Plan.

Annual post-construction reports would be provided to the IDNR liaison to this Conservation Plan by December 31 of each year that monitoring is completed. The reports would provide the results of monitoring activities.

Revegetation Monitoring and Reporting

Spire would conduct post-construction monitoring to document restoration and revegetation of the right-of-way and other disturbed areas. Spire would monitor wetlands annually until revegetation is successful in accordance with the Procedures. Spire would monitor upland areas after the first and second growing seasons following restoration or until revegetation is successful in accordance with FERC's Plan. Spire would also file quarterly monitoring reports with the FERC to document the status of revegetation in disturbed areas. These reports would describe the results of post-construction inspections, any problem areas, and corrective actions taken. Monitoring would cease if an area meets performance standards at the end of the second year (or in any subsequent year). Within three years of construction, Spire would file with a FERC a wetland revegetation monitoring report. Spire would continue to file wetland revegetation monitoring reports on an annual basis thereafter until revegetation efforts are considered successful. In addition, the FERC staff would inspect the Project throughout construction to independently verify compliance. The FERC staff would continue to monitor and inspect the vegetation along the Project route until restoration and revegetation are deemed successful.

Spire would provide a copy of all post-construction revegetation monitoring reports to the IDNR Conservation Plan Liaison upon request.

E) **Adaptive management practices** that will be used to deal with changed or unforeseen circumstances that may affect the endangered or threatened species.

Adaptive Management

Adaptive management practices would be used to respond to changed or unforeseen circumstances that affect the measures used to avoid, minimize, and mitigate potential effects of the Project to the species covered in this Conservation Plan.

Spire proposes the following adaptive management practices:

- Daily tailgate meetings or briefings held by construction contractors actively working within known Indiana bat and northern long-eared bat, and the Potential Timber Rattlesnake Habitat would include a brief discussion on any modifications that could be necessary for construction practices or avoidance measures while working in areas.
- Weekly conference calls held by the Chief Environmental Inspector would include discussions on construction progress through the Potential Timber Rattlesnake Habitat, the effectiveness of the avoidance and minimization measures, and any modifications that may be necessary to better protect sensitive habitats during construction. The environmental inspector would assess active Project work locations daily within the Potential Timber Rattlesnake Habitat. If sightings of the species indicate a level

of occurrence greater than anticipated in this Conservation Plan, a coordination call with the IDNR would be immediately scheduled to discuss the effectiveness of avoidance and minimization measures, and possible additional measures.

- Qualified biological contractors would be contracted in the event that additional species surveys become immediately necessary to quantify populations encountered during construction.
- Pre-construction representative photographs of habitat areas would be collected to document a baseline of habitat conditions. This information would be used for comparison during post-construction monitoring as a comparison to baseline conditions.
- If an incidental take of any state-listed species is observed, it will be immediately reported to the appropriate IDNR contact.

Any new information that is discovered before, during, or after construction that may affect the avoidance and minimization measures in this Conservation Plan would be coordinated with the IDNR Conservation Plan Liaison.

F) **Verification that adequate funding exists** to support and implement all minimization and mitigation activities described in the conservation plan. This may be in the form of bonds, certificates of insurance, escrow accounts, or other financial instruments adequate to carry out all aspects of the conservation plan.

The Project be wholly owned and operated by Spire. Spire is the fifth largest publicly traded gas utility company with 53,200 miles of natural gas pipeline and 1.7 million customers. As such, Spire has adequate financial backing to support and implement this Conservation Plan and the costs would be incorporated into the overall Project budget. Therefore, no specific financial instruments such as bonds, certificates of insurance, or escrow accounts would be required to implement this Conservation Plan.

3) A description of alternative actions the applicant considered that would reduce take, and the reasons that each of those alternatives was not selected. A **"no-action" alternative** shall be included in this description of alternatives. Please describe the economic, social, and ecological tradeoffs of each action.

Alternative Actions

Spire undertook extensive alternative routing analyses for the Project. Spire evaluated alternatives based on environmental considerations, population densities, and construction safety and engineering feasibility considerations. Spire evaluated a no-action alternative, two major route alternatives, and alternative crossings of the Mississippi River near the Project's proposed crossing of state-listed species habitat, as described below.

No Action Alternative

Under the "no-action" alternative, the temporary and permanent impacts associated with construction and operation of the proposed new pipeline would be avoided and issuance of an ITA would also not occur because Project activities covered by this Conservation Plan would not occur. However, the needs that the Project is designed to fulfill would also not be met. In particular, the St. Louis region and surrounding counties in Missouri and southwest Illinois would not have affordable firm access to gas supplies sourced from new supply basins, and would be left with only their historical gas supply options. The historical supply areas have only modest growth projections, in contrast to significant growth projections in newer gas supply basins in other regions. In addition, because these mature supply basins are also located near developing new markets for natural gas consumption and export, increased competition for supply out of these regions will result in increased natural gas price risk to the St. Louis market absent the introduction of new sources and new transportation paths to access those new sources.

In addition, if the Project were not constructed, the St. Louis region would not obtain the new physical natural gas transportation path that is one of the primary purposes of the Project. Its absence would reduce reliability, and the St. Louis region would continue to experience increased risk of service interruption given its disproportionate dependence on a single incumbent pipeline system, Enable Mississippi River Transmission, LLC ("Enable MRT"). The fact that the incumbent pipeline system traverses an acknowledged area of increased seismic activity magnifies the risk associated with such lack of transportation path diversity. Additionally, without the Project, the Foundation Shipper, LGC, would have lost a peak day supply option and would need to consider whether any viable alternatives exist to address its current dependence on a propane peak-shaving facility that does not meet its system's operational and reliability needs.

Thus, if the Project were not pursued, the Foundation Shipper and similarly situated customers in eastern Missouri and southwest Illinois would need to explore different pipeline construction projects or risk negative price and reliability issues. In addition to direct impacts on gas supply competitive options and resource security and reliability, there would be no increase in firm transportation capacity into the region, and thus the anticipated benefits of providing access to incremental gas supplies to support market growth, particularly in the industrial and electric generation sectors, would not be met. This has both economic consequences and negative environmental effects, where additional gas supply would not be available to displace coal and other fossil fuels that have greater emissions of greenhouse gases.

Major Route Alternatives

The following descriptions of alternatives includes descriptions of portions of the Project in both Illinois and Missouri, as required.

Illinois Route Major Alternative

The Illinois Route was developed to provide an alternative crossing of the Mississippi River. The Illinois Route originates at REX in Morgan County, and travels south through Macoupin and Madison Counties, before crossing the Mississippi River and terminating at Enable MRT's existing Chain of Rocks facility in St. Louis County, Missouri. The total length of greenfield pipeline would be approximately 72 miles, which would include approximately 66 miles of new 24-inch pipeline and an additional six miles of the proposed North County Extension in Missouri, which would be required for this alternative. Approximately 32 percent of this alternative route would collocate with existing pipeline, powerline, and road or railroad right-of-ways. This major route alternative would avoid crossing the Missouri River and its associated levee, but would cross federal lands owned by the USACE on the east side of the Mississippi River. There is also a crossing of a canal that serves vessels utilizing the Mississippi River for shipping. It would be likely that one HDD would be required for the Mississippi River and a second HDD would be required to cross the canal, since traversing both the river and the canal may not be technically feasible in a single drill.

Under this alternative it is anticipated that approximately 3,300 horsepower of compression would be needed in order to provide the pressure required to flow the gas to the northern end of the North County Extension (St. Charles and St. Louis Counties, Missouri), which would deliver gas to Spire's proposed Laclede/Lange Delivery Station (St. Louis County, Missouri) that connects to a storage field owned by the Foundation Shipper. An approximately 15-acre site would be anticipated for construction of the compression facility, with approximately 10 acres maintained for operations.

The greenfield portion of the Illinois Route is approximately seven miles longer than the proposed route, and would, therefore, be expected to result in greater impacts as a result of construction and operation. In addition, the greenfield portion of the Illinois Route impacts a larger proportion of highly populated areas and developed areas, including more medium intensity and high intensity areas than the Illinois portion of the proposed route. Based on USFWS NWI data, the Illinois Route with the North County Extension would be expected to cross 0.7-mile forested/shrub wetlands and 11 wetland complexes. While this is comparable to the number of crossings that would be expected on the proposed route, the total mileage of forested/shrub wetlands crossed would be approximately 0.3-mile greater for the Illinois Route with an additional 2.7 acres of wetland impact. With the Illinois Route having additional pipeline mileage, the construction of an aboveground compressor station facility, and the crossing of more populated areas, it would be expected to consequently result in a greater environmental impact and an increase in air emissions. Therefore, Spire has determined in comparison to the Illinois Route that the proposed route is the better option for the Project. A map of this route is shown on Figure 4 (Attachment 1).

Missouri Route Major Alternative

The Missouri Route originates at REX, west of the Mississippi River in Pike County, Missouri, and travels southeast through Lincoln and St. Charles Counties, Missouri, before terminating at the proposed Laclede/Lange Delivery Station and North County Extension in St. Louis County, Missouri. The total length of greenfield pipeline would be

approximately 84 miles, which would include approximately 78 miles of new 24-inch pipeline and an additional six miles of the proposed North County Extension (St. Charles and St. Louis Counties, Missouri). Approximately 41 percent of this alternative route would collocate with existing pipeline, powerline, and road or railroad rights-of-ways. This major route alternative would eliminate the need for a crossing at the Mississippi River, and would include one HDD crossing of the Missouri River and its associated levee. In addition, compression would be needed on this alternative to achieve the necessary delivery pressures on the North County Extension, which would result in additional permanent impacts associated with the construction of a new compressor station. An approximately 30-acre site would be anticipated for the compression facility, with approximately 20 acres maintained for operations.

The greenfield portion of the Missouri Route is approximately 20 miles longer than the 24-inch pipeline portion of the proposed route, and would, therefore, be expected to result in greater impacts during construction and operation, particularly in forested areas. Based on review of aerial mapping, the areas crossed by the Missouri Route would cross significantly more PHMSA Ecological High Consequence Areas than the proposed route. Based on USFWS NWI data, the Missouri Route would be expected to cross 1.6 miles of freshwater forested/shrub wetlands and 25 wetland complexes, which is significantly greater than the other alternatives considered. As it would require additional compression, the Missouri Route would result in an increase in air emissions during operation. The Missouri Route crosses two Protective Management Areas in St. Charles County managed for multiple uses, one controlled by Whistling Wings and the second by Decoy Inn, LLC. With the Missouri Route having additional pipeline mileage, the construction of an aboveground compressor station facility, and the crossing of more populated areas, it would be expected to consequently result in a greater environmental impact and an increase in air emissions. Therefore, Spire has determined in comparison to the Missouri Route that the proposed route is the better option for the Project. A map of this route is shown on Figure 4 (Attachment 1).

Evaluation of the Mississippi River Crossing

In determining constructability of any north-to-south route, the crossing location of the Mississippi River was the foremost consideration. A siting review was completed using both desktop data and field reconnaissance. A variety of constraints are present in the area including densely populated and extensively developed areas to the east, and the presence of the Illinois River to the west, which would result in additional environmental impacts if also crossed. Given these constraints, potential Mississippi River crossing locations for the proposed route were considered within a 15-mile length of the river between Grafton, Illinois and Melville, Illinois. In evaluating the crossing location for the Illinois Route major alternative, Spire also reviewed an approximately four-mile section of the river south of Alton, from the Lewis and Clark State Historic Site to Interstate 270.

When reviewing this area for potential HDD crossings, a variety of factors were evaluated, including:

- a relatively level area at least 200 feet by 200 feet such that it would provide adequate space to conduct drilling operations;

- a sufficient pipe staging area that is approximately the length of the crossing to facilitate the proper stringing and welding of the pipe in advance of pull-back; stopping and restarting the pull-back of the pipeline would introduce increased stress on the pipe and introduce a higher risk that the pipe may get stuck, which may result in failure of the drill;
- sufficient access for heavy equipment to the drilling operation site;
- minimized elevation differences between the two entry/exit locations, as large elevation differential increases the risk of pipe damage and/or inadvertent returns of the drilling fluid;
- location of HDD workspaces outside of sensitive resources such as conservation easements, flowage easements, areas prone to flooding, and sensitive habitats;
- location of residences or other occupied structures that may be impacted by the sound of the drilling operations; and
- minimized length of the overall drill which increases success rates (see Figure 5, Attachment 1).

Figure 5 (Attachment 1) illustrates a compilation of successfully completed crossings in North America by major HDD contractors (Mott MacDonald 2015). The common range of industry experience/capability, in green, was established based on the requirement that several contractors have completed similar installation lengths at the specific diameter. Installation lengths and diameters that are considered feasible given an experienced contractor and favorable ground conditions are in yellow. Other installation lengths and diameters are considered to be at or beyond the state-of-practice for the industry.

The northern bank of the Mississippi River presents several constraints in siting a potential crossing. It consists of high bluffs with few locations of low relief, which result in large elevation differences and isolated pockets of concentrated development. Several populated towns are located on the north bank of the Mississippi in Jersey County, including Grafton, Chautauqua, Elsah, Lockhaven, Melville, and Alton, Illinois. The Raging Rivers Water Park is located between Grafton and Chautauqua, and Pere Marquette State Park and the Two Rivers National Wildlife Refuge are located west of Grafton.

The south bank consists of multiple conservation easements and environmentally sensitive areas, including a floodplain with protected islands and flooded sloughs. Portage Island, near Portage des Sioux, Missouri, is part of the Two Rivers National Wildlife Refuge. As a result, there are limited opportunities for constructible pipeline crossings.

The proposed crossing is located in one of the few undeveloped low relief areas of the bluffs on the north bank and minimizes overall drill length, while still allowing Spire to cross federally-owned lands on the south bank via a trenchless method. The proposed crossing location also provides the opportunity to minimize the elevation differences between the entrance and exit locations of the proposed HDD due to an existing cutout in the bluffs. Both overall drill length and elevation differences are two of the key risk factors considered when evaluating an HDD crossing for the potential of inadvertent release of drilling fluids. The proposed route collocates with an

existing right-of-way at the crossing of the Mississippi River, thereby minimizing tree clearing and other impacts; there are no other colocation opportunities available within the area reviewed. Other locations evaluated in the area failed to provide constructible low relief locations at the bluffs on the north bank; avoidance of impacts to conservation easements and sensitive areas on both the north and south banks; avoidance of direct impacts to protected lands on the south bank; and/or minimized total length of the HDD for acceptable constructability risks.

In addition, Spire reviewed the entire area between Grafton, Illinois and Alton, Illinois for known utility corridors in which to collocate the proposed route. The only known utility identified was the existing pipeline right-of-way adjacent to the proposed route (NuStar) near river mile 215. Two pipeline/cable crossings are identified on USACE navigation charts near river mile 212 near Portage Des Sioux; however, Spire was unable to confirm the presence, type, or ownership of these lines, and did not identify a constructible crossing of the river in this area (USACE 2011). The crossing location for the proposed route is shown relative to other existing utility crossings on Figure 6 (Attachment 1).

As a result of this review, Spire identified one potentially constructible alternative crossing, described below (referenced as Minor Alternative 4 in Spire's FERC application and shown on Figure 7 (Attachment 1) of this Conservation Plan as the Mississippi River Crossing Alternative). However, no other constructible alternative routes were identified due to the engineering and environmental constraints discussed; therefore, no further environmental analysis of minor alternatives at the Mississippi River crossing is available.

Mississippi River Crossing Alternative

One minor route alternative crossing for the Mississippi River was considered between Milepost ("MP") 43.1 and MP 47.0 as an alternative crossing of the Mississippi River. This alternative would involve relocating the HDD crossing of the Mississippi River approximately 3,800 feet upstream from the proposed route. The increase in length of pipeline would be negligible at approximately 0.1-mile. The HDD would be approximately 400 feet longer than currently proposed route. This alternative would result in 0.14-mile greater crossing length of freshwater forested/scrub-shrub wetlands, as well as an increase of 0.5-acre of impacts to forest land. This alternative also crosses the New Piasa Chautauqua Historic District in Jersey County, Illinois; the Upper Mississippi Conservation Area via HDD in St. Charles County, Missouri; and the adjacent conservation easement of Ducks Unlimited, which is also registered as the privately-owned Protective Management Area Raccoon Ranch and managed for multiple uses including hunting. The length of pipeline on USACE-owned lands would be comparable to the proposed route; however, this alternative would cross both USACE-controlled lands and a flowage easement. Unlike the proposed route, this alternative route does not collocate with existing rights-of-way and would, therefore, impact extensive and un-fragmented forest lands.

The northern HDD entry/exit location would require a drilling spread and equipment setup near Fern Glen Valley Road in Chautauqua, Illinois. Several structures in this area, including occupied structures, are located within 0.25-mile of the alternative drill location and would be impacted by the noise of the construction. Temporary workspace for pipe staging would be located south of the river in Missouri. Based on the location of the new exit location and the increased length of the HDD installation, multiple strings would need to be staged (with

intermediate welds needed during pull-back operations) due to a lack of space to stage the entire pipeline in a single pipe string. Stopping to complete intermediate welds during pullback operations increases risks to the installation due to increased installation loads and stresses to recommence pullback operations. In evaluating these additional risks on the success of the drill, the potential impact to the surrounding community due to the proximity of the drill to occupied structures, and the increased impact to un-fragmented forest, it was determined that this alternative would be significantly less desirable than the proposed route. This route is depicted on Figure 7 (Attachment 1).

Avoidance of the Potential Timber Rattlesnake Habitat

In addition to the alternatives of the proposed route crossing of the Mississippi River, Spire also evaluated the feasibility of conducting an HDD of the tracts to the north of the Mississippi River in order to minimize impacts to forested land. Spire evaluated locating an HDD exit location on agricultural land at approximately MP 43.9 and locating the HDD entry location at MP 45.1 (Spire's current HDD entry location for the Mississippi River HDD). Based solely on bore geometry, an HDD alignment would be possible but could encounter serious risks discussed below. The total length of this HDD installation would be approximately 6,250 feet. Design preparation for the HDD would require approximately six to eight geotechnical boreholes (spaced equally along the alignment) to be drilled to depths below the proposed HDD installation to characterized the ground materials and determine the associated risk. Risks of this HDD are described as follows:

- There is a significant elevation change of approximately 220 feet between the evaluated HDD entry and exit locations. This elevation change would result in approximately 950 feet of the HDD alignment lacking any supportive drilling fluid pressure to help support and stabilize the geotechnical materials. The lack of fluid increases bore instability/collapse risks, stuck pipe conditions during installation, and/or potential damage to the product pipe as the pipe is pulled through the long section of dry bore. Conversely, in order to ensure enough drilling fluid is present in the drill, an increase of pressure of the drilling fluid would be required which would significantly increase the risk of potential inadvertent release of drilling fluid onto the surface. This would result in additional forested clearing in the HDD alignment.
- The completion of this HDD could require a drill and intersect method which requires drill rigs to be staged on each end of the installation, drilling towards each other to meet at the midpoint of the HDD. The elevation difference of 220 feet between the entry and exit locations would result in significant drilling fluid pressures at the lower elevation at the instant when the two drills intersect, which would result in drilling fluid draining towards the lower elevation. This would cause an increased risk of over flow of drilling fluid containment at the lower drill site as pumps moving the fluids to storage tanks may not be sufficient to accommodate the increased volume and velocity. Due to the increased volume of fluid, significantly more staging area would be required at the lower elevation HDD drill pad to store fluids in tanks. These tanks could require up to 50 percent more additional cleared temporary work areas in the forested areas near the Mississippi River.

- Product pipe installation requires minimization of the number of pull strings and associated intermediate welds to minimize delays and associated risks of a stuck pipe condition. The lowest risk alternative would require staging of the entire 6,250-foot-long pipe string in a single string following a straight alignment behind the HDD exit location on the north end of the requested alignment. This would require an equal length of workspace for HDD pullback behind the exit location. Based on publically available aerial imagery, such a length is not possible without clearing additional forested areas north of the HDD exit location. The length of open space currently available without clearing trees is approximately 1,000 to 1,100 feet. The higher risk alternative would use this open area, which would result in approximately eight to 10 pipe strings and up to nine intermediate welds during pullback operations, significantly increasing the risk to this installation. This number of pullback strings and intermediate welds has not been attempted within the HDD industry.

4) Data and information to indicate that the proposed taking will not reduce the likelihood of the survival of the endangered or threatened species in the wild within the State of Illinois, the biotic community of which the species is a part, or the habitat essential to the species existence in Illinois.

Indiana Bat

Indiana bat population estimates are based on hibernacula surveys. The USFWS (2017) estimated the range-wide population of Indiana bats at 530,705 individuals. The Midwest (USFWS region) supported 86 percent of the total population with 453,731 individuals. Missouri supported the largest population (217,884 individuals; 41%), followed by Indiana with 180,583 (34%). Illinois supported the fourth largest population with 52,354 individuals, accounting for ten percent of the estimated range wide population and 12 percent of the Midwest population. Current populations are likely lower than estimated due to WNS; however, these estimates, compared with the anticipated level of incidental take of Indiana bats, provide reasonable evidence that the proposed incidental taking will not reduce the likelihood of the survival of the species in the wild in Illinois.

Critical habitat for the Indiana bat was federally-designated on September 24, 1976 and included 11 caves and two abandoned mines in six states (41 FR 41914). The nearest critical habitat for the Indiana bat includes a cave in Washington County, Missouri (approximately 50 miles from the Project), a cave in Franklin County, Missouri (approximately 60 miles from the Project), and a cave in Crawford County, Missouri (approximately 70 miles from the Project). In addition to these areas, Indiana bats use caves and mines as hibernacula in the winter and a variety of wooded areas during other life stages. The proposed incidental taking will not affect any critical habitat, known hibernacula, or potential hibernacula, and is not expected to significantly reduce the availability of wooded areas, neither as a biotic community (a grouping of populations of different organisms), nor as an overall habitat type essential to the species existence in Illinois.

Northern Long-eared Bat

Unlike Indiana bat population estimates based on hibernacula surveys, northern long-eared bat populations were recently estimated based on summer survey records and occupancy rates. The USFWS (2016) estimated the range-wide summer population of northern long eared bats at 6,546,718 adults. The Midwest supported 43 percent of the total population with 2,785,032 individuals. Arkansas supported the largest population (863,850 adults; 13%), followed by Minnesota with 829,890 (13%). Illinois supported the twelfth largest population with 213,720 adults, accounting for three percent of the estimated range wide population and eight percent of the Midwest population. Current populations are likely lower than estimated due to WNS; however, these estimates, compared with the anticipated level of take of northern long-eared bats, provide reasonable evidence that the proposed incidental taking will not reduce the likelihood of the survival of the species in the wild in Illinois.

Critical habitat has not been federally-designated for the species (81 FR 24707), nor have any areas essential to the conservation of the species been identified. Northern long-eared bats use caves and mines as hibernacula in the winter and a variety of wooded areas during other life stages. The proposed incidental taking will not affect any known or potential hibernacula and is not expected to significantly reduce the availability of wooded areas, neither as a biotic community (a grouping of populations of different organisms), nor as an overall habitat type essential to the species existence in Illinois.

Finally, the USFWS determined that incidental take of northern long-eared bats as a result of tree clearing, normally prohibited under Section 9 of the ESA, is no longer prohibited as long as a project's design meets the requirements of the final rule, under Section 4(d) of the ESA, for the species (i.e., it is not within 150 feet of any known, occupied maternity roosts or within 0.25-mile of any known, occupied hibernacula). Projects that are consistent with the final Section 4(d) rule are not likely to jeopardize the species or cause adverse effects at a population level. The USFWS determined that the Project is consistent with the final 4(d) rule (Attachment 8).

Timber Rattlesnake

Current range-wide and regional population estimates for the timber rattlesnake are unavailable; however the adult population in the United States presumably exceeds 100,000 individuals (Hammerson 2007), and is widespread. Records of timber rattlesnakes exist in 27 counties in Illinois since 1980 (INHS 2016). Previously more widespread, the current population has probably declined due to habitat loss, and now probably occurs in moderate numbers only in the Shawnee Hills region in southern Illinois (INHS 2016). These estimates, compared with the anticipated level of take of timber rattlesnakes, provide reasonable evidence that the proposed incidental taking will not reduce the likelihood of the survival of the endangered or threatened species in the wild in Illinois.

Timber rattlesnakes use rock dens in the winter and a variety of other rocky and wooded areas during other life stages. The proposed incidental taking will not affect any known or potential dens and is not expected to

significantly reduce the availability of wooded areas, neither as a biotic community (a grouping of populations of different organisms), nor as an overall habitat type essential to the species existence in Illinois.

5) An **implementing agreement**, which shall include, but not be limited to (on a separate piece of paper containing signatures):

A) Names and signatures of all participants in the execution of the conservation plan;

B) The obligations and responsibilities of each of the identified participants with schedules and deadlines for completion of activities included in the conservation plan and a schedule for preparation of progress reports to be provided to the IDNR;

C) Certification that each participant in the execution of the conservation plan has the legal authority to carry out their respective obligations and responsibilities under the conservation plan;

D) Assurance of compliance with all other federal, State and local regulations pertinent to the proposed action and to execution of the conservation plan; and

E) **Copies of any final federal authorizations for a taking already issued to the applicant**, if any.

Implementing Agreement

Spire agrees to implement this Conservation Plan upon approval by the IDNR and issuance of the requested ITA. Spire would be solely responsible for meeting the terms and conditions of the ITA and would allocate sufficient personnel and resources for effective implementation of the Conservation Plan. Spire would be responsible for planning, contract execution, and construction supervision for the entire Project, including the Plan Area.

Names, Signatures, Obligations, and Responsibilities

Russell A. English of Spire would serve as the Conservation Plan Coordinator and would be responsible for the implementation of the avoidance and minimization measures, mitigation measures, restoration activities, monitoring, and reporting as described in this Conservation Plan. An IDNR employee would be the IDNR liaison to the Conservation Plan and will receive monitoring reports and notification of any adaptive management measures necessary to comply with the Conservation Plan.

Contact information for the Conservation Plan Coordinator is as follows:

Russell A. English
Spire Pipeline, LLC
700 Market Street
St. Louis, MO 63101
Russell.English@SpireEnergy.com
(314) 342-3303

Russell A. English

8-9-2018
Date

Certification

Spire hereby certifies that the Conservation Plan Coordinator has the legal authority to carry out their respective obligations and responsibilities under the Conservation Plan.

Schedule for Preparation of Progress Reports

The schedule for preparation of progress reports detailing the results of post-construction monitoring, as required by the IDNR and described in section 2) D) of this Conservation Plan, are summarized in Table 16.

Table 16. Schedule for Preparation of Progress Reports[1].

Progress Report	Agency or Organization	Monitoring Date (Anticipated)	Report Submittal Date (Anticipated)
Species Monitoring			
Year 2 Indiana and Northern Long-eared Bat Monitoring	IDNR	(Summer 2021)	(December 2021)
Year 2 Timber Rattlesnake Monitoring	IDNR	(Spring 2021)	(December 2021)
Year 7 Indiana and Northern Long-eared Bat Monitoring	IDNR	(Summer 2026)	(December 2026)
Year 7 Timber Rattlesnake Monitoring	IDNR	(Spring 2026)	(December 2026)
Revegetation Monitoring			
Year 1 Wetland Revegetation Monitoring	FERC	(After first growing season in 2020)	(Not Applicable)
Year 1 Upland Revegetation Monitoring	FERC	(As Needed, at minimum once after first growing season in 2020)	(Reports Filed Quarterly)
Year 2 Wetland Revegetation Monitoring	FERC	(After first growing season in 2021)	(Not Applicable)
Year 2 Upland Revegetation Monitoring	FERC	(As Needed, at minimum once after first growing season in 2021)	(Reports Filed Quarterly)
Year 3 Wetland Revegetation Monitoring	FERC	(After first growing season in 2022)	(December 2022)

Compliance with Federal, State, and Local Regulations

Spire will comply with all applicable federal, state, and local regulations that govern the proposed Project and will provide copies of federal authorizations that could affect the terms and conditions of any incidental take permit authorized by the IDNR for this Project. Spire anticipates full attainment and compliance with permits that it is required by law to obtain.

Spire submits this Conservation Plan in cooperation with the IDNR, as a state authority, but nevertheless maintains that Illinois law or regulation that conflicts with federal regulation or would unreasonably delay construction is preempted by the Natural Gas Act of 1938, as amended.

Federal Authorizations for Taking

The FERC conducted formal consultation with the USFWS regarding incidental take of the Indiana bat and the northern long-eared bat. The USFWS determined that the Project fulfills the conservation measures in the final ESA 4(d) rule dated January 5, 2016 for the northern long-eared bat. The Project is consistent with the description in the Service's programmatic biological opinion on the 4(d) rule; therefore, incidental take of the species is not prohibited by Section 9 of the ESA. The USFWS determination on the northern long-eared bat and the USFWS Biological Opinion on the Indiana bat are included in Attachment 8 (Table 17).

Table 17. Schedule for Formal Consultation between FERC and USFWS

Species	Milestone	Submittal Date	Receipt Date
Indiana Bat	Biological Opinion	September 2017	February 2018
Northern Long-eared Bat	Streamlined 4(d) Consultation (programmatic Biological Opinion)	September 2017	October 2017

As a condition of the Biological Opinion, the USFWS indicated that re-initiation of consultation should occur if workspace changes are proposed within occupied areas that require a net increase of more than 1 additional acre of clearing from the proposed 28.8 acres, as reported in the Project Biological Assessment submitted to USFWS.

The IDNR has also agreed to this re-initiation threshold; however, it is important to note that this Conservation Plan includes effects to an additional 1.6 acres of northern long-eared bat habitat that is not covered by the USFWS BO. Therefore, changes to workspaces within occupied areas sufficient to require re-initiation with the IDNR require a net increase of more than 1 additional acre of clearing from the proposed 30.4 acres.

Updates to the Project route or workspace in areas covered by this Conservation Plan that affect more than 1 additional acre of clearing would be reported to the IDNR liaison to this Conservation Plan per this Implementing Agreement. Spire is reviewing a potential Project re-route near MP 45 (within Indiana bat and timber rattlesnake habitat) that is considered a non-substantive change (per IDNR) to the Project and the effects to listed species.

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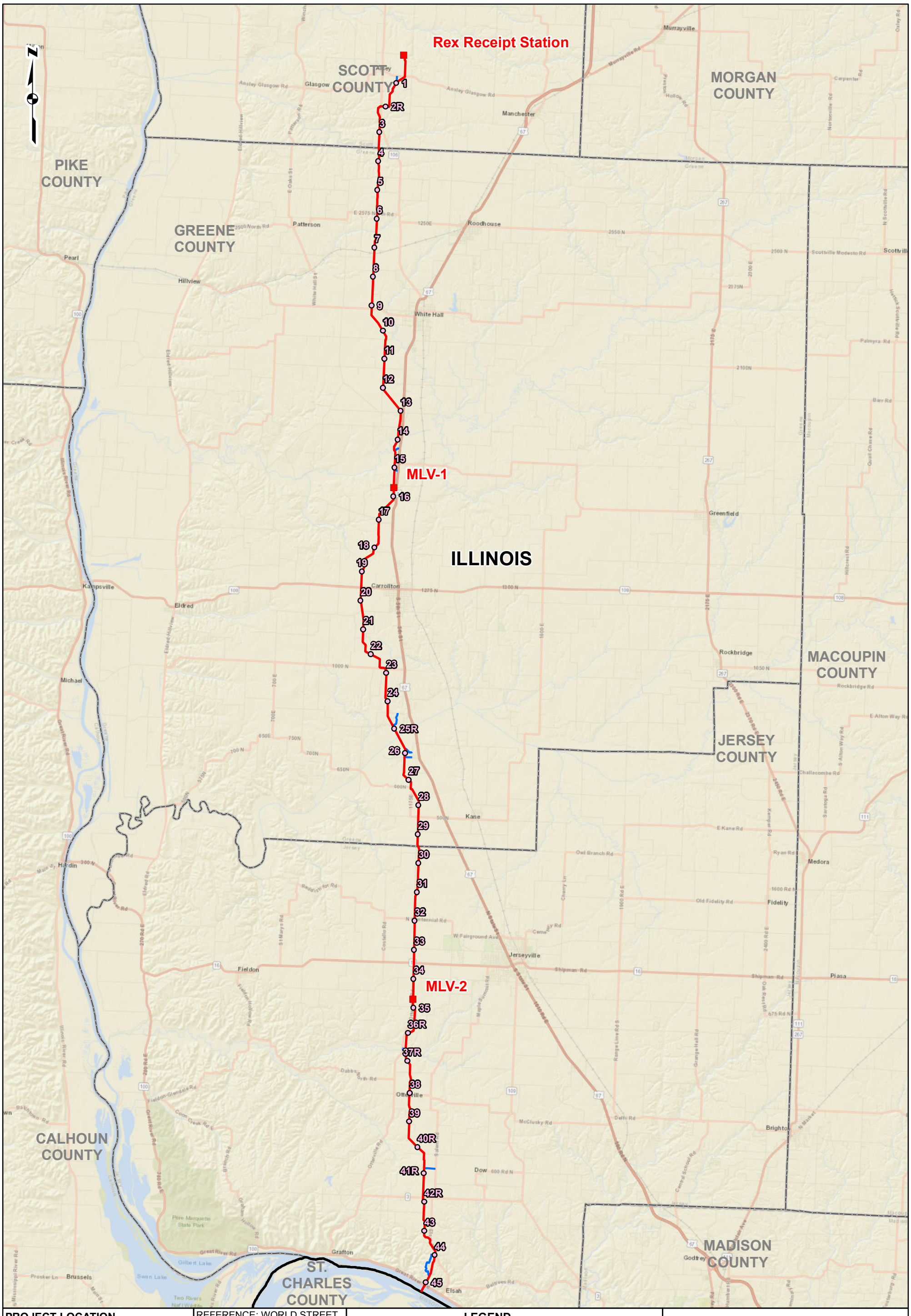
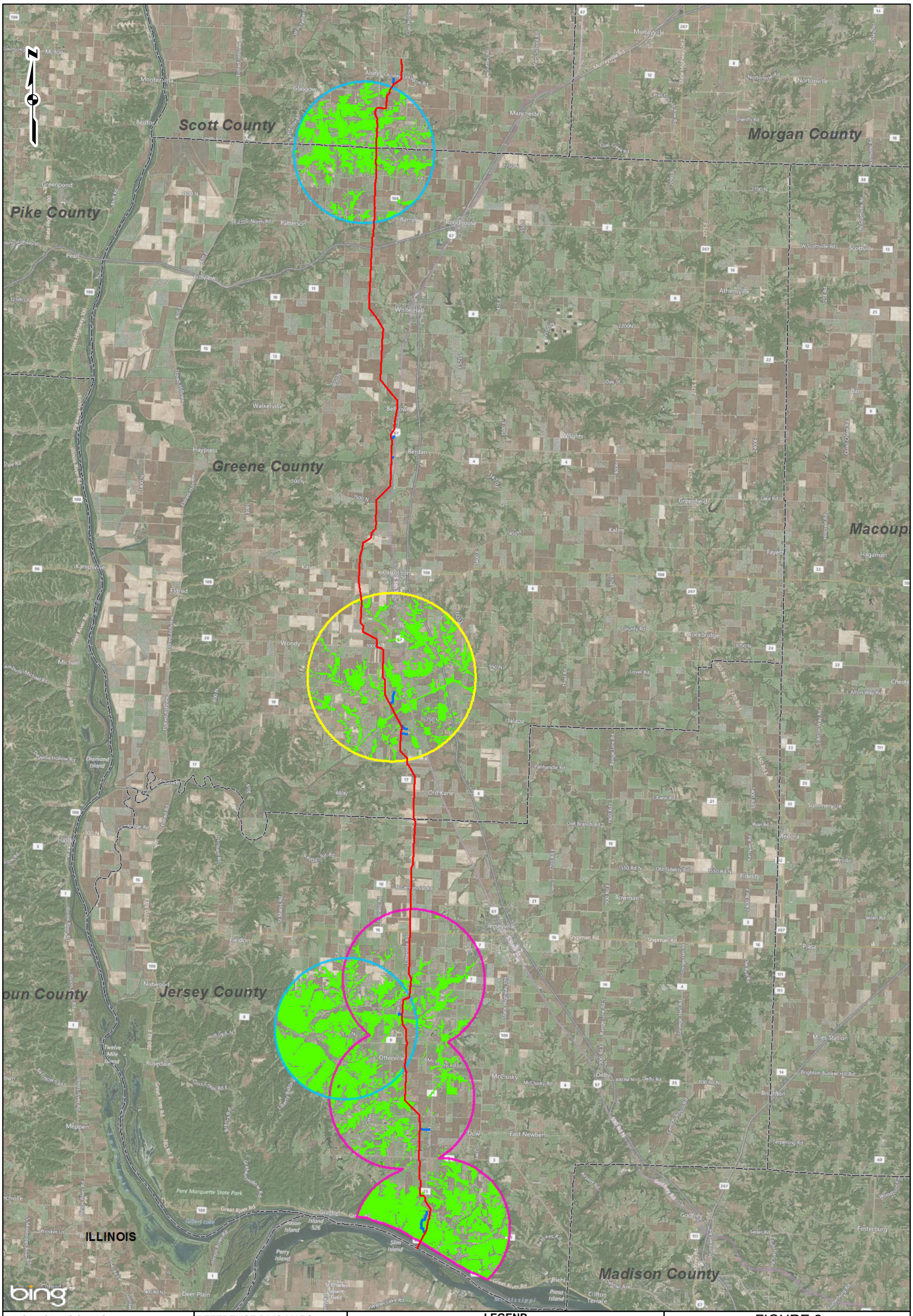
ATTACHMENT 1
FIGURES



PROJECT LOCATION	REFERENCE: WORLD STREET MAP, ESRI, 2017, ACCESSED 10/2017	LEGEND	FIGURE 1 PROJECT LOCATION
GREENE, JERSEY AND SCOTT COUNTIES, IL		Milepost; Facility; 24-inch Pipeline; County Boundary; Access Road; State Boundary; 0 1.5 3 6 Miles	gai consultants SPIRE STL PIPELINE PROJECT spire DRAWN BY: PK DATE: 10/20/2017 CHECKED: JAD APPROVED: JAD

C:\Users\kudlup\Desktop\Priya\2016\Spire\MXD\CP\102012017\Figure 1 Project Location.mxd



PROJECT LOCATION

GREENE, JERSEY AND SCOTT COUNTIES, IL

REFERENCE:BING MAPS HYBRID, © 2014 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS, ACCESSED : 10/2017

LEGEND

- 24-inch Pipeline
- Access Road
- Indiana Bat Summer Maternity Habitat
- Indiana Bat Summer Non-maternity Habitat
- Northern Long-eared Bat Summer Maternity Habitat
- County Boundary
- Forested within Known Habitat
- State Boundary

0 8,250 16,500 33,000 Feet

FIGURE 2
KNOWN BAT OCCURENCE AREAS

gai consultants

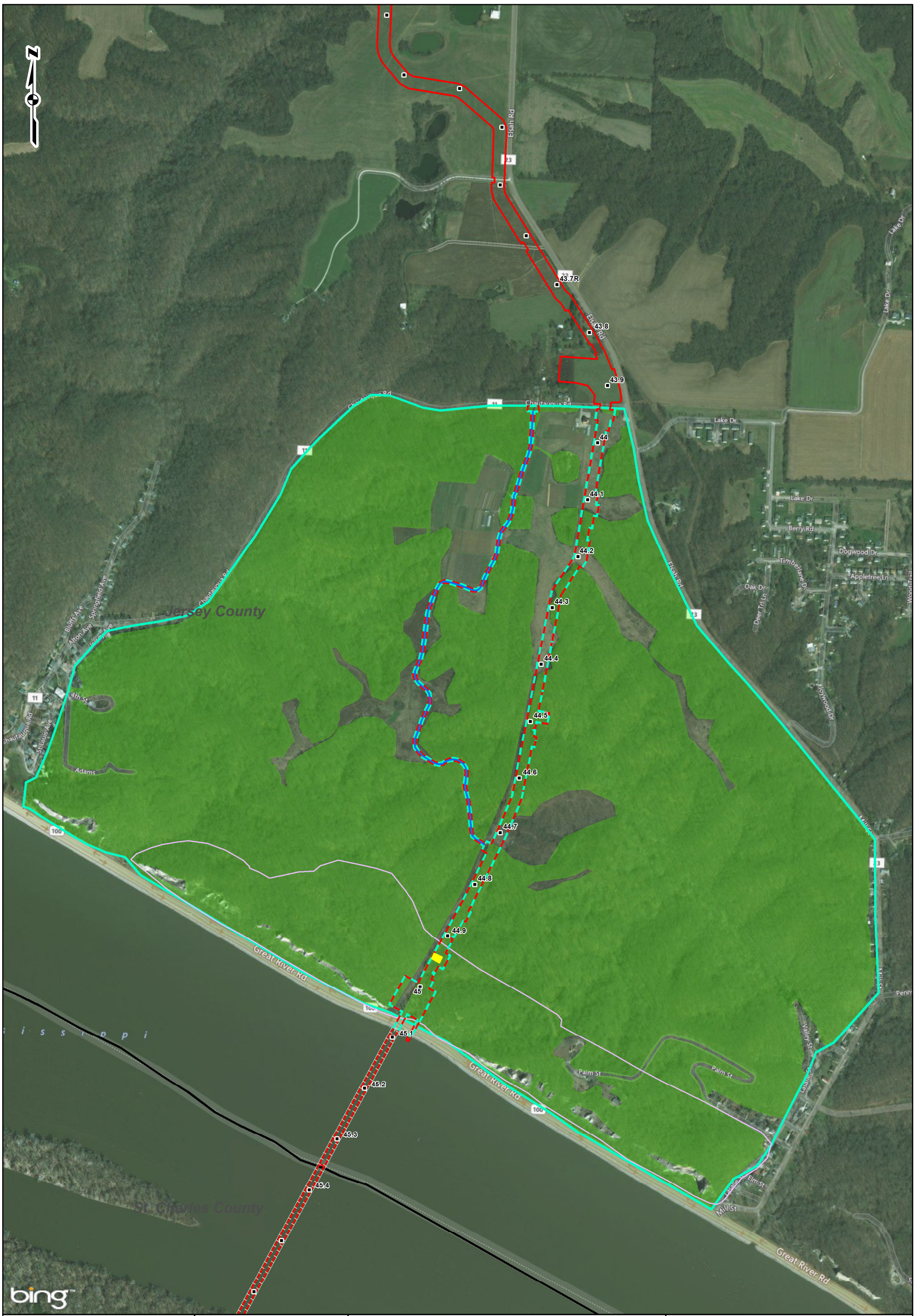
SPIRE STL PIPELINE PROJECT

spire

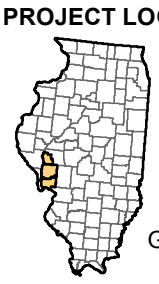
DRAWN BY: PK DATE: 10/20/2017

CHECKED: JAD APPROVED: JAD

C:\Users\kudlup\Desktop\Priya\2016\Spire\MXD\CP\102012017\Figure 2 Known Bat Occurence Areas.mxd



PROJECT LOCATION



GREENE, JERSEY AND SCOTT COUNTIES, IL

REFERENCE:BING MAPS HYBRID, © 2014 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS, ACCESSED : 02/2018

LEGEND

- 24- inch Pipeline
- Access Road
- Mile Post
- HDD
- Potential Blasting Area
- Principia Hill Prairies West Natural Area Inventory Site
- Timber Rattlesnake Monitoring Area
- Potential Timber RattlesnakeHabitat
- Forested within Known Habitat
- County Boundary
- State Boundary

0 400 800 1,600 Feet

FIGURE 3
TIMBER RATTLESNAKE HABITAT

gai consultants

SPIRE STL PIPELINE PROJECT

spire

DRAWN BY: PK DATE: 2/13/2018

CHECKED: JAD APPROVED: JAD

C:\Users\kudlup\Desktop\Priya\2016\Spire\MXD\CP\102012017\Figure 3 Timber Rattlesnake Habitat_021318.mxd

RALLS COUNTY
PIKE COUNTY
SCOTT COUNTY
MORGAN COUNTY
SANGAMON COUNTY
CHRISTIAN COUNTY
GREENE COUNTY
CALHOUN COUNTY
MACOUPIN COUNTY
MONTGOMERY COUNTY
LINCOLN COUNTY
JERSEY COUNTY
FAYETTE COUNTY
WARREN COUNTY
ST. CHARLES COUNTY
ST. LOUIS COUNTY
MADISON COUNTY
BOND COUNTY
CLINTON COUNTY

- PROPOSED 24-INCH DIAMETER PIPELINE
- PROPOSED 24-INCH NORTH COUNTY EXTENSION
- ILLINOIS ROUTE
- MISSOURI ROUTE
- ROCKIES EXPRESS PIPELINE (REX)
- PANHANDLE EASTERN
- ENABLE MRT PIPELINE
- NGPL PIPELINE
- MOGAS PIPELINE
- SOUTHERN STAR CENTRAL GAS PIPELINE
- COUNTY BOUNDARY
- STATE BOUNDARY

MAPS COMPILED UTILIZING ESRI TOPOGRAPHIC BASEMAP. DIGITIZED APPROXIMATE LOCATIONS OF THE FOLLOWING PIPELINE CENTERLINES: ENABLE MRT, MOGAS, NGPL, SOUTHERN STAR AND REX WERE CREATED BASED ON A PROVIDED SCREEN CAPTURE FROM SPIRE TAKEN FROM THE SNL PLATFORM (12/08/2016). PANHANDLE CENTERLINE CREATED TO RUN PARALLEL TO REX CENTERLINE. FOR REPRESENTATION PURPOSES ONLY.

SPIRE STL PIPELINE PROJECT

MAJOR ROUTE ALTERNATIVES
PROPOSED 24-INCH DIAMETER PIPELINE

SCOTT, GREENE, JERSEY, MORGAN, MACOUPIN, & MADISON COUNTIES, ILLINOIS
AND PIKE, LINCOLN, ST. CHARLES, & ST. LOUIS COUNTIES, MISSOURI

FEET
20,000 0 20,000 40,000

N
W E
S

ABSOLUTE SCALE:
1:240,000

REFERENCE SCALE:
1 IN = 20,000 feet

PREPARED FOR **Spire STL Pipeline**

PREPARED BY
MOTT MACDONALD

DRAWN BY:	EAP 12/16/2016
CHECKED BY:	KPW 12/19/2016
ENG. APPROVAL:	DG 12/19/2016
APPROVED BY:	JW 12/19/2016
REV. DATE:	04/2017
REVISION:	3
DESC:	AMENDMENT TO FERC
PAGE:	STLP-MJALT-001

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Figure 5. Summary of HDD Industry Drill Success in North America[1]

Product Pipe Diameter	Installation Length												
	1,000 m	1,200 m	1,400 m	1,600 m	1,800 m	2,000 m	2,200 m	2,400 m	2,600 m	2,800 m	3,000 m	3,500 m	3,750 m
	3,281 ft	3,937 ft	4,593 ft	5,249 ft	5,905 ft	6,562 ft	7,218 ft	7,874 ft	8,530 ft	9,186 ft	9,842 ft	11,483 ft	12,303 ft
200 mm (8 inch)	16	9	14	4	5	10	5	0	0	0	1	0	1
250 mm (10 inch)	9	9	4	11	1	0	3	1	0	0	0	0	0
300 mm (12 inch)	14	10	9	4	3	1	0	1	1	0	0	1	0
350 mm (14 inch)	3	5	3	0	1	0	0	0	0	0	0	0	0
400 mm (16 inch)	9	4	4	6	4	1	3	0	0	0	2	0	0
450 mm (18 inch)	0	0	0	2	0	0	0	0	0	0	0	0	1
500 mm (20 inch)	8	10	9	1	0	1	2	1	0	0	0	0	0
600 mm (24 inch)	29	30	9	12	9	4	1	2	0	0	1	0	0
750 mm (30 inch)	23	10	10	11	8	3	1	3	0	0	1	0	0
900 mm (36 inch)	23	21	21	6	2	1	2	0	1	0	0	0	0
1050 mm (42 inch)	29	21	11	5	1	1	0	0	0	0	0	0	0
1200 mm (48 inch)	1	2	1	0	0	0	0	0	0	0	0	0	0

Colour Coding:

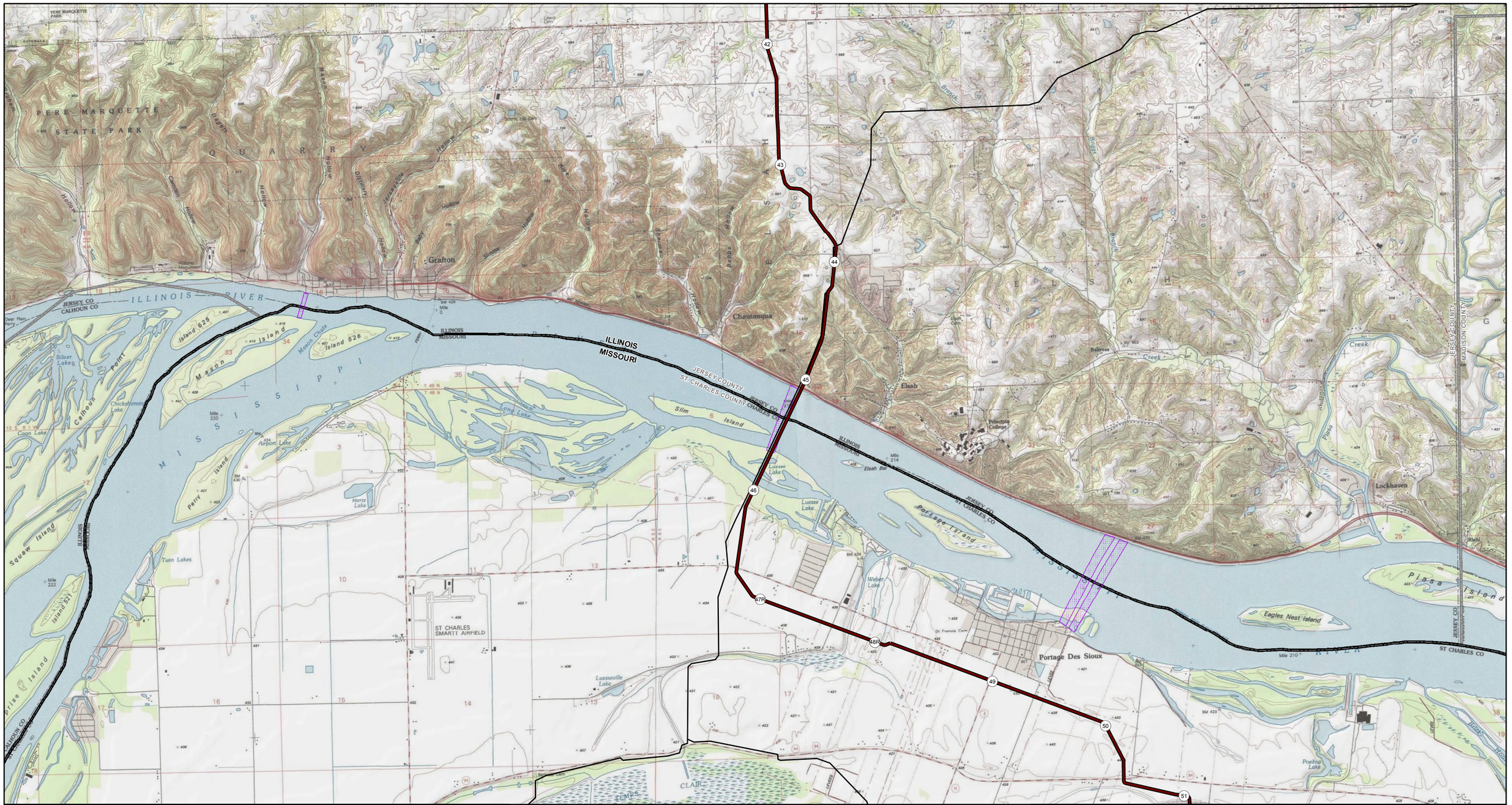
Within typical capabilities of industry. Multiple experienced contractors.

Zone of limited industry application. Considered feasible with an experienced contractor and favourable ground conditions.

Exceeds current capabilities of industry. Considered risky even with an experienced contractor and favourable ground conditions.

Notes:

1 Information presented is based solely on the reported installation lengths and diameters. Site-specific geotechnical and installation based risks were not considered in developing this chart.



① MILE POST

PROPOSED 24-INCH DIAMETER PIPELINE

EXISTING NUSTAR PIPELINE (DIGITIZED)*

BURIED PIPELINE OR CABLE FROM U.S. ARMY CORPS OF ENGINEERS UPPER MISSISSIPPI RIVER CHART MAPS (DIGITIZED) **

COUNTY BOUNDARY

STATE BOUNDARY

* THE NUSTAR CENTERLINE WAS DIGITIZED UTILIZING THE PHMSA NATIONAL PIPELINE MAPPING SYSTEM DATA VIEWER. (HTTPS://WWW.NPMS.PHMSA.DOT.GOV/)
** BURIED PIPELINE OR CABLE EASEMENT DIGITIZED APPROXIMATE LOCATIONS WERE CREATED BASED ON THE U.S. ARMY CORPS OF ENGINEERS RIVER CHART MAPS. FOR REPRESENTATION PURPOSES ONLY. MAP COMPILED UTILIZING ESRI TOPOGRAPHIC BASEMAP.

SPIRE STL PIPELINE PROJECT

PROPOSED MISSISSIPPI RIVER CROSSING QUAD OVERVIEW

JERSEY COUNTY, ILLINOIS AND
ST. CHARLES COUNTY, MISSOURI

4,000 2,000 0 4,000 8,000 FEET

N W E S

ABSOLUTE SCALE: 1:48,000

REFERENCE SCALE: 1 IN = 4,000 FEET

PREPARED FOR Spire STL Pipeline

PREPARED BY MOTT MACDONALD

DRAWN BY:	NDK 12/19/2016
CHECKED BY:	EAP 12/19/2016
APPROVED BY:	JW 12/19/2016
REV. DATE:	04/2017
REVISION:	1
DESC:	AMENDMENT TO FERC
PAGE:	1 OF 1

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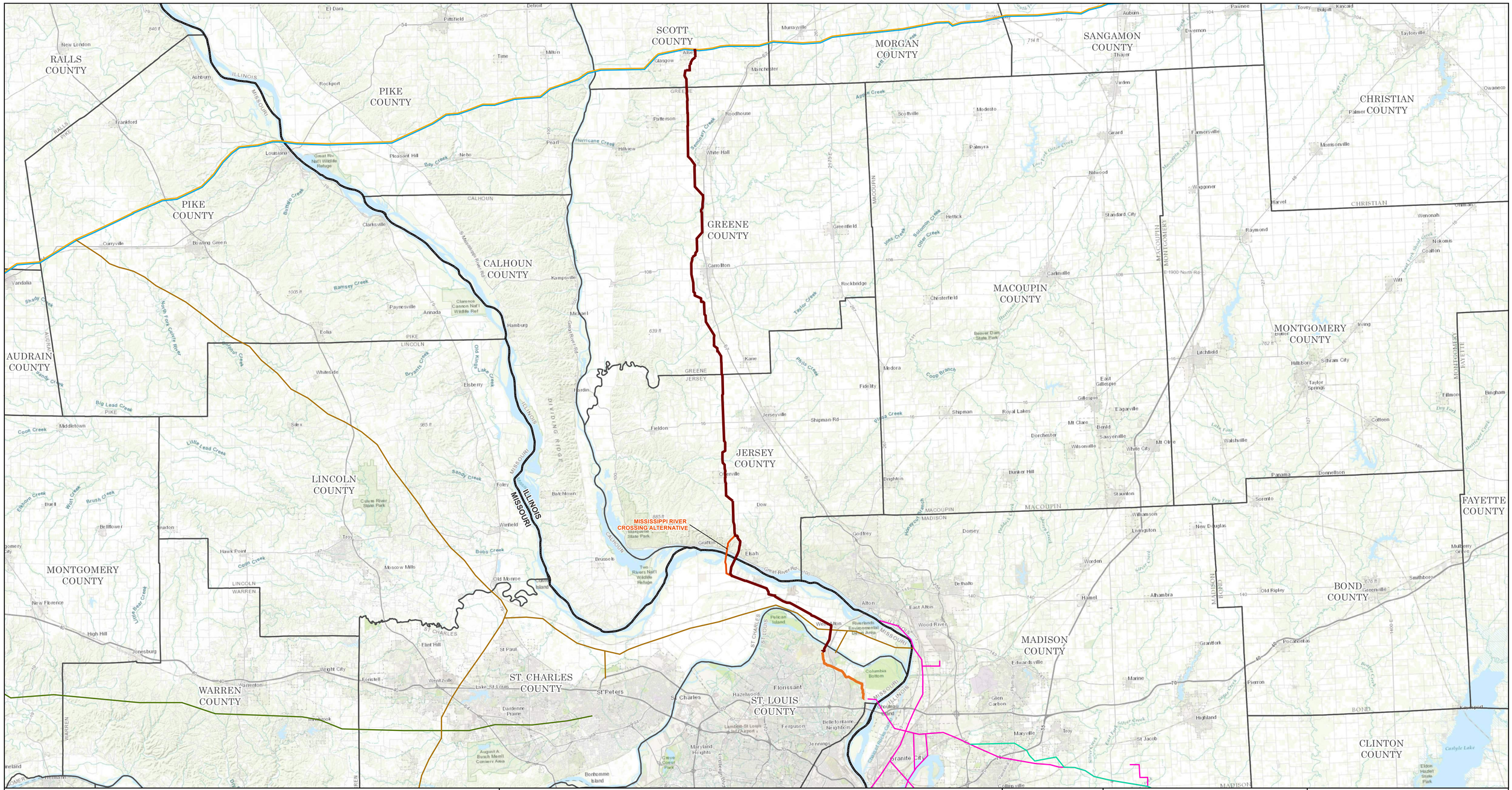

PROPOSED 24-INCH DIAMETER PIPELINE
PROPOSED 24-INCH NORTH COUNTY EXTENSION
MISSISSIPPI RIVER CROSSING ALTERNATIVE
ROCKIES EXPRESS PIPELINE (REX)
PANHANDLE EASTERN
ENABLE MRT PIPELINE
NGPL PIPELINE
MOGAS PIPELINE
SOUTHERN STAR CENTRAL GAS PIPELINE
COUNTY BOUNDARY
STATE BOUNDARY

MAPS COMPILED UTILIZING ESRI TOPOGRAPHIC BASEMAP. DIGITIZED APPROXIMATE LOCATIONS OF THE FOLLOWING PIPELINE CENTERLINES: ENABLE MRT, MOGAS, NGPL, SOUTHERN STAR AND REX WERE CREATED BASED ON A PROVIDED SCREEN CAPTURE FROM SPIRE TAKEN FROM THE SNL PLATFORM (12/08/2016). PANHANDLE CENTERLINE CREATED TO RUN PARALLEL TO REX CENTERLINE. FOR REPRESENTATION PURPOSES ONLY.

SPIRE STL PIPELINE PROJECT

MISSISSIPPI RIVER CROSSING ALTERNATIVE
PROPOSED 24-INCH DIAMETER PIPELINE

SCOTT, GREENE, & JERSEY COUNTIES, ILLINOIS
AND ST. CHARLES & ST. LOUIS COUNTIES, MISSOURI

20,000 0 20,000 40,000 FEET

N W E S

ABSOLUTE SCALE: 1:240,000

REFERENCE SCALE: 1 IN = 20,000 feet

PREPARED FOR **Spire STL Pipeline**

PREPARED BY **MOTT MACDONALD**

DRAWN BY:	EAP 05/04/2017
CHECKED BY:	NDK 05/04/2017
ENG. APPROVAL:	DG 05/04/2017
APPROVED BY:	JW 05/04/2017
REV. DATE:	05/2017
REVISION:	0
DESC:	SUBMIT FOR REVIEW
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spire

ATTACHMENT 2
ECOCAT RECEIPT

EcoCAT
Ecological Compliance Assessment Tool

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Applicant:	GAI Consultants, Inc	*IDNR Project Number:*	1703874
Contact:	Lori Ferry	*Date:*	10/21/2016
Address:	1444 Farnsworth Avenue, Suite 303 Aurora, IL 60505	*Alternate Number:*	E160438, Part 2 of 1703873

Project: Spire STL Pipeline
Address: Not Applicable, Not Applicable

Description: Spire is in the planning stages of the Project. As proposed, the Project will serve the energy needs of residential,commercial, and industrial customers in the eastern portion of Missouri, including the St. Louis metropolitan area and surrounding counties. The Project will consist of approximately 57.4 miles of new build 24 inch diameter steel pipeline (referred to as the “24-inch pipeline” portion of the Project)originating at an interconnection with Rockies Express Pipeline LLC (“REX”) pipeline in Scott County, Illinois, extending down through Greene and Jersey Counties in Illinois before crossing the Mississippi River and extending east in St. Charles County, Missouri. The 24 -inch pipeline then crosses the Missouri River and ties into an existing pipeline in St. Louis County, Missouri, that is currently owned and operated by Laclede Gas Company (“LGC”) (referred to as “Line 880”). Spire plans to purchase Line 880, including its appurtenant and ancillary facilities, from LGC and modify the pipeline before placing it into interstate service. Line 880 consists of approximately 7.6 miles of existing 20-inch-diameter steel natural gas pipeline located in St. Louis County, Missouri, that will connect the new build portion of the Project to the Enable Mississippi River Transmission, LLC(“Enable MRT”)pipeline along the western bank of the Mississippi River, in St. Louis County, Missouri. The total length of the Project pipelines will be approximately 65.0 miles. No compression will be required. The Project will include pipeline interconnects with REX in Illinois and LGC and Enable MRT in Missouri. The Project will also include the construction of minor aboveground facilities.

Approximately 45 miles of new build 24-inch diameter steel pipeline will be located in Illinois and traverse Scott, Greene, and Jersey Counties. One metering and regulating station and one pig launcher are proposed in Scott County, Illinois, at the interconnection location with the REX pipeline.

GAI is providing a one-half-mile buffer

Natural Resource Review Results

Consultation for Endangered Species Protection and Natural Areas Preservation (Part 1075)

The Illinois Natural Heritage Database contains no record of State-listed threatened or endangered species, Illinois Natural Area Inventory sites, dedicated Illinois Nature Preserves, or registered Land and Water Reserves in the vicinity of the project location.

Consultation is terminated. This consultation is valid for two years unless new information becomes available that was not previously considered; the proposed action is modified; or additional species, essential habitat, or Natural Areas are identified in the vicinity. If the project has not been implemented within two years of the date of this letter, or any of the above listed conditions develop, a new consultation is necessary. Termination does not imply IDNR's authorization or endorsement.

Location

The applicant is responsible for the accuracy of the location submitted for the project.

County: Greene	*County:* Scott
Township, Range, Section:	*Township, Range, Section:*
11N, 12W, 2	, ,
11N, 12W, 3	, ,
11N, 12W, 4	, ,
11N, 12W, 10	, ,
11N, 12W, 14	, ,
11N, 12W, 15	, ,
11N, 12W, 22	, ,
11N, 12W, 23	, ,
11N, 12W, 26	, ,
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11N, 12W, 34	, ,
11N, 12W, 35	, ,
12N, 12W, 3	, ,
12N, 12W, 4	, ,
12N, 12W, 9	, ,
12N, 12W, 10	, ,
12N, 12W, 15	, ,
12N, 12W, 16	, ,
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12N, 12W, 22	, ,
12N, 12W, 27	, ,
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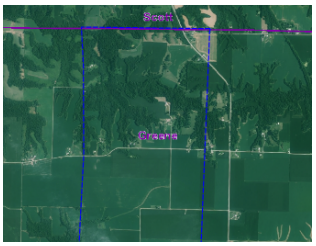
, ,	13N, 12W, 33
, ,	13N, 12W, 34



IL Department of Natural Resources Contact
Natalia Jones
217-785-5500
Division of Ecosystems & Environment

Government Jurisdiction
IL Environmental Protection Agency
Not Applicable
1021 North Grand Avenue East
Springfield, Illinois 62794

Disclaimer

The Illinois Natural Heritage Database cannot provide a conclusive statement on the presence, absence, or condition of natural resources in Illinois. This review reflects the information existing in the Database at the time of this inquiry, and should not be regarded as a final statement on the site being considered, nor should it be a substitute for detailed site surveys or field surveys required for environmental assessments. If additional protected resources are encountered during the project's implementation, compliance with applicable statutes and regulations is required.

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EcoCAT
Ecological Compliance Assessment Tool

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Applicant:	GAI Consultants, Inc	*IDNR Project Number:*	1703876
Contact:	Lori Ferry	*Date:*	10/21/2016
Address:	1444 Farnsworth Avenue, Suite 303 Aurora, IL 60505	*Alternate Number:*	E160438, Part 3 of 1703873

Project: Spire STL Pipeline
Address: Not Applicable , Not Applicable

Description: Spire is in the planning stages of the Project. As proposed, the Project will serve the energy needs of residential,commercial, and industrial customers in the eastern portion of Missouri, including the St. Louis metropolitan area and surrounding counties. The Project will consist of approximately 57.4 miles of new build 24 inch diameter steel pipeline (referred to as the “24-inch pipeline” portion of the Project originating at an interconnection with Rockies Express Pipeline LLC(“REX”) pipeline in Scott County, Illinois, extending down through Greene and Jersey Counties in Illinois before crossing the Mississippi River and extending east in St. Charles County, Missouri. The 24 -inch pipeline then crosses the Missouri River and ties into an existing pipeline in St. Louis County,Missouri, that is currently owned and operated by Laclede Gas Company(“LGC”) (referred to as “Line 880”). Spire plans to purchase Line 880, including its appurtenant and ancillary facilities, from LGC and modify the pipeline before placing it into interstate service. Line 880 consists of approximately 7.6 miles of existing 20-inch-diameter steel natural gas pipeline located in St. Louis County,Missouri, that will connect the new build portion of the Project to the Enable Mississippi River Transmission, LLC(“Enable MRT”)pipeline along the western bank of the Mississippi River, in St. Louis County, Missouri. The total length of the Project pipelines will be approximately 65.0 miles. No compression will be required. The Project will include pipeline interconnects with REX in Illinois and LGC and Enable MRT in Missouri. The Project will also include the construction of minor aboveground facilities.

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Location

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County: Greene	*County:* Jersey
Township, Range, Section:	*Township, Range, Section:*
10N, 12W, 2	, ,
10N, 12W, 3	, ,
10N, 12W, 4	, ,
10N, 12W, 9	, ,
10N, 12W, 10	, ,
10N, 12W, 15	, ,
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9N, 12W, 26	, ,
9N, 12W, 35	, ,
9N, 12W, 36	, ,
, ,	8N, 12W, 1
, ,	8N, 12W, 2

IL Department of Natural Resources Contact
Pat Malone
217-785-5500
Division of Ecosystems & Environment

Government Jurisdiction
IL Environmental Protection Agency
Not Applicable
1021 North Grand Avenue East
Springfield, Illinois 62794

Disclaimer

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3. IDNR reserves the right to enhance, modify, alter, or suspend the website at any time without notice, or to terminate or restrict access.

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EcoCAT
Ecological Compliance Assessment Tool

ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Applicant:	GAI Consultants, Inc	*IDNR Project Number:*	1703873
Contact:	Lori Ferry	*Date:*	10/21/2016
Address:	1444 Farnsworth Avenue, Suite 303 Aurora, IL 60505	*Alternate Number:*	E160438

Project: Spire STL Pipeline
Address: Not Applicable, Not Applicable

Description: Spire is in the planning stages of the Project. As proposed, the Project will serve the energy needs of residential, commercial, and industrial customers in the eastern portion of Missouri, including the St. Louis metropolitan area and surrounding counties. The Project will consist of approximately 57.4 miles of new build 24 inch diameter steel pipeline (referred to as the "24-inch pipeline" portion of the
Project) originating at an interconnection with Rockies Express Pipeline LLC ("REX") pipeline in Scott County, Illinois, extending down through Greene and Jersey Counties in Illinois before crossing the Mississippi River and extending east in St. Charles County, Missouri. The 24-inch pipeline then crosses the Missouri River and ties into an existing pipeline in St. Louis County, Missouri, that is currently owned and operated by Laclede Gas Company ("LGC") (referred to as "Line 880"). Spire plans to purchase Line 880, including its appurtenant and ancillary facilities, from LGC and modify the pipeline before placing it into interstate service. Line 880 consists of approximately 7.6 miles of existing 20-inch-diameter steel natural gas pipeline located in St. Louis County, Missouri, that will connect the new build portion of the Project to the Enable Mississippi River Transmission, LLC ("Enable MRT") pipeline along the western bank of the Mississippi River, in St. Louis County, Missouri. The total length of the Project pipelines will be approximately 65.0 miles. No compression will be required. The Project will include pipeline interconnects with REX in Illinois and LGC and Enable MRT in Missouri. The Project
will also include the construction of minor aboveground facilities.

Spire anticipates a 90-foot temporary construction right-of-way width, which will include a 50-foot permanent easement. An additional 25 feet of temporary workspace will be required through agricultural areas, and additional temporary workspace may be required to facilitate construction in certain areas, such as crossings of ro

Natural Resource Review Results

Consultation for Endangered Species Protection and Natural Areas Preservation (Part 1075)

The Illinois Natural Heritage Database contains no record of State-listed threatened or endangered species, Illinois Natural Area Inventory sites, dedicated Illinois Nature Preserves, or registered Land and Water Reserves in the vicinity of the project location.

Consultation is terminated. This consultation is valid for two years unless new information becomes available that was not previously considered; the proposed action is modified; or additional species, essential habitat, or Natural Areas are identified in the vicinity. If the project has not been implemented within two years of the date of this letter, or any of the above listed conditions develop, a new consultation is necessary. Termination does not imply IDNR's authorization or endorsement.

Location

The applicant is responsible for the accuracy of the location submitted for the project.

County: Greene	*County:* Scott
Township, Range, Section:	*Township, Range, Section:*
12N, 12W, 3	, ,
12N, 12W, 4	, ,
, ,	13N, 12W, 14
, ,	13N, 12W, 15
, ,	13N, 12W, 21
, ,	13N, 12W, 22
, ,	13N, 12W, 23
, ,	13N, 12W, 27
, ,	13N, 12W, 28
, ,	13N, 12W, 33
, ,	13N, 12W, 34

IL Department of Natural Resources Contact
Natalia Jones
217-785-5500
Division of Ecosystems & Environment

Government Jurisdiction
IL Environmental Protection Agency
Not Applicable
1021 North Grand Avenue East
Springfield, Illinois 62794

Disclaimer

The Illinois Natural Heritage Database cannot provide a conclusive statement on the presence, absence, or condition of natural resources in Illinois. This review reflects the information existing in the Database at the time of this inquiry, and should not be regarded as a final statement on the site being considered, nor should it be a substitute for detailed site surveys or field surveys required for environmental assessments. If additional protected resources are encountered during the project's implementation, compliance with applicable statutes and regulations is required.

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EcoCAT
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ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Applicant:	GAI Consultants, Inc	*IDNR Project Number:*	1703880
Contact:	Lori Ferry	*Date:*	10/21/2016
Address:	1444 Farnsworth Avenue, Suite 303 Aurora, IL 60505	*Alternate Number:*	E160438, Part 4 of 1703873

Project: Spire STL Pipeline
Address: Not Applicable, Not Applicable

Description: Spire is in the planning stages of the Project. As proposed, the Project will serve the energy needs of residential, commercial, and industrial customers in the eastern portion of Missouri,including the St. Louis metropolitan area and surrounding counties. The Project will consist of

approximately 57.4 miles of new build 24 inch diameter steel pipeline (referred to as the “24-inch pipeline” portion of the Project originating at an interconnection with Rockies Express Pipeline LLC(“REX”) pipeline in Scott County, Illinois, extending down through Greene and Jersey Counties in Illinois before crossing the Mississippi River and extending east in St. Charles County, Missouri. The 24 -inch pipeline then crosses the Missouri River and ties into an existing pipeline in St. Louis County, Missouri, that is currently owned and operated by Laclede Gas Company(“LGC”) (referred to as “Line 880”). Spire plans to purchase Line 880, including its appurtenant and ancillary facilities, from LGC and modify the pipeline before placing it into interstate service. Line 880 consists of approximately 7.6 miles of existing 20-inch-diameter steel natural gas pipeline located in St. Louis County, Missouri, that will connect the new build portion of the Project to the Enable Mississippi River Transmission,LLC(“Enable MRT”)pipeline along the western bank of the Mississippi River, in St. Louis County, Missouri. The total length of the Project pipelines will be approximately 65.0 miles. No compression will be required. The Project will include pipeline interconnects with REX in Illinois and LGC and Enable MRT in Missouri. The Project will also include the construction of minor aboveground facilities.

Approximately 45 miles of new build 24-inch diameter steel pipeline will be located in Illinois and traverse Scott, Greene, and Jersey Counties. One metering and regulating station and one pig launcher are proposed in Scott County, Illinois, at the interconnection location with the REX pipeline.

GAI is providing a one-half-mile buffer

Natural Resource Review Results

Consultation for Endangered Species Protection and Natural Areas Preservation (Part 1075)

The Illinois Natural Heritage Database shows the following protected resources may be in the vicinity of the project location:

Chautauqua Prairie INAI Site
Powdermill Bed INAI Site
Principia Hill Prairies East INAI Site
Principia Hill Prairies West INAI Site
Palisades Nature Preserve
Principia Hill Prairies - East Natural Heritage Landmark
Principia Hill Prairies - West Natural Heritage Landmark
Black Sandshell *(Ligumia recta)*
Butterfly *(Ellipsaria lineolata)*
Ebonyshell *(Fusconaia ebena)*
Great Plains Rat Snake *(Elaphe emoryi)*

Large Ground Plum *(Astragalus crassicarpus var. trichocalyx)*
Timber Rattlesnake *(Crotalus horridus)*

An IDNR staff member will evaluate this information and contact you to request additional information or to terminate consultation if adverse effects are unlikely.

Location

The applicant is responsible for the accuracy of the location submitted for the project.

County: Greene	*County:* Jersey
Township, Range, Section:	*Township, Range, Section:*
9N, 12W, 35	, ,
9N, 12W, 36	, ,
, ,	6N, 11W, 5
, ,	6N, 11W, 6
, ,	6N, 11W, 7
, ,	6N, 11W, 8
, ,	6N, 11W, 17
, ,	6N, 11W, 18
, ,	6N, 11W, 19
, ,	6N, 11W, 20
, ,	6N, 12W, 1
, ,	6N, 12W, 12
, ,	7N, 11W, 19
, ,	7N, 11W, 30
, ,	7N, 11W, 31
, ,	7N, 12W, 1
, ,	7N, 12W, 2
, ,	7N, 12W, 11
, ,	7N, 12W, 12
, ,	7N, 12W, 13
, ,	7N, 12W, 14
, ,	7N, 12W, 23
, ,	7N, 12W, 24
, ,	7N, 12W, 25
, ,	7N, 12W, 36
, ,	8N, 12W, 1
, ,	8N, 12W, 2
, ,	8N, 12W, 11
, ,	8N, 12W, 12
, ,	8N, 12W, 13
, ,	8N, 12W, 14
, ,	8N, 12W, 23
, ,	8N, 12W, 24
, ,	8N, 12W, 25
, ,	8N, 12W, 26
, ,	8N, 12W, 35
, ,	8N, 12W, 36

IL Department of Natural Resources Contact
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ATTACHMENT 3
HDD CONTINGENCY PLAN

Spire STL Pipeline Project

Horizontal Directional Drill Contingency Plan

FERC Docket Nos. CP17-40-000 and CP17-40-001

April 2017

Public

Table of Contents

Acronyms and Abbreviations

FERC	Federal Energy Regulatory Commission
HDD	horizontal directional drill
LGC	Laclede Gas Company
Project	Spire STL Pipeline Project
Spire	Spire STL Pipeline LLC

Horizontal Directional Drill Contingency Plan

The following discussions summarize the minimum requirements for dealing with an inadvertent return during horizontal directional drill ("HDD") installations beneath the Mississippi and Missouri Rivers. It also presents a contingency plan in the event of a failed HDD installation. A detailed hydraulic fracture/inadvertent return plan will be developed by the HDD contractor and reviewed by Spire STL Pipeline LLC ("Spire") prior to commencing drilling operations.

1.0 Background Information

Spire is seeking authorization from the Federal Energy Regulatory Commission ("FERC") to construct and operate the proposed Spire STL Pipeline Project ("Project") located in Scott, Greene, and Jersey Counties, Illinois, and St. Charles and St. Louis Counties, Missouri. The proposed Project will consist of approximately 65 miles of new, greenfield, 24-inch-diameter steel pipeline in two segments. The first segment (referred to as the "24-inch pipeline" portion of the Project) will originate at a new interconnect with the Rockies Express Pipeline LLC pipeline in Scott County, Illinois and extend approximately 59 miles through Greene and Jersey Counties in Illinois before crossing the Mississippi River and extending east through St. Charles County, Missouri. The 24-inch pipeline then crosses the Missouri River into St. Louis County, Missouri, and terminates at a new interconnect with Laclede Gas Company ("LGC"). The second segment of new, greenfield pipeline (referred to as the "North County Extension"), will consist of a 24-inch-diameter steel pipeline which will extend approximately six miles from the LGC interconnect through the northern portion of St. Louis County and terminate at a new interconnect with Enable Mississippi River Transmission, LLC and LGC.

Spire proposes to use the HDD method to install the pipeline under the Mississippi River, Missouri River, Coldwater Creek, and Spanish Lake Park. A traditional single drill rig operation is anticipated to be used to complete the Missouri River, Coldwater Creek, and Spanish Lake Park HDD installations. For the Mississippi River, it is anticipated the HDD contractor will use the drill and intersect method to complete the installation due to the need for temporary conductor casings on each end of the HDD alignment (casings will be removed upon completion of pullback operations). The intersect method involves drilling individual pilot bores from each end of the HDD installation and intersecting in a target intersection location established in the bottom horizontal tangent of the HDD profile. Use of the drill and intersect method decreases the flow pathway length for each individual pilot bore. One advantage of this method is a lower required drilling fluid pressure necessary to complete each pilot bore operation.

1.1 HDD Construction Method

HDD is a surface-to-surface installation technique comprised of three primary stages including pilot bore, reaming, and product pipe installation. This method of construction is typically used to install pipelines in areas not amenable for open cut construction, including waterbodies, highways, railroads, runways, environmentally sensitive areas and urban environments. Assuming proper design and good HDD construction practices, the HDD method allows for the installation of pipelines with minimal impacts to the crossing feature(s).

The first stage of the installation process consists of advancing a steerable, rotary drill bit along the design alignment from the drill rig entry location to the exit location. The downhole tooling is matched to the anticipated ground conditions. Soil tooling is typically used in soils and bedrock tooling is used to drill through bedrock materials. As the pilot bore is advanced, a tracking system is used to locate the position and orientation of the assembly to allow for steering inputs required to maintain the design profile and alignment.

The second stage of the installation process is referred to as the reaming stage. This process consists of enlarging the pilot bore to a final diameter necessary to accommodate the product pipe. Depending upon the outer diameter of the product pipe, multiple reaming passes of increasing diameter are typically used to incrementally increase the size of the bore to the final required diameter. The acceptable HDD industry standard for the final bore diameter is generally 1.5 times the outer diameter of the pipe being installed for product pipe diameters less than or equal to 24 inches and 12 inches larger than the outer diameter of the product pipe for product pipe diameters greater than 24 inches. Hence, for the anticipated NPS24 pipeline, the final bore diameter is expected to be 36 inches.

Upon completion of the reaming pass(es), the condition of the HDD bore is assessed by pushing or pulling a barrel or ball reamer with a slightly larger diameter than the product pipe (but less than the final diameter of the bore) through the fully reamed bore from start to finish. This proving step is referred to as a swab pass. The observed drill rig effort during this installation step allows the HDD contractor to evaluate if the bore has been conditioned sufficiently to receive the product pipe.

The final stage of the installation process consists of pulling/installing the fabricated product pipe from the pipe entry location toward the drill rig. A reamer and swivel is placed between the drill pipe within the reamed bore and the pulling head connected to the product pipe. The swivel is used to isolate the torsional stresses from the rotating drill pipe and reamer assembly and prevent rotation of the product pipe during its installation. The reamer used in the pulling assembly is slightly larger than the pipe diameter, but smaller than the final bore diameter. The reamer assembly is used to clear any cuttings that may remain in the bore, reducing installation risks during the product pipe pullback phase of the installation process.

The use of the reamer also allows for fluids to be pumped downhole during pullback to assist with cuttings removal and lubrication of the product pipe string. Large diameter product pipes are typically buoyant when pulled into a drilling fluid filled bore and tend to float to the top of the bore. To counter buoyancy conditions and increased frictional forces, water is often added to the back end of the product pipe to increase the net weight of the product pipe string. Without the use of buoyancy counter measures, risks associated with overstressing of the product pipe and excessive damage to abrasion resistant coatings and corrosion protection due to the increased frictional forces will increase.

Pipe rollers and additional heavy equipment (i.e., cranes, excavators, and/or side booms) are required to assist the pullback process. The rollers and slings on the equipment provide support for the fully fabricated pipe string, help to reduce the amount of friction acting on the tail string (thus reducing the overall amount of force required to pull the pipe into the bore) and also help to position the pipe such that the angle that the pipe enters the bore matches the exit angle of the bore itself. All of these features reduce the bending and tensional stresses applied to the product pipe at the break-over location during installation.

Drilling fluids, consisting of a mixture of water, bentonite, and/or polymers are pumped into the bore during the entire HDD installation process. The exact mixture of fluids is typically determined by the HDD contractor based on the anticipated and actual geotechnical materials encountered within the bore and the performance of the drilling equipment as the drilling process progresses. Polymers are commonly used to modify specific drilling fluid properties that bentonite alone is incapable of providing. The drilling fluids are typically a mixture of freshwater and bentonite (sodium montmorillonite). Bentonite is natural clay usually mined in Wyoming. Bentonite is extremely hydrophilic and can absorb up to 10 times its weight in water. Typically, the drilling fluid contains no more than five percent bentonite (95 percent freshwater).

Drilling fluids perform several functions integral to the success of the installation. These primary functions include:

- cooling, lubricating, and cleaning drilling tools, drill pipe and the product pipe during its installation;
- suspension of cuttings within the drilling fluid to facilitate their removal;
- transport soil/bedrock cuttings from the bore during each phase of the installation process;
- stabilization of the bore against collapse and minimization of raveling of the surrounding soil materials;
- provide a bentonite filter cake along the bore walls to help maintain fluid flow within the drilled bore;
- provide a hydrostatic fluid pressure within the bore to offset ground formation/groundwater pressure; and
- drive downhole tooling (mud motor assemblies) for drilling in bedrock materials.

The HDD contractor maintains drilling fluid performance through sampling, testing, and recording the fluid properties during drilling operations. The HDD contractor also analyzes, adjusts, and maintains the fluids as necessary to afford the most efficient drilling fluid rheology to adapt to various geological conditions.

The drilling fluid is pumped into the bore through the drill pipe. As the drilling fluid exits the down-hole tooling within the bore, it mixes with the soil and/or rock cuttings generated by the down-hole tooling to create “flowable” slurry. This mixture flows through the HDD bore under an induced fluid pressure gradient generated by the injection of additional drilling fluids into the bore.

When the drilling fluids reach the ground surface at either the HDD entry or exit locations, these fluids are either transferred to a separation plant for processing or removed from the site with vacuum trucks (or other means). Separation plants are commonly used on installations where the cost to dispose of the drilling mud and cuttings exceeds the costs to recycle and reuse the fluids.

Controlling and maintaining fluid flow within the HDD bore during all installation stages is critical to the success of an HDD installation. While the HDD method is a proven technology, there are certain impacts that could occur as a result of the drilling such as the inadvertent release of drilling fluid, which is a slurry of bentonite clay and water which is classified as non-toxic to the aquatic environment and is a non-hazardous substance. Drilling fluids that are released typically contain a lower concentration of bentonite when they surface because the bentonite is filtered out as its passes through existing sediments of varying types. All drilling fluid components will be approved by the Owner prior to transportation and use on each HDD installation.

The following sections provide the process of HDD and procedures to be implemented in the case of an inadvertent release of drilling fluid.

1.2 Inadvertent Release Procedures/Contingency Plan

Prior to drilling operations, site-specific HDD procedures will be prepared by the HDD contractor and submitted to Spire for review and approval. Drilling fluid returns (flow of drilling fluids to the HDD entry/exit location) will be continuously monitored visually during the installation.

Lost circulation materials may be introduced to the drilling fluid to help seal off a flow pathway that is allowing for drilling fluid migration away from the HDD bore. All mud products will be approved by the Owner prior to use on-site. Lost circulation materials can include, but are not limited to, sawdust, bentonite chips, ground corn, magma fiber, and/or other manufactured materials.

As a minimum, the HDD Procedures will address the following:

1.2.1 Inadvertent Return Prevention

The drill rig operator will monitor the downhole annular pressure at all times. If the bore pressure is observed to be abnormally high or fluid loss is apparent and a release has occurred, the driller has the following options (or any combination of these options):

- temporarily cease drilling operations and shut down mud pump delivering drilling fluids downhole;
- notify Spire representatives immediately;
- dispatch experienced company personnel to monitor the area in the vicinity of the drilled path;
- restart pump and stroke bore hole in 30 foot (+/-) lengths to restore circulation (“swab” the hole) as many as six times but no fewer than two times;
- introduce additional flow along the borehole starting at the entry/exit using “weeper” subs; and
- modify the drilling mud with a change in viscosity and/or lost circulation additives.

1.2.2 Monitoring of Inadvertent Returns

1.2.2.1 Personnel and Responsibilities

The actions in this Plan are to be implemented by the following personnel:

- Chief Inspector - Spire will designate an HDD Chief Inspector for the Project. The Chief Inspector will have overall authority for construction activities that occur on the Project.
- Environmental Inspector - At least one Environmental Inspector will be designated by Spire to monitor the HDD activities. The Environmental Inspector will have status over all other activity inspectors and will report directly to the HDD Chief Inspector who has overall authority. The Environmental Inspector will have the authority to stop activities that violate the environmental conditions of the FERC Certificate (if applicable), other federal and state permits, or landowner requirements, and to order corrective action.

- HDD Superintendent - The HDD Superintendent will be the senior on-site representative of the HDD contractor and will have the overall responsibility for implementing this Plan on behalf of the HDD contractor. The HDD Superintendent will be familiar with all aspects of the drilling activities, the contents of the Plan, and the conditions of approval under which the activity is permitted to take place. The HDD Superintendent will make a copy of this Plan available at the drill site and will distribute it to the appropriate construction personnel. The HDD Superintendent will ensure that workers are properly trained and familiar with the necessary procedures for response to an inadvertent release.
- HDD Operator - The HDD Operator will be responsible for operating the drilling rig and mud pumps, monitoring circulation back to the entry and exit locations, and monitoring annular pressures during pilot hole drilling. In the event of loss of circulation or higher than expected annular pressures, the HDD Operator must communicate the event to the HDD Superintendent and HDD contractor field crews, as well as the on-site Spire inspection staff. The HDD Operator is responsible for stoppage or changes to the drilling program in the event of observed or anticipated inadvertent returns.
- HDD Contractor Personnel - During HDD installation, field crews will be responsible for monitoring the HDD alignment along with the Spire's field representatives. Field crews, in coordination with the Environmental Inspector, will be responsible for timely notifications and responses to observed releases in accordance with this Plan. The Environmental Inspector ultimately must sign-off on the action plan for mitigating the release.

Prior to drilling, the HDD Superintendent, Chief Inspector, and Spire's Environmental Inspector will verify that the HDD Operator and field crew receive, at minimum, the following site-specific training:

- Project-specific safety training;
- review provisions of this Plan and site-specific permit requirements;
- review location of sensitive environmental resources at the site;
- review drilling procedures for release prevention;
- review the site-specific monitoring requirements;
- review the location and operation of release control equipment and materials; and
- review protocols for reporting observed inadvertent returns.

1.2.2.2 Monitoring and Reporting

Appropriate monitoring and reporting actions will be as follows:

- If the HDD Operator observes an increase in annular fluid pressure or loss of circulation, the Operator will notify the HDD Superintendent and field crews of the event and approximate position of the tooling.
- Where practical, a member of the field crew will visually inspect the ground surface near the position of the cutting head.

- If an inadvertent release is observed:
  - field crew will notify (via handheld radio or cell phone) the HDD Operator;
  - the HDD Operator will temporarily cease pumping of the drilling fluid and notify the HDD Superintendent and Chief Inspector;
  - the Chief Inspector will notify and coordinate a response with the Environmental Inspector;
  - the Environmental Inspector will notify appropriate permit authorities, as necessary, of the event and proposed response and provide required documentation within 24 hours; and
  - the Chief Inspector will prepare a report that summarizes the incident.

1.2.3 Response to Inadvertent Returns

Typically, inadvertent releases are most often detected in an area near the entry or exit locations of the drill alignment when the pilot bore is at shallow depths, above bedrock, and in permeable/porous soils. In these occurrences, the release will be assessed by the HDD Superintendent, Environmental Inspector, and Chief Inspector to determine an estimated volume and footprint of the release. The potential of the release to reach adjacent waterbodies, wetlands, or other types of infrastructure will also be assessed.

The HDD Superintendent will assess the drilling parameters (depth, annular pressures, fluid flow rate, and drill fluid characteristics) and incorporate appropriate changes.

The HDD Superintendent, Environmental Inspector, and Chief Inspector will implement installation of appropriate containment structures and additional response measures. Access for personnel and equipment to the release site is a major factor in determining the methods used for containment and disposal. Typically, containment is achieved by excavating a small sump pit (five cubic yards) at the site of the release and to surround the release with hay bales, silt fence, and/or sand bags. Once contained, the drilling fluid is either collected by vacuum trucks or pumped back to the mud recycle unit or to a location accessible to vacuum trucks. The fluids are then transported either back to the HDD drilling rig or to a disposal site.

If the release is mitigated and controlled, forward progress of the drilling will be approved by the Environmental Inspector in coordination with the HDD Superintendent and Chief Inspector.

The site-specific response will follow the guidelines presented below.

1.2.3.1 Inadvertent Fluid Release at Inaccessible Location

If inadvertent returns are observed surfacing on the ground surface at a location that is inaccessible, the following procedures will be followed:

- contractor will ensure all reasonable measures within the limitations of current technology have been taken to re-establish circulation; and
- continue drilling utilizing a minimal amount of drilling fluid as required to penetrate the formation or to maintain a successful product pull back.

1.2.3.2 Upland Location

- Evaluate the amount of release to determine if containment structures are warranted and will effectively contain the release.
- Promptly implement appropriate containment measures as needed to contain and recover the slurry.
- If the release is within 50 feet of a wetland or waterbody, silt fence and/or hay bales will be installed between the release site and the wetland or waterbody.
- If the release cannot be contained, then the HDD Operator will suspend drilling operations until appropriate containment is in place.
- Remove the fluids using either a vacuum truck or by pumping to a location accessible to a vacuum truck.
- After the HDD installation is complete, perform final clean-up.

1.2.3.3 Wetland Location

Spire's proposed HDD installations are designed to minimize the potential for inadvertent releases to the HDD crossing locations. Although final design is still in progress, Spire expects that the Mississippi and Missouri River crossings will be in soils in the vicinity of the HDD entry and exit locations transitioning to bedrock materials. The bedrock materials are capable of resisting higher drilling fluid pressures than the soils. To further minimize the potential for inadvertent returns, casing will be installed through overburden soils at both ends of the HDD for the Mississippi River. Casing is anticipated at the HDD entry location only for the Missouri River crossing.

Even with these controls in place, if a release of drilling fluids does occur, the following steps will be taken:

- Evaluate the amount of release to determine if containment structures are warranted and will effectively contain the release.
- Promptly implement appropriate containment measures to contain and recover the slurry.
- Efforts to contain and recover slurry in wetlands may result in further disturbance by equipment and personnel and possibly offset the benefit gained in removing the slurry.
- If the amount of the slurry is too small to allow the practical collection from the affected area, the fluid will be diluted with freshwater or allowed to dry and dissipate naturally.
- If the release cannot be controlled or contained, drilling operations will be suspended immediately until appropriate containment is in place.
- Remove the fluids using either a vacuum truck or by pumping to a location accessible to a vacuum truck.
- After the HDD installation is complete, perform final clean-up.

1.2.3.4 Final Clean-Up

After completion of the HDD installation, site-specific clean-up measures will be developed by the Chief Inspector and HDD Superintendent for approval by the Environmental Inspector. Potential for secondary impact from the clean-up process will be evaluated, along with the benefits of clean-up activities.

The following measures are considered appropriate:

- Drilling mud will be removed by hand using shovels, buckets, and soft bristled brooms to minimize damage to existing vegetation.
- Freshwater washes may be employed if deemed beneficial and feasible.
- Containment structures will be pumped out and the ground surface scraped to bare topsoil, thereby minimizing loss of topsoil or damage to adjacent vegetation.
- The recovered drilling fluid will be recycled or disposed of at an approved upland location or disposal facility. No recovered drilling fluid will be disposed of in streams or storm drains.
- All containment structures will be removed.
- Recovered materials will be collected in containers for temporary storage prior to removal from the site.

1.3 Failed HDD Installation

While not anticipated, if an attempted HDD installation is unsuccessful, the proposed HDD alignment could be modified beneath the River using the same general location to accommodate an additional HDD attempt, depending on the condition that resulted in the HDD failure. Prior to attempting a second HDD crossing, a risk mitigation workshop should be held with all parties to determine the cause of the initial failure and any mitigation measures that could be adopted to reduce the risk(s) during the second HDD attempt.

Potential causes that may lead to a failed HDD installation include:

- stuck or damaged product pipe during pullback operations; this risk is mitigated by:
  - completing swab pass or passes to gauge the condition of the HDD bore by evaluating the drill rig effort required to pull tooling through the HDD bore;
  - only commencing pullback operations after verification that the bore is adequately conditioned; and
  - minimizing the amount of downtime associated with delays during pullback operations.
- bore instability/collapse; this risk is mitigated by:
  - designing the HDD profile in favorable ground materials along the alignment that are not amenable to raveling causing collapse of the bore.
- Excess loss of drilling fluids and inability to remove cuttings from the bore; this risk is mitigated by:
  - designing the HDD profile in favorable ground materials along the alignment;

- evaluating the required and allowable drilling fluid pressures for the installation and providing sufficient separation between the required and allowable drilling fluid pressures; and
- incorporating temporary casing pipe to support shallow soils.

If an open HDD bore could not be advanced and abandonment where required, the bore would be grouted with a cement-based material to fill the excavation and minimize risks of a potential groundwater flow pathway.

If an HDD installation were completed and the installed pipe was damaged to the point it could not be used for its intend purpose, the inside of the steel product pipe would be grouted with a cement based grout and the annular space around the pipe would be grouted for a distance of approximately 200 feet at each HDD entry and exit location. The above approach is as outlined in the US Army Corps of Engineers' "Guidelines for Installation of Utilities Beneath Corps of Engineers Levees Using Horizontal Directional Drilling" (Latorre et al. 2002) that requires backfilling with grout or bentonite. In addition, any additional requirements set forth in permits acquired for a specific HDD installation will be met in terms of abandonment.

1.4 Reference

Latorre, Carlos A., Wakeley, Lillian D., and Conroy, Patrick J. 2002. *Guidelines for Installation of Utilities Beneath Corps of Engineers Levees Using Horizontal Directional Drilling.* United States Army Corps of Engineers. ERDC/GS LTR-02-9.

ATTACHMENT 4
REPRESENTATIVE PHOTOGRAPHS

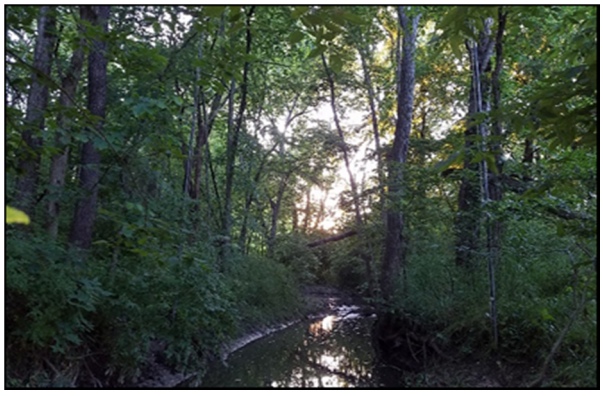
Representative Photographs of the Plan Area

Photographs were taken during site visits in 2016 and 2017.

Riparian Forest near MP 2.7

Riparian forest near MP 3.4

Riparian Forest near MP 4.3



Riparian Forest near MP 13.2

Riparian Forest near MP 13.9

Riparian Forest near MP 23.5

Riparian Forest near MP 35.7R

Riparian Forest near MP 36.8R

Riparian Forest near MP 39.4

Riparian Forest near MP 39.8

Upland Forest near TAR-017

Upland Forest near TAR-017

Upland Forest near MP 44.2

Upland Forest near MP 44.5

Upland Forest near MP 44.8

Upland Forest near MP 44.9

Upland Forest near MP 45.0

Palustrine Forest near MP 45.0

ATTACHMENT 5
MIST NET SURVEY REPORT

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Bat Survey Report

Spire STL Pipeline LLC
Spire STL Pipeline Project
Scott, Greene, and Jersey Counties, Illinois, and St. Charles and St. Louis Counties, Missouri

GAI Project Number: E160438.00

July 2017

Prepared by: GAI Consultants, Inc.
Erlanger Office
1830 Airport Exchanged Blvd, Suite 220
Erlanger, Kentucky 41018

Prepared for: Spire STL Pipeline LLC
700 Market Street
St. Louis, MO 63101

Bat Survey Report

Spire STL Pipeline LLC
Spire STL Pipeline Project
Scott, Greene, and Jersey Counties, Illinois, and St. Charles and St. Louis Counties, Missouri

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Report Authors:

Jason Duffey
Senior Project Environmental Specialist

Adam Mann, MS
Environmental Manager

Table of Contents

1.0 Introduction

Spire STL Pipeline LLC ("Spire"), is proposing the Spire STL Pipeline Project ("Project") in Scott, Greene, and Jersey Counties, Illinois, and St. Charles and St. Louis Counties, Missouri (Figure 1). As proposed, the Project consists of approximately 65 miles of new, greenfield, 24-inch-diameter steel pipeline in two segments. The first segment (referred to as the "24-inch pipeline" portion of the Project) will originate at a new interconnect with the Rockies Express Pipeline LLC ("REX") pipeline in Scott County, Illinois and extend approximately 59 miles through Greene and Jersey Counties in Illinois before crossing the Mississippi River and extending east through St. Charles County, Missouri. The 24-inch pipeline then crosses the Missouri River into St. Louis County, Missouri, and terminates at a new interconnect with Laclede Gas Company ("LGC"). The second segment of new, greenfield pipeline (referred to as the "North County Extension" portion of the Project), will consist of a 24-inch-diameter steel pipeline which will extend approximately six miles from the LGC interconnect through the northern portion of St. Louis County and terminate at a new interconnect with Enable Mississippi River Transmission, LLC ("Enable MRT") and LGC. The overall design capacity of the Project pipeline is expected to be 400,000 dekatherms per day. No compression will be required. The Project also includes the construction of three new metering and regulating stations that provide interconnects with (1) REX in Illinois, (2) LGC in Missouri, and (3) Enable MRT and LGC in Missouri.

The Project is under the jurisdiction of the Federal Energy Regulatory Commission ("FERC") and therefore submitted an application on January 26, 2017 requesting a Certificate of Public Convenience and Necessity and Need under Section 7(c) of the Natural Gas Act to construct and operate the proposed Project. Docket number CP17-40-000 was issued for the Project. This application was amended in April 2017 due to Project changes and docket number CP17-40-001 was issued.

1.1 Project Description

The Project will utilize a typical 90-foot-wide temporary construction right-of-way ("ROW"), and maintain a 50-foot permanent ROW. An additional 25 feet of additional temporary workspace will be required through agricultural areas and to facilitate construction prior to crossings of roads, railroads, waterbodies, wetlands, etc. The construction ROW will be generally reduced to 75 feet at waterbodies and wetlands. The Project will include approximately 5.3 miles of access roads with an anticipated width of 25 feet. Of these, approximately 4.4 miles are proposed for temporary use, and 0.9 mile will be permanently maintained for operation of the Project. The Project will also include the construction of minor aboveground facilities.

The Project will remove approximately 59.0 acres of upland forest and 0.8 acres of forested wetland, with approximately 30.0 acres of upland forest and 0.3 acres of forested wetland as a permanent loss due to maintenance and operation of the Project within the 50 foot permanent right-of-way. However, the maintained corridor in forested wetlands will be reduced to approximately 30 feet wide, since Spire will selectively trim trees within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline coating in accordance with the FERC Wetland and Waterbody Construction and Mitigation Procedures (FERC 2013). In addition, this acreage excludes forested areas between Spire's proposed HDD entry and exit locations which will not be cleared during construction or operation. This acreage differs from the forested land use acreage reported in Resource Report 8 of Spire's Amendment Certification application filing, as those acreages included the forested areas crossed by the HDDs.

As proposed, the Project will serve the energy needs of residential, commercial, and industrial customers in the eastern portion of Missouri, including the St. Louis metropolitan area and surrounding counties.

1.2 USFWS Consultation

Spire initiated consultation with the United States Fish and Wildlife Service ("USFWS") in June 2016. On September 29, 2016, GAI Consultants, Inc. ("GAI") submitted a letter to the USFWS Rock Island Field Office ("RIFO") requesting review of initial effects determinations and proposed survey protocols for rare, threatened, and endangered species that may be impacted by the proposed Project. In a letter dated December 8, 2016, the USFWS RIFO indicated that the Project is within the range of three federally-listed bat species: Indiana bat (*Myotis sodalis*), northern long-eared bat (*Myotis septentrionalis*), and gray bat (*Myotis grisescens*). According to the USFWS RIFO, the Indiana bat and northern long-eared bat are known to occur within the counties where the proposed Project will be located. The Project is within the range of each of these species, but is not believed to be within any known active occurrence areas.

To comply with Section 7 of the Endangered Species Act ("ESA"), Spire contracted GAI to conduct a survey in the summer of 2017 in order to determine presence or likely absence of federally-listed bats, with the purpose of allowing active-season clearing of forested habitat in those areas where the species are determined to be likely absent. Depending on multiple factors, including time, cost, and appropriate survey conditions, project proponents and their surveyors can choose to perform a mist net survey, acoustic survey, or a combination of both. Spire and GAI chose to conduct a mist net survey.

GAI is informally consulting with the USFWS RIFO, regarding potential effects to these species. Spire understands that the USFWS RIFO will continue to handle coordination with the USFWS Columbia Field Office. Incidental take of northern long-eared bats as a result of Project tree clearing is not prohibited under Section 9 of ESA because the Project design meets the requirements of the final rule, under Section 4(d) of ESA, for the species (i.e., it is not within 150 feet of any known, occupied maternity roosts or within 0.25-mile of any known, occupied hibernacula). Although incidental take of northern long-eared bats associated with Project tree clearing is not prohibited by ESA, this species is state-listed by the Illinois Department of Natural Resources ("IDNR"). Therefore, GAI will utilize the presence/absence survey to evaluate effects to northern long-eared bats in consultation with IDNR.

2.0 Methods

GAI and its subcontractor performed a summer mist net survey based on the latest protocols as provided in *2017 Range-wide Indiana Bat Summer Survey Guidelines, May 2017* ("USFWS Summer Guidelines;" USFWS, 2017) which are also the current, approved methods of surveying for northern long-eared bats, as described in the *Northern Long-eared Bat Interim Conference and Planning Guidance* (USFWS, 2014). Combined with winter habitat surveys, these survey methods are sufficient for gray bats.

In accordance with the USFWS Summer Guidelines (USFWS, 2017), GAI obtained approval of a mist net survey study plan from the USFWS RIFO prior to conducting the survey (Appendix A). A federally-permitted bat biologist was present at each site during the survey and was responsible for overseeing all aspects of the survey at the site, including adherence to summer mist netting standards and effort requirements. All captured bats were identified by the permitted bat biologist. Trained technicians assisted with the work under the direct and on-site supervision of the permitted bat biologist. The survey was conducted in accordance with the IDNR Scientific Collecting Permits, IDNR Threatened and

Endangered Species Permits, and Missouri Department of Conservation Wildlife Collector's Permits (issued separately to each individual bat biologist). GAI was assisted with the mist net survey by SCI Engineering, Inc.

2.1 Summer Mist Net Survey

The USFWS Summer Guidelines require linear projects within the Ozark-Central Recovery Unit to utilize one mist net site per kilometer (0.6 mile) of suitable summer habitat (i.e., forest) proposed for clearing. Each mist net site requires a minimum of four net nights of survey effort (e.g. two net sets operated for two nights). Through Geographic Information Systems ("GIS") analyses, the Project was divided into segments that were approximately one kilometer wide by one kilometer long, created by buffering the Project centerline by 0.5 kilometer along each kilometer of potentially suitable habitat proposed for clearing.

GAI selected and operated one mist net site within each segment that covered all linear Project facilities (i.e., those that require tree clearing) located within that segment, including access roads and small additional temporary work spaces. There are no non-linear portions of the Project that required additional efforts (Figure 2). Based on the Project alignment, 33 mist net sites (132 net nights), were required to provide adequate coverage of the Project. In addition, three additional mist net sites were selected and operated on a parcel of land in Jersey County, Illinois to accommodate a private land owner's request (Figure 2). These additional sites consisted of two to four nets operated for one to two nights each, for a total 17 net nights of additional effort. The mist net survey was conducted from May 15 to June 1 and June 13 to June 19, 2017, which was within the May 15 to August 15 survey window designated for Illinois.

Bat biologists performed desktop and field reconnaissance efforts and selected optimal mist net sites based on availability of suitable travel corridors through or along forested habitat. Suitable travel corridors often include streams, roads, driveways, access roads, logging trails, trails, forest edges, and existing utility ROW) corridors. Table 1 contains mist net site coordinates and survey dates. Appendix B contains representative net site photographs. Appendix C contains Net Site Habitat data sheets.

2.1.1 Bat Captures

Bat biologists identified captured bats to species, recorded various morphometric data, and turned the bats loose unharmed at the capture site. The biologists recorded time of capture, net location, species, age, sex, reproductive phase, mass, length of right forearm, and wing condition for each captured bat prior to release. Data were recorded on GAI's Bat Captures data sheets (Appendix C). Appendix B contains representative photographs of each species captured during the survey.

2.1.2 White-nose Syndrome

The latest White-nose Syndrome ("WNS") protocols, National White-nose Syndrome Decontamination Protocol – Version 4.12.16 (USFWS, 2016), were followed. Wing damage, as a result of WNS was categorized with the *Wing Damage Index Used for Characterizing Wing Condition of Bats Affected by White-nose Syndrome* (Reichard, 2008) and recorded on GAI's Bat Captures data sheets (Appendix C).

2.1.3 Weather and Temperature

Weather conditions were monitored and recorded during the mist net survey to ensure compliance with the USFWS Summer Guidelines (USFWS, 2017). Temperatures must be at or above 10° Celsius (50° F), with no precipitation lasting longer than 30 minutes, and no

sustained winds over 14 kilometers per hour (9 mph) during netting. Temperature, wind speed, and sky condition were recorded on GAI's Bat Captures data sheets (Appendix C).

2.1.4 Summer Habitat Conditions

While on their summer range, Indiana bats and northern long-eared bats usually roost in trees (gray bats use caves year-round and are thus covered by the next section of this report). Roost trees are highly variable in their characteristics, including size, height, species, health, and solar exposure; however, they generally possess features such as exfoliating bark, cracks, cavities, hollows, and/or crevices that offer structure for roosting. Depending on the conditions, these roosting features can support one individual to hundreds of individuals. Because it is inefficient to examine and evaluate each tree along a project of this size just to determine overall habitat suitability, the mere availability of forested habitat is generally the determining factor of whether potentially suitable habitat does exist. Forested habitat is present along the Project.

A summer habitat assessment was not completed as part of this presence/absence survey; however, certain summer habitat conditions were recorded at each mist net site to gain a generalized view of bat summer habitat suitability in the vicinity of the Project. Biologists described site features and summer habitat conditions (e.g., topography, vegetation, and dominant tree species) within approximately 150 meters (500 feet) of each site, and recorded them on GAI's Net Site Habitat data sheets (Appendix C).

2.2 Winter Habitat

GAI conducted a desktop GIS analysis to determine the potential for karst features that are suitable for use by listed bats to exist in the Project area. Karst landscape layers from United States Geological Survey and sinkhole locations from the Illinois State Geological Survey Prairie Research Institute and the Missouri Spatial Data Institute were compared to Project layers. The analysis showed that karst resource areas and sinkholes could exist near the Project (Figure 3). In addition, it was assumed that there is a potential for underground limestone mines to occur in the region.

2.2.1 Portal Search

Portal searches were conducted within a 300-foot-wide corridor (environmental study corridor) centered on the ROW centerline. Simultaneous to other studies (wetland/stream delineations, etc.), GAI personnel searched for caves, karst features, abandoned mine portals, or any potential openings to subterranean voids along the Project. Portal searches were completed in the winter 2016/2017 for the majority of the Project, where landowner access was obtained, including new Project routes and re-routes. Any potentially suitable feature found in the field would have been assessed for suitability as bat habitat based on criteria such as those provided in the Draft Protocol for Assessing Abandoned Mines/Caves for Bat Use ("USFWS Portal Guidelines"; USFWS, 2011). No features would have been physically entered and searched for bats without prior coordination with the USFWS.

3.0 Results

3.1 Summer Mist Net Survey

3.1.1 Bat Captures

A total of 141 bats representing nine species were captured, including 91 eastern red bats (*Lasiurus borealis*), 25 big brown bats (*Eptesicus fuscus*), seven evening bats (*Nycticeius*

humeralis), seven Indiana bats (*Myotis sodalis*), five silver-haired bats (*Lasionycteris noctivagans*), two hoary bats (*Lasiurus cinereus),* two little brown bats (*Myotis lucifugus*), one northern long-eared bat (*Myotis septentrionalis*), and one tri-colored bat (*Perimyotis subflavus*; Table 2; Figure 4).

Site KM-25 produced the most bat captures (n=25), followed by Site KM-13 and Site KM-21 with eight bats each. Seven or fewer bats were captured at the remaining sites. Overall, the average capture rate was five bats per site. Combined, big brown bats and red bats composed approximately 82 percent of captures.

Eighteen bats escaped before age or sex were determined; however, they were identified to species before they escaped (Table 2). All the remaining 123 bats were adults due to the time of year the survey was conducted. Of these, approximately 46 percent were female. Evidence of reproduction (i.e., presence of reproductive females) was documented for all species except silver-haired bats and tri-colored bats. Approximately 84 percent of the adult females were pregnant while the remaining 16 percent were non-reproductive.

3.1.2 Indiana Bat Captures and Radio Telemetry

Seven Indiana bats were captured at five net sites (Figure 2), including five adult males and two adult females. Capture data are shown in Table 3. Five of the Indiana bats, including three adult males and two adult females, were radio-tagged and tracked to eleven diurnal roosts. None of the roost trees were within the Project ROW. The bats were tracked for seven days each, with the exception of Bat 591, which shed its transmitter after five days, as described below. Roost tree data are shown in Table 4. Emergence counts were conducted for two nights at each roost tree. Emergence count data are shown in Table 5. Appendix B contains representative photographs of each Indiana bat captured during the survey. The following paragraphs describe the radio tracking conducted for each radio-tagged bat.

Bat 177 was an adult male Indiana bat captured at Site KM-19 on May 17, 2017. The bat was tracked for seven days, from May 18 through May 24, and was found roosting in two different trees. On May 18 it was found in Roost 177-1, which was a partially-dead American elm (43 cm diameter at breast height [dbh]). On May 19 and 20 it was found in Roost 177-2, which was a live black walnut tree (48 cm dbh). Emergence counts on these trees resulted in one bat exiting each night the counts were performed. On May 21 the radio signal was detected in a woodlot adjacent to these trees, but Bat 177 was not found prior to emergence that night. Biologists searched for Bat 177 for three additional days, but the bat's radio signal was not detected.

Bat 500 was an adult male Indiana bat captured at Site KM-15 on May 21, 2017. The bat was tracked for seven days, from May 22 through May 28, and was found roosting in three different trees. On May 22 it was found in Roost 500-1, which was a live shagbark hickory (44 cm dbh). On May 23 it was found in Roost 500-2, which was also a live shagbark hickory (33 cm dbh). On May 24 it was in Roost 500-3, which was a dead shagbark hickory (23 cm dbh). Emergence counts on these trees resulted in one to two bats exiting each night the counts were performed. Bat 500's radio signal was detected in Roost 500-3 for four additional days until tracking concluded on May 28.

Bat 533 was an adult female Indiana bat captured at Site KM-17 on May 22, 2017. The bat was tracked for seven days, from May 23 through May 29, and was found roosting in two different trees. The bat was not found on the first day of tracking but the signal was detected

that night while netting at Site KM-17, where the bat was captured the previous night. On May 24, it was found in Roost 533-1, which was a dead white oak (40 cm dbh) where Bat 533 roosted for three days. On May 27, Bat 533's radio signal was not detected. On May 28, it was found in Roost 533-2, which was dead shagbark hickory (40 cm dbh) where Bat 533 was also found on May 29, the final day of tracking. Emergence counts on Roost 533-1 resulted in two bats exiting each night the counts were performed, while emergence counts on Roost 533-2 resulted in 32 and 31 bats exiting on each of the two nights that emergence counts were performed, respectively.

Bat 644 was an adult female Indiana bat captured at Site KM-04 on May 28, 2017. The bat was tracked for seven days from May 29 through June 4, and was found roosting in two different trees. On May 29, it was found in Roost 644-1, which was a dead American elm (42 cm dbh) where Bat 644 roosted for two days. On May 31, it was found in Roost 644-2, which was also a dead American elm (44 cm dbh) where Bat 644 roosted for four days. Emergence counts on these trees resulted in three to eight bats exiting each night the counts were performed. Bat 644's radio signal was not detected on June 4, the last day of tracking.

Bat 591 was an adult male Indiana bat captured at Site KM-23 on June 13, 2017. The bat was tracked for four days, from June 14 through June 17, until the transmitter was found shed on June 18. Bat 591 was found utilizing two roost trees during this time. On June 14, it was found in Roost 591-1, which was a dead American elm (45 cm dbh) where Bat 591 roosted for two days. On June 17, the radio signal was detected in Roost 591-2, which was a dead white oak (dbh 40 cm). However, the bat did not emerge during emergence counts that night; therefore, it was assumed that the radio transmitter was shed and stuck in the tree. Because Bat 591 was not in the tree with the shed transmitter, it is likely that the bat had used the roost as a nocturnal roost the night before the emergence count was conducted. On June 18, 2017 after a night of strong thunderstorms, the transmitter was found along the ephemeral stream bank downstream of Roost 591-2.

3.1.3 Northern Long-eared Bat Capture

One adult female northern long-eared bat was captured at Site KM-11 on May 16, 2017. It was not radio-tagged. Capture data are shown in Table 3. Appendix B contains a representative photograph of the northern long-eared bat captured during the survey.

3.1.4 White-nose Syndrome

Of the 141 bats captured, 124 bats received Wing Damage Index ("WDI") scores. The majority (81%, n=100) of the bats exhibited no signs of WNS wing damage (WDI score was 0); 19 bats received a WDI score of 1 indicating minor damage; and five bats received a WDI score of 2 indicating moderate damage. No bats showed major wing damage indicative of major WNS scarring (WDI score of 3).

3.1.5 Weather and Temperature

Temperature, precipitation, wind, and other weather factors were within acceptable limits based on the USFWS Summer Guidelines (USFWS, 2017). Survey temperatures ranged from 30.5° to 10.0° Celsius (86.9° – 50.0° F) during the survey period of May 15 to June 19, 2017 (Figure 5) with no extended precipitation or sustained high winds during complete survey nights. Rain or high winds precluded complete survey nights at Sites KM-06 and KM-07 on May 17, May 18, and May 19; at Site KM-18 on May 17 and May 19; at Sites KM-16 and KM -32 on May 19; at Site KM-33 on May 27; and at Sites KM-23 and KM-23a on June 14. (Table 1).

3.1.6 Summer Habitat Conditions

Net sites were placed across travel corridors commonly used by bats. Most nets were across streams. Other sites included nets set across access roads, trails, forest edges, ponds, canopy openings, driveways, and farm lanes. Potential habitat around all net sites was predominantly composed of mature lowland or upland deciduous forest (Table 6). Sites KM-22, KM-23c, and KM-29 were characterized as having high roosting potential. The remaining sites exhibited moderate or low roosting potential.

Common canopy tree species at net sites included tulip poplar (*Liriodendron tulipifera*), sugar maple (*Acer saccharum*), sycamore (*Platanus occidentalis*), and black walnut (*Juglans nigra*). Appendix B contains representative net site photographs.

3.2 Winter Habitat

Portal searches were conducted on all portions of the Project where landowner access was obtained. No caves, open karst features, abandoned mine portals, or any potential openings to subterranean voids were found. Portal searches were not completed within the 300-foot-wide corridor (environmental study corridor) centered on the ROW centerline where the Project crosses two tracts in Jersey County, Illinois and two tracts in St. Louis County, Missouri where landowner access was not obtained, and the Missouri River HDD Pullback in St. Charles County, Missouri, which was recently re-designed.

The unsearched portions of the 300-foot-wide corridor on the two tracts in Jersey County, Illinois cover 1.4-mile and 0.25-mile, respectively (Figure 2, Sheet 6). This portion of the 300-foot-wide corridor is in a karst region; however, it is not near any known sinkhole areas (Figure 3). In addition, this portion of the 300-foot-wide corridor predominantly crosses agricultural fields, and based on evaluation of aerial photography, contains few areas not under active tillage/crop production. No forested or untilled areas capable of holding a potentially suitable unknown bat hibernaculum were observed in the corridor using this method. For these reasons, it is assumed no potentially suitable unknown hibernacula exist along this portion of the Project.

The unsearched portions of the 300-foot-wide corridor on the tracts in St. Louis County, Missouri cover 0.28-mile and 1.2 mile, respectively (Figure 2, Sheet 11). This portion of the 300-foot-wide corridor is near a karst region and near potential sinkholes; however, based on the Missouri Spatial Data Institute maps, none of the sinkholes would be crossed by the 300-foot-wide corridor on these unsearched parcels. In addition, this portion of the 300-foot-wide corridor predominantly crosses agricultural fields; however it also contains approximately 0.32-mile of forest that could hold potentially suitable bat hibernaculum. However, based on the results of portal searches conducted for the rest of the Project, as well as reviews of sinkhole maps and aerial photos, it is assumed to be unlikely that potentially suitable unknown bat hibernacula exist in this small forested portion of the Project.

The unsearched portion of the 300-foot-wide corridor on Missouri River HDD pullback site covers 0.2-mile (Figure 2, Sheet 10). This portion of the 300-foot-wide corridor is near a karst region and near potential sinkholes; however, based on the Missouri Spatial Data Institute maps, none of the sinkholes are in the 300-foot-wide corridor. In addition, this portion of the 300-foot-wide corridor predominantly crosses agricultural fields, and based on evaluation of aerial photography, contains few areas not under active tillage/crop production. No forested or untilled areas capable of holding a potentially suitable unknown bat hibernaculum were observed using this method. For these reasons, it is assumed no potentially suitable unknown hibernacula exist along this portion of the Project.

4.0 Summary

A total of 141 bats representing nine species were captured over 149 complete net nights of summer mist netting. Mist netting efforts completed for the Project complied with current guidelines established by the USFWS (2017) to survey summer habitat for the presence/absence of the federally-endangered Indiana bat, the federally-endangered gray bat, and the federally-threatened northern long-eared bat. Seven Indiana bats and one northern long-eared bat was captured. Five of the Indiana bats, including three adult males and two adult females, were radio-tagged and tracked to eleven diurnal roosts. None of the roost trees were within the Project ROW. GAI and Spire will consult with the USFWS to evaluate potential Project effects on Indiana bats and northern long-eared bats and their summer habitat.

No caves, open karst features, abandoned mine portals, or any potential openings to subterranean voids were found during field portal searches where landowner access could be obtained. Searches were not conducted along approximately 3.4 miles of the Project where landowner access was not obtained, and where a recent re-designed area has not been surveyed. No known sinkholes are in the proposed 300-foot-wide survey corridor or are crossed by the Project in these areas. It is assumed that no potentially suitable unknown bat hibernacula exist in the portions of the Project that cross agricultural lands in these areas. It is assumed to be unlikely that potentially suitable unknown bat hibernacula exist in the 0.32-mile portion of the Project that crosses forest land in these areas. The unsearched portions of the 300-foot-wide survey corridor will be searched for Portals when access is obtained. GAI will notify the USFWS if any potentially suitable unknown bat hibernacula are found.

5.0 References

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USFWS. 2014. Northern long-eared bat interim conference and planning guidance. U.S. Fish and Wildlife Service. 67 pp.

USFWS. 2016. National White-Nose Syndrome Decontamination Protocol – Version 01.12.2016. U.S. Department of Interior, Fish and Wildlife Service, Fort Snelling, Minnesota. 7 pp.

USFWS. 2017. 2017 Revised Range-wide Indiana Bat Summer Survey Guidelines, May 2017. U.S. Department of Interior, Fish and Wildlife Service, Fort Snelling, Minnesota. 44 pp.

TABLES

Table 1
Mist Net Site Locations and Survey Dates

Site	County (IL and MO)	Latitude	Longitude	Dates Completed (2017)	Total Net Nights
KM-1	Scott	39.54880	90.42950	May 23 – 24	4
KM-2	Scott	39.54025	90.42654	May 24 – 25	4
KM-3	Scott	39.53340	-90.43221	May 26 – 27	4
KM-4	Scott	39.52301	-90.43109	May 27 – 28	4
KM-5	Greene	39.51554	-90.42855	May 27 – 28	4
KM-6	Greene	39.44301	90.42909	May 20 – 21	4
KM-7	Greene	39.42474	90.42039	May 20 – 21	4
KM-8	Greene	39.38692	-90.41010	May 25 – 26	4
KM-9	Greene	39.37885	-90.41029	May 25 – 26	4
KM-10	Greene	39.31348	-90.42946	May 23 – 24	4
KM-11	Greene	39.24733	-90.40729	May 15 – 16	4
KM-12	Greene	39.23249	90.40820	May 15 – 16	4
KM-13	Greene	39.21549	-90.39966	May 22, 24	4
KM-14	Jersey	39.14314	-90.38959	May 22 – 23	4
KM-15	Jersey	39.09050	-90.38828	May 21 – 22	4
KM-16	Jersey	39.08408	-90.39270	May 20 – 21	4
KM-17	Jersey	39.07189	90.39133	May 22 – 23	4
KM-18	Jersey	39.03680	-90.38839	May 18, 20	4
KM-19	Jersey	39.02700	-90.38618	May 17 – 18	4
KM-20	Jersey	39.00539	-90.38297	May 28, 30	4
KM-21	Jersey	39.00490	-90.38317	May 29 – 30	4
KM-22	Jersey	38.96929	-90.37122	June 16, 19	5
KM-23	Jersey	38.95803	-90.36967	June 13, 15	4
KM-23a	Jersey	38.95979	-90.37048	June 13, 15	5
KM-23b	Jersey	38.96052	-90.36566	June 16 – 17	7
KM-23c	Jersey	38.96002	-90.37878	June 18	4

Site	County (IL and MO)	Latitude	Longitude	Dates Completed (2017)	Total Net Nights
KM-24	St. Charles	38.92355	-90.36524	May 24 – 25	4
KM-25	St. Louis	38.84125	-90.24441	May 29 – 30	4
KM-26	St. Louis	38.83400	-90.24423	May 31 – June 1	4
KM-27	St. Louis	38.80028	-90.20000	May 15 – 16	4
KM-28	St. Louis	38.81561	90.23267	May 15 – 16	4
KM-29	St. Louis	38.81512	-90.21834	May 15 – 16	4
KM-30	St. Louis	38.80280	-90.21150	May 22 – 23	4
KM-31	St. Louis	38.80028	-90.20000	May 17 – 18	4
KM-32	St. Louis	38.78717	-90.18393	May 20 – 21	4
KM-33	St. Louis	38.77914	-90.18322	May 26, 28	4

Notes

[1] Rain or high winds precluded complete survey nights at Sites KM-06 and KM-07 on May 17, May 18 and May 19; at KM-18 on May 17 and May 19; at KM-16 and KM -32 on May 19; at KM-33 on May 27; and at KM-23 and KM-23a on June 14.

Table 2
Bat Captures

Species	Adult Male	Adult Female[1]					Juvenile		Escape[2]	Total
		P	L	PL	NR	UNK	Male	Female		
Eastern Red Bat	35	31	2		8				15	**91**
Big Brown Bat	18	5							2	**25**
Evening Bat	2	4		1						**7**
Indiana Bat	5	2								**7**
Silver-haired Bat	4				1					**5**
Hoary Bat		1							1	**2**
Little Brown Bat	1	1								**2**
Northern Long-eared Bat		1								**1**
Tri-colored Bat	1									**1**
Total	**66**	**45**	**2**	**1**	**9**				18	**141**

Notes

[1] P = Pregnant; L = Lactating; PL = Post lactating; NR = Non-reproductive; UNK = Status unknown.

[2] Escape = Escaped from net or hand before processing was complete.

Table 3
Listed Bat Capture Data

Species	Capture Date (2017)	Capture Site	Age[1]	Sex[1]	Reproductive Status[1]	Wing Index Score	
Northern Long-eared Bat	May 16	KM-11	A	F	NR	0	N/A
Indiana Bat	May 17	KM-19	A	M	NR	0	172.177
Indiana Bat	May 21	KM-15	A	M	NR	1	172.500
Indiana Bat	May 21	KM-15	A	M	NR	0	N/A
Indiana Bat	May 22	KM-17	A	F	P	0	172.533
Indiana Bat	May 22	KM-17	A	M	NR	0	N/A
Indiana Bat	May 28	KM-04	A	F	P	0	172.644
Indiana Bat	June 13	KM-23	A	M	NR	0	172.591

Notes

[1] A = Adult; M = Male; F = Female; NR = Non-reproductive; P = Pregnant; N/A = no radio tag was attached

Table 4
Indiana Bat Roost Trees

Roost Name	1st Date Occupied (2017)	Latitude	Longitude	Tree Species	DBH (cm)	Status	Distance to Tree Clearing (m)
177-1	May 18	[redacted]	[redacted]	*Ulmus americana*	43	Partial	26.9
177-2	May 19	[redacted]	[redacted]	*Juglans nigra*	48	Live	285.8
500-1	May 22	[redacted]	[redacted]	*Carya ovata*	44	Live	232.1
500-2	May 23	[redacted]	[redacted]	*Carya ovata*	33	Live	141.7
500-3	May 24	[redacted]	[redacted]	*Carya ovata*	23	Dead	127.6
533-1[1]	May 24	[redacted]	[redacted]	*Quercus alba*	40	Dead	3081.1
533-2[1]	May 28	[redacted]	[redacted]	*Carya ovata*	40	Dead	3221.6
644-1[1]	May 29	[redacted]	[redacted]	*Ulmus americana*	42	Dead	668.3
644-2[1]	May 31	[redacted]	[redacted]	*Ulmus americana*	44	Dead	673.2
591-1	June 14	[redacted]	[redacted]	*Ulmus americana*	45	Dead	714.6
591-2	June 17	[redacted]	[redacted]	*Quercus alba*	40	Dead	28.4

Notes

[1] Tree used by female Indiana bat

Table 5

Emergence County Summary

Roost	Date (2017)	Night	Count	Radio-Tagged Bat Present?
177-1	May 18	1	1	Yes
177-1	May 19	2	1	No
177-2	May 19	1	1	Yes
177-2	May 20	2	1	Yes
500-1	May 22	1	2	Yes
500-1	May 23	2	2	No
500-2	May 23	1	1	Yes
500-2	May 25	2	2	No
500-3	May 24	1	2	Yes
500-3	May 25	2	2	Yes
533-1	May 24	1	2	Yes
533-1	May 25	2	2	Yes
533-2	May 28	1	32	Yes
533-2	May 29	2	31	Yes
644-1	May 29	1	6	Yes
644-1	May 30	2	8	Yes
644-2	May 31	1	3	Yes
644-2	June 1	2	4	Yes
591-1	June 15	1	2	Yes
591-1	June 16	2	2	Yes
591-2	June 17	1	0	No
591-2	June 18	2	0	No

Table 6
Habitat Conditions at Mist Net Sites

Site	Water Source		Tree Species[1]		Canopy Closure[2]	Subcanopy[2]		Roost Potential[3]		Habitat Type[4]
	Type	Distance (m)	Canopy	Subcanopy		Clutter	Type	Rank	Type	
KM-01	Stream	0	*Acer saccharum, Juglans nigra, Ulmus americana, Platanus occidentalis*	*Celtis laevigata, Acer saccharum, Ulmus americana*	C	M	Saplings	L	Live	D,MS,L,S,C
KM-02	Stream	0	*Quercus imbricaria, Platanus occidentalis, Carya tomentosa, Quercus alba, Juglans nigra*	*Carya ovata, Carya tomentosa, Sassafras albidum, Ulmus rubra*	M	C	Saplings, Branches	L	Live	D,YS,E,S,C
KM-03	Stream	0	*Acer saccharum, Platanus occidentalis, Juglans nigra, Acer negundo, Robinia pseudoacacia*	*Celtis occidentalis, Acer negundo, Acer saccharum*	C	M	Saplings, Shrubs,	L	Dead	D,YS,MS,L, E,S,C
KM-04	Stream	0	*Platanus occidentalis, Gleditsia triacanthos, Ulmus americana*	*Acer negundo, Lonicera maackii, Sassafras albidum*	M	M	Saplings, Shrubs,	L	Partial, Live	D,YS,L,S
KM-05	Stream	0	*Platanus occidentalis, Populus deltoides, Juglans nigra, Acer negundo*	*Acer negundo, Celtis occidentalis*	M	C	Shrubs,	M	Dead	D,MS,L,E,S, C
KM-06	Ditch	0	*Juglans nigra, Populus deltoides, Prunus serotina*	*Sassafras albidum, Acer negundo, Morus rubra, Celtis occidentalis*	M	C	Saplings, Shrubs,	L	Dead, Partial	D,YS,L,E,C

Site	Water Source		Tree Species[1]		Canopy Closure[2]	Subcanopy[2]		Roost Potential[3]		Habitat Type[4]
	Type	Distance (m)	Canopy	Subcanopy		Clutter	Type	Rank	Type	
KM-07	Stream	0	*Acer saccharinum, Prunus serotina, Gleditsia triacanthos*	*Gleditsia triacanthos, Morus rubra, Lonicera*	M	M	Saplings, Shrubs, Branches	L	Partial	D,YS,L,E,S, C
KM-08	Stream	0	*Celtis occidentalis, Platanus occidentalis, Juglans nigra, Gleditsia triacanthos, Populus deltoides*	*Celtis occidentalis, Ulmus americana, Ulmus rubra, Maclura pomifera*	C	C	Saplings, Shrubs,	M	Dead, Live	D,MS,L,S,C
KM-09	Stream	5	*Acer saccharinum, Acer negundo, Gleditsia triacanthos*	*Acer saccharinum, Acer negundo, Ulmus americana, Juglans nigra*	M	M	Saplings, Shrubs,	L	Dead	D,MS,L,E,S
KM-10	Stream	0	*Platanus occidentalis, Juglans nigra, Gleditsia triacanthos, Celtis occidentalis*	*Ulmus americana, Maclura pomifera, Ulmus rubra*	M	C	Shrubs,	L	Dead	D,MS,L,E,S, P
KM-11	Stream	0	*Quercus rubra, Juglans nigra, Celtis occidentalis, Platanus occidentalis, Carya ovata*	*Celtis occidentalis, Platanus occidentalis*	M	M	Shrubs,	M	Live	D,MS,U,E,S, C
KM-12	Ditch	0	*Acer saccharinum, Platanus occidentalis*	*Celtics occidentalis, Acer negundo, Fraxinus americana*	M	O	Branches	L	Dead	D,MS,U,E,C
KM-13	Stream	500	*Celtics occidentalis, Celtics laevigata, Prunus serotina, Ulmus rubra, Ulmus americana*	*Lonicera maackii, Ulmus rubra, Celtis occidentalis, Maclura pomifera*	O	O	Saplings, Shrubs,	L	Dead	D,MS,U,E,C

Site	Water Source		Tree Species[1]		Canopy Closure[2]	Subcanopy[2]		Roost Potential[3]		Habitat Type[4]
	Type	Distance (m)	Canopy	Subcanopy		Clutter	Type	Rank	Type	
KM-14	Ditch	0	*Gleditsia triacanthos, Maclura pomifera, Juglans nigra, Morus rubra, Celtis occidentalis*	*Lonicera maackii, Celtis occidentalis, Morus rubra, Juglans nigra*	C	C	Saplings, Shrubs,	N	None	D,YS,L,E,S, C
KM-15	Stream	0	*Platanus occidentalis, Ulmus americana, Celtis laevigata, Fraxinus pennsylvanica*	*Celtis occidentalis, Acer negundo, Lonicera*	M	C	Saplings, Shrubs, Branches	M	Dead, Partial, Live	D,MS,L,S,C, P
KM-16	Stream	5	*Juglans nigra, Ulmus americana, Gleditsia triacanthos, Celtis laevigata*	*Acer negundo, Lonicera maackii*	M	M	Saplings, Shrubs,	L	Live	D,MS,L,S
KM-17	Stream	0	*Platanus occidentalis, Populus deltoides, Juglans nigra, Acer negundo*	*Acer negundo, Acer saccharinum, Maclura pomifera*	O	M	Shrubs, Branches	L	Live	D,MS,L,E, S,C
KM-18	Small Stream	10	*Quercus rubra, Quercus alba, Prunus serotina, Fraxinus pennsylvanica*	*Sassafras albidum, Catalpa speciosa*	M	C	Shrubs,	L	Dead	D,MS,U,E, S,C
KM-19	Stream	0	*Acer saccharum, Juglans nigra, Platanus occidentalis, Quercus alba, Quercus velutina*	*Ulmus americana, Lonicera maackii, Ulmus rubra*	C	C	Shrubs,	L	Dead	D,YS,L,S
KM-20	Stream	70	*Juglans nigra, Gleditsia triacanthos, Platanus occidentalis, Quercus imbricaria, Populus deltoides*	*Gleditsia triacanthos, Juglans nigra, Acer negundo, Celtis occidentalis*	O	C	Saplings, Shrubs,	L	Dead	D,YS,L,E, S,C

Site	Water Source		Tree Species[1]		Canopy Closure[2]	Subcanopy[2]		Roost Potential[3]		Habitat Type[4]
	Type	Distance (m)	Canopy	Subcanopy		Clutter	Type	Rank	Type	
KM-21	Stream	70	*Juglans nigra, Gleditsia triacanthos, Platanus occidentalis, Quercus imbricaria, Populus deltoides*	*Gleditsia triacanthos, Juglans nigra, Maclura pomifera, Celtis occidentalis*	O	C	Saplings, Shrubs,	L	Dead	D,YS,L,E, S,C
KM-22	Pond	0	*Quercus rubra, Platanus occidentalis, Ulmus rubra, Carya tomentosa , Salix nigra*	*Acer saccharum, Cornus florida, Lonicera maackii, Sassafras albidum*	M	M	Saplings, Shrubs, Branches	H	Dead, Live	D,MS,U,RL, E,C
KM-23	Pond	120	*Quercus velutina, Carya tomentosa, Quercus rubra, Quercus alba, Carya ovata*	*Lonicera maackii , Carya tomentosa, Sassafras albidum, Cornus florida*	M	M	Saplings, Shrubs	M	Dead	D,YS,U,RL
KM-23a	Pond	0	*Quercus rubra, Quercus velutina, Quercus alba, Acer saccharum*	*Prunus serotina, Cornus florida, Ulmus americana, Acer saccharum*	M	M	Shrubs	M	Dead	D,MS,U,RL, E
KM-23b	Stream	0	*Quercus alba, Platanus occidentalis, Ulmus rubra, Juglans nigra, Acer saccharum*	*Acer saccharum, Ulmus rubra, Lonicera maackii, Sassafras albidum*	M	M	Shrubs	M	Dead	D,MS,L,RL, E
KM-23c	River	500	*Quercus rubra, Platanus occidentalis, Ulmus rubra, Carya tomentosa , Acer saccharum*	*Acer saccharum, Cornus florida, Lonicera maackii, Sassafras albidum*	M	M	Saplings, Shrubs, Branches	H	Dead, Live	D,MS,U,RL, E
KM-24	Inter-mittent stream	5	*Acer saccharum, Platanus occidentalis, Populus deltoides*	*Lonicera maackii, Acer saccharum, Morus rubra*	M	C	Saplings, Shrubs,	L	Live	D,MS,L,E, S,C

Site	Water Source		Tree Species[1]		Canopy Closure[2]	Subcanopy[2]		Roost Potential[3]		Habitat Type[4]
	Type	Distance (m)	Canopy	Subcanopy		Clutter	Type	Rank	Type	
KM-25	River, pond	100, 100	*Juglans nigra, Populus deltoides, Platanus occidentalis, Diospyros virginiana*	*Lonicera maackii, Vitis sp., Parthenocissus quinquefolia*	M	M	Shrubs, Branches	M	Dead, Partial	D,MS,U,E
KM-26	Pond	120	*Acer saccharinum, Juglans nigra, Morus rubra, Prunus serotina*	*Juglans nigra, Acer negundo, Sassafras albidum, Ulmus rubra*	O	C	Saplings, Shrubs, Branches	L	Dead, Live	D,YS,L,E
KM-27	Inter-mittent stream	5	*Acer negundo, Quercus alba, Celtis occidentalis, Ulmus rubra, Platanus occidentalis*	*Lonicera maackii, Juglans nigra, Acer negundo*	M	C	Shrubs,	L	Live	D,MS,U,E
KM-28	stream	25	*Platanus occidentalis, Juglans nigra, Quercus rubra, Carya tomentosa, Tilia americana, Acer negundo*	*Acer negundo, Aesculus glabra, Ulmus americana, Juglans nigra*	M	M	Saplings, Shrubs,	L	Dead	D,YS,L,E
KM-29	Pond	200	*Populus deltoides, Prunus serotina, Celtis laevigata, Ailanthus altissima*	*Sassafras albidum, Lonicera maackii, Ulmus americana*	O	C	Saplings, Shrubs, Branches	H	Dead, Partial	D,MS,L,P
KM-30	Pond	7	*Acer saccharinum, Ulmus americana, Pyrus calleryana, Acer saccharum, Carya cordiformis*	*Lonicera maackii, Carya cordiformis, Vitis spp.*	M	C	Saplings, Shrubs,	M	Dead, Partial	D,MS,U,E

Site	Water Source		Tree Species[1]		Canopy Closure[2]	Subcanopy[2]		Roost Potential[3]		Habitat Type[4]
	Type	Distance (m)	Canopy	Subcanopy		Clutter	Type	Rank	Type	
KM-31	Pond	30	*Quercus alba, Quercus rubra, Populus deltoides, Sassafras albidum*	*Lonicera maackii, Sassafras albidum, Vitis* spp*., Robinia pseudoacacia*	M	C	Saplings, Shrubs, Branches	L	Dead	D,YS,U,E
KM-32	Inter-mittent stream	5	*Quercus macrocarpa, Quercus alba, Robinia pseudoacacia, Platanus occidentalis, Carya cordiformis*	*Lonicera maackii, Carya cordiformis, Vitis* spp.	M	C	Saplings, Shrubs,	L	Live	D,MS,U,E, S
KM-33	River	100	*Fraxinus pennsylvanica, Acer rubrum, Quercus macrocarpa, Juglans nigra, Juniperus virginiana*	*Lonicera maackii, Sassafras albidum, Vitis* spp.	M	C	Saplings, Shrubs, Branches	L	Partial	MDC,MS,U, E

Notes

1 Tree Species: box elder (*Acer negundo*), red maple (*Acer rubrum*), silver maple (*Acer saccharinum*), sugar maple (*Acer saccharum*), Ohio Buckeye (*Aesculus glabra*), tree of heaven (*Ailanthus altissima*), bitternut hickory (*Carya cordiformis*), shagbark hickory (*Carya ovata*), mockernut hickory (*Carya tomentosa*), northern catalpa (*Catalpa speciosa*), southern hackberry (*Celtis laevigata*), common hackberry (*Celtis occidentalis*), flowering dogwood (*Cornus florida*), American persimmon (*Diospyros virginiana*), white ash (*Fraxinus americana*), green ash (*Fraxinus pennsylvanica*), honey locust (*Gleditsia triacanthos*), black cherry (*Juglans nigra*), eastern red cedar (*Juniperus virginiana*), amur honeysuckle (*Lonicera maackii*), Osage orange (*Maclura pomifera*), red mulberry (*Morus rubra*), Virginia creeper (*Parthenocissus quinquefolia*), sycamore (*Platanus occidentalis*), eastern cottonwood (*Populus deltoides*), black cherry (*Prunus serotina*), Callery pear (*Pyrus calleryana*), white oak (*Quercus alba*), shingle oak (*Quercus imbricaria*), burr oak (*Quercus macrocarpa*), red oak (*Quercus rubra*), black oak (*Quercus velutina*), black locust (*Robinia pseudoacacia*), black willow (*Salix nigra*), sassafras (*Sassafras albidum*), American basswood (*Tilia americana*), American elm (*Ulmus americana*), slippery elm (*Ulmus rubra*), grape species (*Vitis sp.*)

2 Canopy Closure / Subcanopy Clutter: C = Closed; M = Moderate; O = Open

3 Roost Potential Rank: H = High; M = Moderate; L = Low; N = None

4 Habitat Type: D = Deciduous; MD/C = Mixed Deciduous/Conifer; YS = Young Stand; MS = Mature Stand; L = Lowland Forest; U = Upland Forest; P = Pond; E = Edge; S = Stream; C = Crop

FIGURES

Rex Receipt Station

MLV-1

MLV-2

MLV-3

Laclede/Lange Delivery Station

Chain of Rocks Station

Scott County

Pike County

Greene County

Calhoun County

ILLINOIS

MISSOURI

Milton

Glasgow

Alsey

Manchester

Murrayville

Patterson

Roodhouse

Pearl

Hillview

White Hall

Scottville

Greenfield

Hettick

Kampsville

Carrollton

Rockbridge

Chesterfield

Michael

Hardin

Kane

Medora

Fidelity

Fieldon

Jerseyville

Shipman

Batchtown

Otterville

Brighton

Dow

Grafton

Elsah

Godfrey

Alton

East Alton

West Alton

Wood River

Bethalto

Dorsey

Pelican Island

Riverlands Environmental Demo Area

St Peters

O'Fallon

Hazelwood

Florissant

St Charles

Columbia Bottom

Pere Marquette State Park

Two Rivers Nat'l Wildlife Refuge

Lambert-St Louis Int'l Airport

PROJECT LOCATION

REFERENCE: WORLD STREET MAP, ESRI, 2017
ACCESSED : 07/2017

GREENE, JERSEY AND SCOTT COUNTIES, IL
ST.CHARLES AND ST.LOUIS COUNTIES, MO

LEGEND

- 24-inch Pipeline
- North County Extension
- Access Road
- Facility
- County Boundary
- State Boundary

0 2 4 8 Miles

FIGURE 1
PROJECT LOCATION

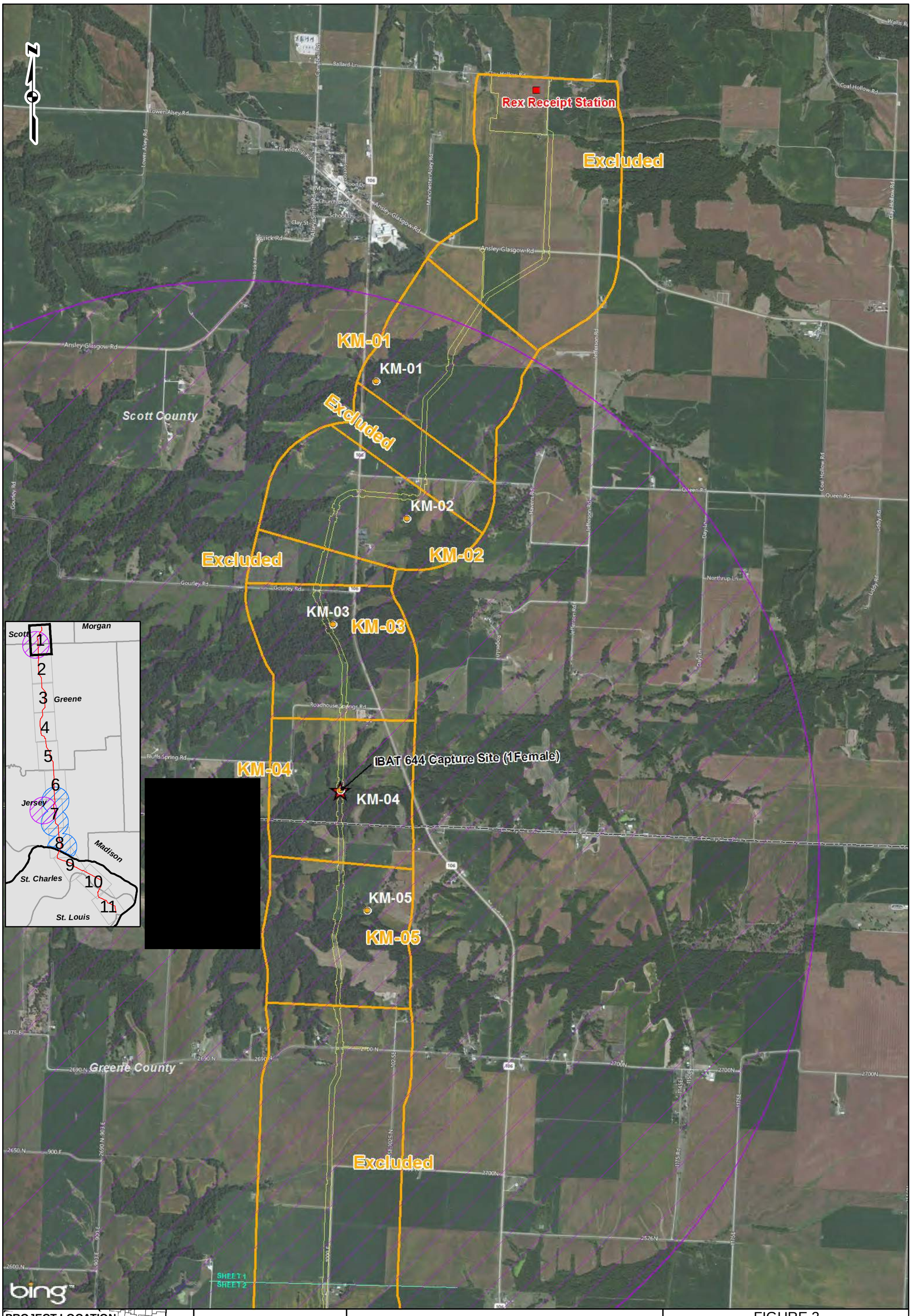
gai consultants

SPIRE STL PIPELINE PROJECT

spire

DRAWN BY: PK DATE: 7/10/2017
CHECKED: JAD APPROVED: JAD

C:\Users\kudlup\Desktop\Priya\2016\Spire\MXD\Mist Net Report\Figure 1 Spire Location_07102017.mxd



PROJECT LOCATION

REFERENCE: NAIP
USDA, FSA, ILLINOIS 2015
MISSOURI 2014
ACCESSED : 07/2017

GREENE, JERSEY
AND SCOTT COUNTIES, IL
ST.CHARLES AND
ST.LOUIS COUNTIES, MO

LEGEND

- Limit of Disturbance
- Facility
- Bat Survey Buffer
- Net Site
- Matchline
- Indiana Bat Capture Site
- County Boundary
- State Boundary
- Indiana Bat Summer Maternity Habitat

0 1,000 2,000 4,000 Feet

FIGURE 2
BAT PRESENCE/ABSENCE SURVEY
SHEET 1 OF 11

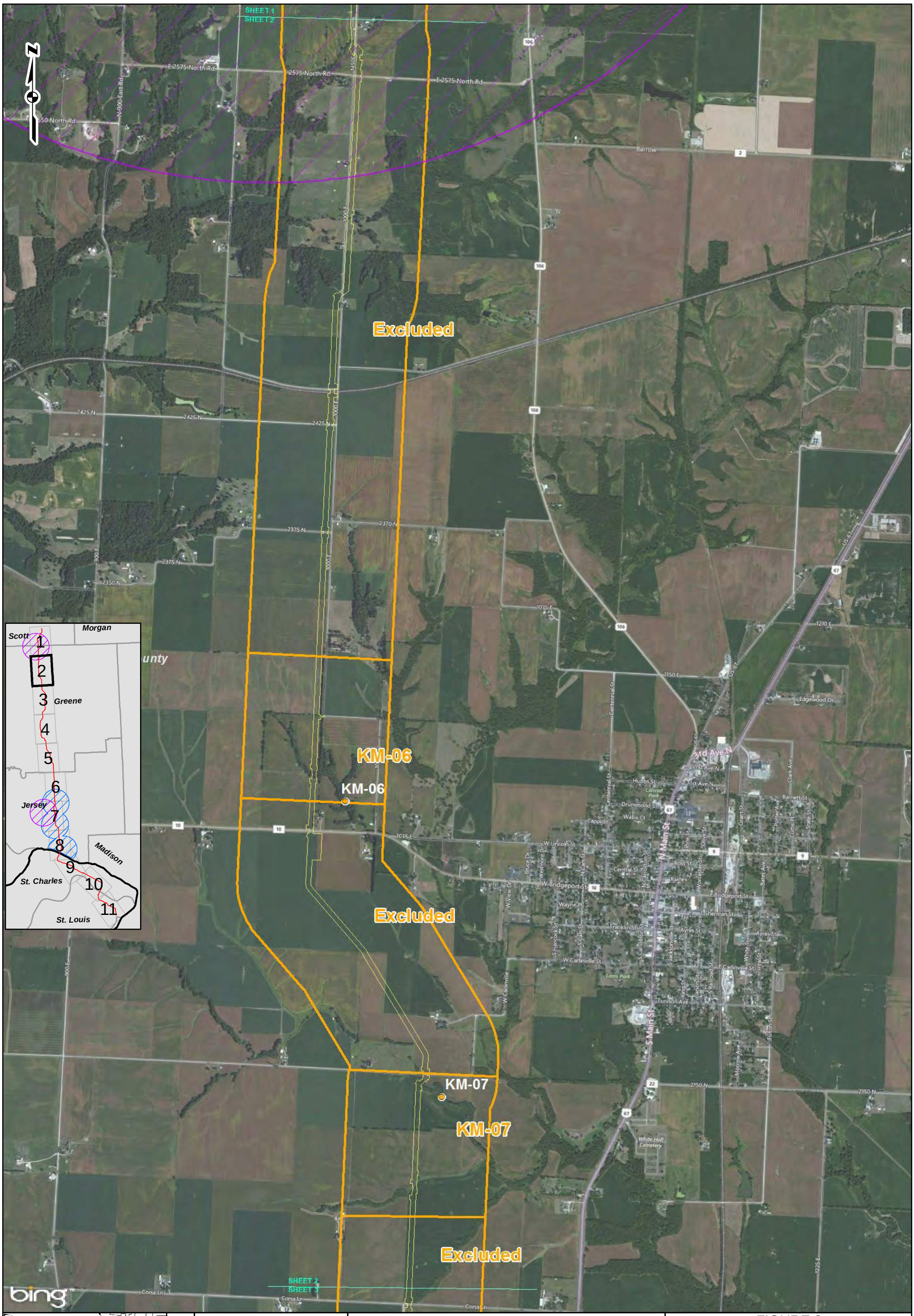
gai consultants

SPIRE STL PIPELINE PROJECT

spire

DRAWN BY: PK DATE: 7/11/2017
CHECKED: JAD APPROVED: JAD

C:\Users\kudlup\Desktop\Priya\2016\Spire\MXD\Mist Net Report\Figure 2 Mist Net Sites_07112017.mxd



PROJECT LOCATION

REFERENCE: NAIP
USDA, FSA, ILLINOIS 2015
MISSOURI 2014
ACCESSED : 07/2017

GREENE, JERSEY
AND SCOTT COUNTIES, IL
ST.CHARLES AND
ST.LOUIS COUNTIES, MO

LEGEND

- Limit of Disturbance
- Bat Survey Buffer
- Net Site
- Matchline
- County Boundary
- State Boundary
- Indiana Bat Summer Maternity Habitat

0 1,000 2,000 4,000 Feet

FIGURE 2
BAT PRESENCE/ABSENCE SURVEY
SHEET 2 OF 11

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SPIRE STL PIPELINE PROJECT

spire

DRAWN BY: PK DATE: 7/11/2017
CHECKED: JAD APPROVED: JAD

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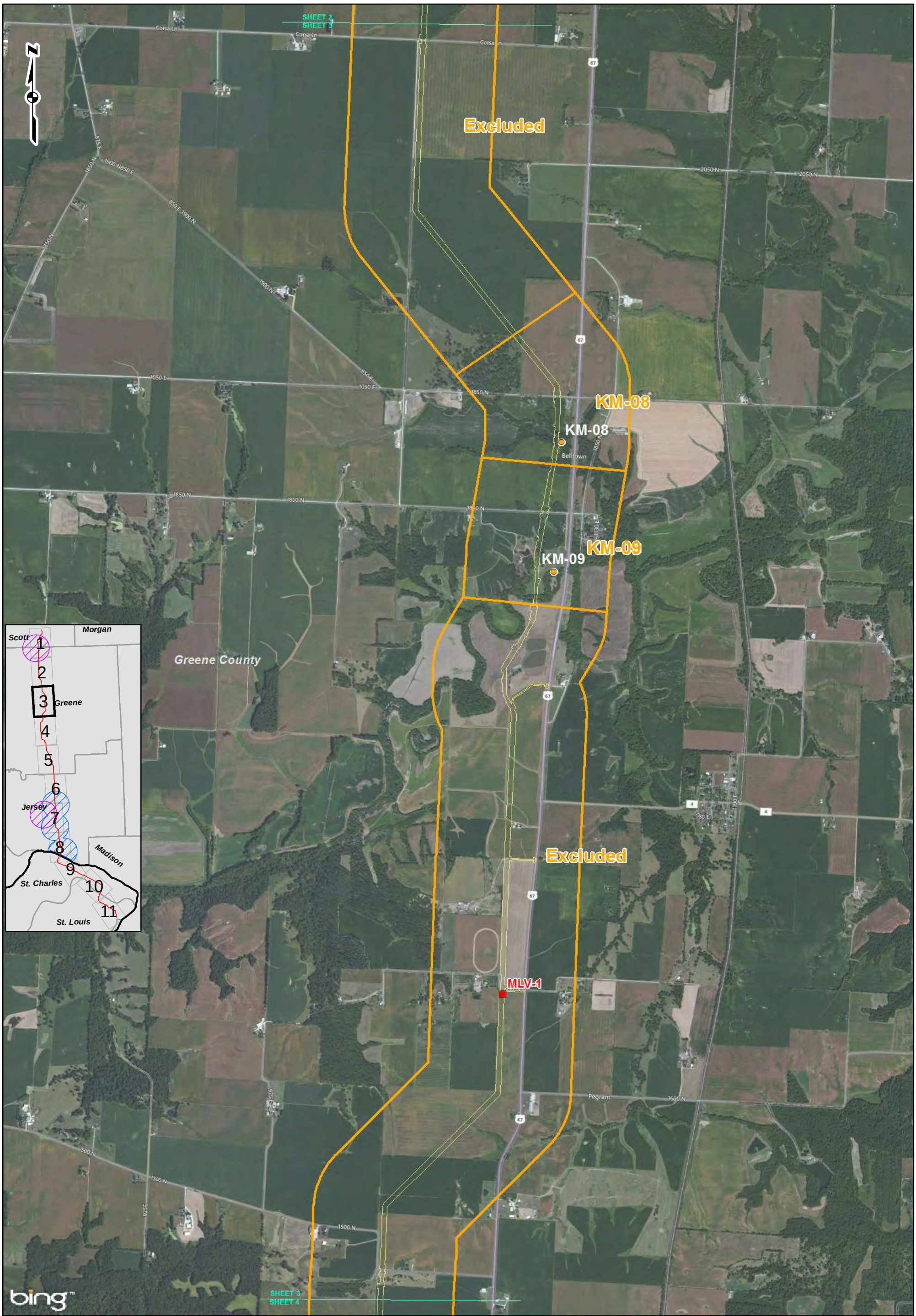


PROJECT LOCATION

REFERENCE: NAIP
USDA, FSA, ILLINOIS 2015
MISSOURI 2014
ACCESSED : 07/2017

GREENE, JERSEY
AND SCOTT COUNTIES, IL
ST.CHARLES AND
ST.LOUIS COUNTIES, MO

LEGEND

- Limit of Disturbance
- Facility
- Bat Survey Buffer
- Net Site
- Matchline
- County Boundary
- State Boundary

0 1,000 2,000 4,000 Feet

FIGURE 2
BAT PRESENCE/ABSENCE SURVEY
SHEET 3 OF 11

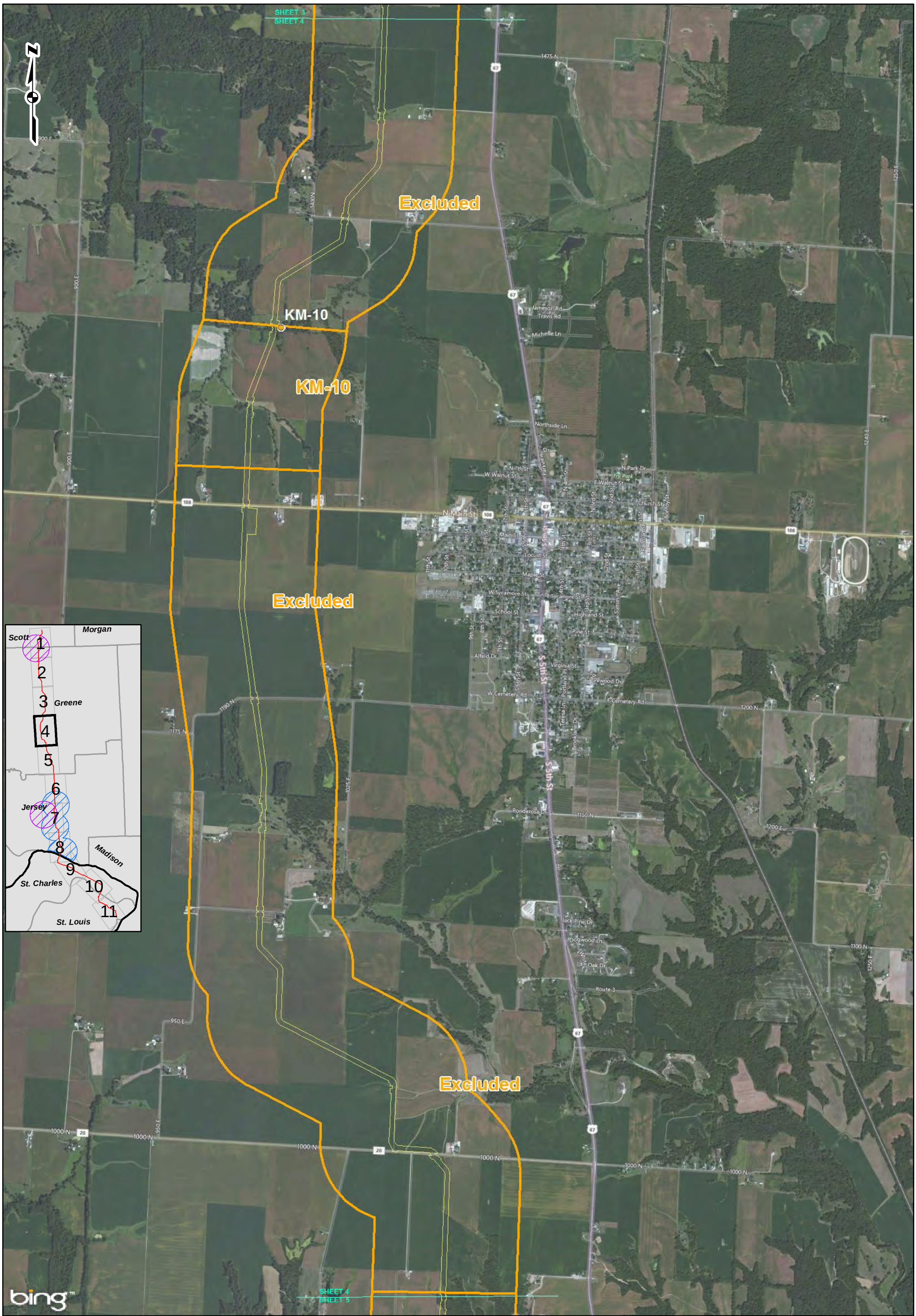
gai consultants

SPIRE STL PIPELINE PROJECT

spire

DRAWN BY: PK DATE: 7/11/2017
CHECKED: JAD APPROVED: JAD

C:\Users\kudlup\Desktop\Priya\2016\Spire\MXD\Mist Net Report\Figure 2 Mist Net Sites_07112017.mxd



PROJECT LOCATION

REFERENCE: NAIP
USDA, FSA, ILLINOIS 2015
MISSOURI 2014
ACCESSED : 07/2017

GREENE, JERSEY
AND SCOTT COUNTIES, IL
ST.CHARLES AND
ST.LOUIS COUNTIES, MO

LEGEND

- Limit of Disturbance
- Bat Survey Buffer
- Net Site
- Matchline
- County Boundary
- State Boundary

0 1,000 2,000 4,000 Feet

FIGURE 2
BAT PRESENCE/ABSENCE SURVEY
SHEET 4 OF 11

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SPIRE STL PIPELINE PROJECT

spire

DRAWN BY: PK DATE: 7/11/2017
CHECKED: JAD APPROVED: JAD

C:\Users\kudlup\Desktop\Priya\2016\Spire\MXD\Mist Net Report\Figure 2 Mist Net Sites_07112017.mxd

KM-11

NLEB Capture Site (1Female)

KM-11

Excluded

KM-12

KM-12

Excluded

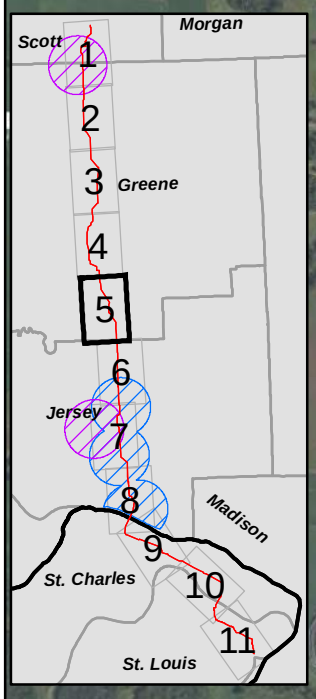
KM-13

KM-13

Excluded

Greene County

Jersey County



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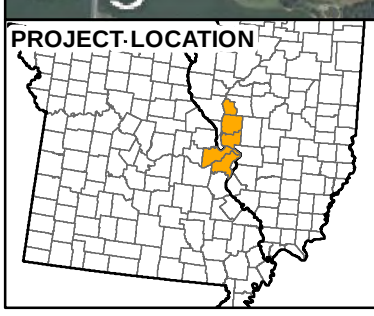

REFERENCE: NAIP
USDA, FSA, ILLINOIS 2015
MISSOURI 2014
ACCESSED : 07/2017

GREENE, JERSEY
AND SCOTT COUNTIES, IL
ST.CHARLES AND
ST.LOUIS COUNTIES, MO

LEGEND

- Limit of Disturbance
- Bat Survey Buffer
- Net Site
- Matchline
- NLEB Capture Site
- County Boundary
- State Boundary

0 1,000 2,000 4,000 Feet

FIGURE 2
BAT PRESENCE/ABSENCE SURVEY

SHEET 5 OF 11

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SPIRE STL PIPELINE PROJECT

spire

DRAWN BY: PK DATE: 7/11/2017
CHECKED: JAD APPROVED: JAD

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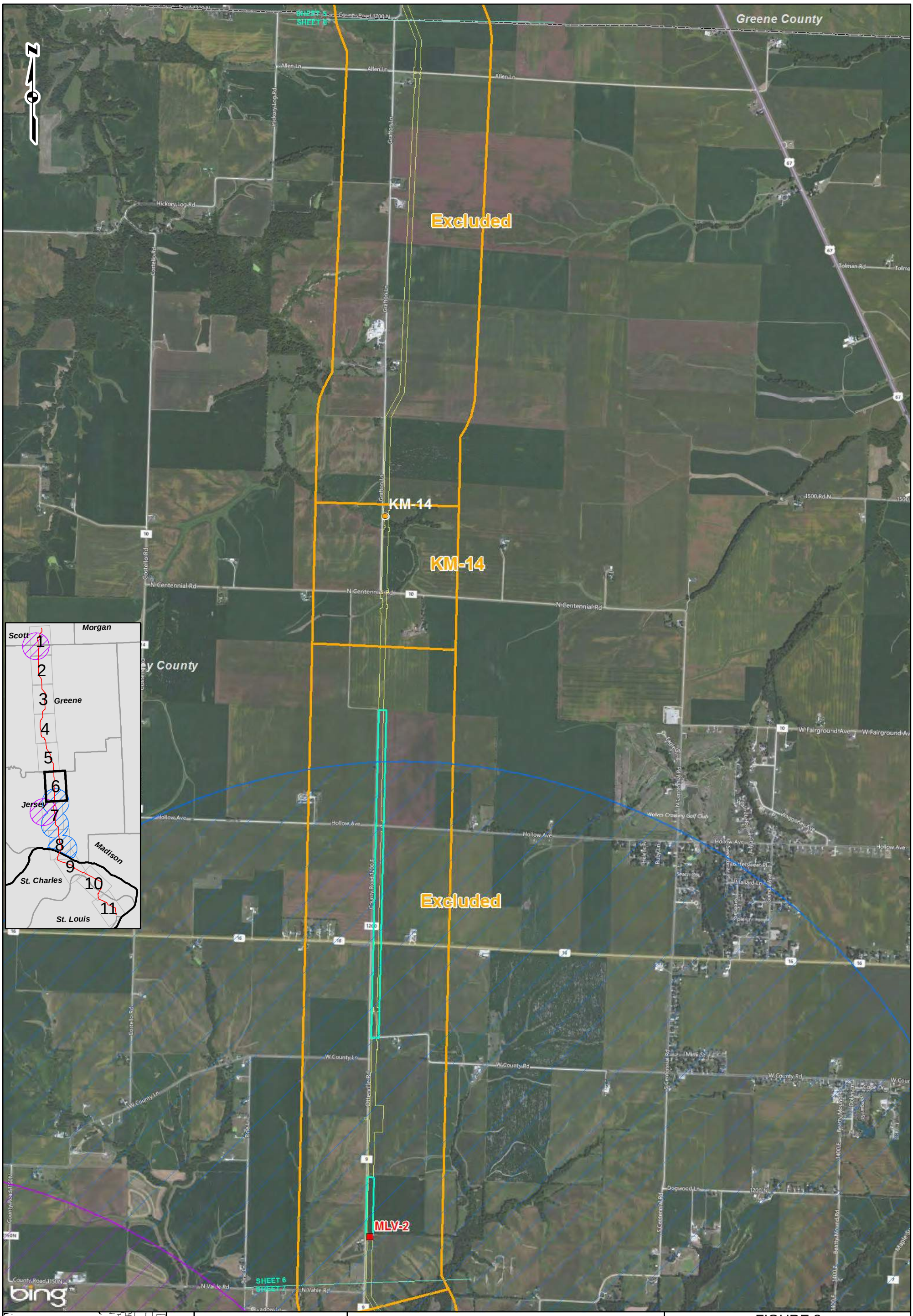

PROJECT LOCATION

REFERENCE: NAIP
USDA, FSA, ILLINOIS 2015
MISSOURI 2014
ACCESSED : 07/2017

GREENE, JERSEY
AND SCOTT COUNTIES, IL
ST.CHARLES AND
ST.LOUIS COUNTIES, MO

LEGEND

- Limit of Disturbance
- Facility
- Bat Survey Buffer
- Net Site
- Matchline
- County Boundary
- State Boundary
- Indiana Bat Summer Maternity Habitat
- Indiana Bat Summer Non-maternity Habitat
- Portal Search Outstanding

0 1,000 2,000 4,000 Feet

FIGURE 2
BAT PRESENCE/ABSENCE SURVEY
SHEET 6 OF 11

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SPIRE STL PIPELINE PROJECT

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DRAWN BY: PK DATE: 7/11/2017
CHECKED: JAD APPROVED: JAD

C:\Users\kudlup\Desktop\Priya\2016\Spire\MXD\Mist Net Report\Figure 2 Mist Net Sites_07112017.mxd

KM-15

[redacted]

IBAT 500 Capture Site (2Males)

KM-15

Km-16

KM-16

IBAT Capture Site (1 Male)

KM-17

IBAT 533 Capture Site (1Female)

KM-17

[redacted]

Jersey County

Excluded

[redacted]

KM-18

KM-18

[redacted]

KM-19

KM-19

IBAT177 Capture Site

Excluded

Scott
Morgan
Greene
Jersey
Madison
St. Charles
St. Louis
1
2
3
4
5
6
7
8
9
10
11

PROJECT LOCATION

REFERENCE: NAIP
USDA, FSA, ILLINOIS 2015
MISSOURI 2014
ACCESSED : 07/2017

GREENE, JERSEY
AND SCOTT COUNTIES, IL
ST.CHARLES AND
ST.LOUIS COUNTIES, MO

LEGEND

- Limit of Disturbance
- Bat Survey Buffer
- Net Site
- Matchline
- Indiana Bat Capture Site
- [redacted]
- County Boundary
- State Boundary
- Indiana Bat Summer Maternity Habitat
- Indiana Bat Summer Non-maternity Habitat

0 1,000 2,000 4,000 Feet

FIGURE 2
BAT PRESENCE/ABSENCE SURVEY
SHEET 7 OF 11

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SPIRE STL PIPELINE PROJECT

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DRAWN BY: PK DATE: 7/11/2017
CHECKED: JAD APPROVED: JAD

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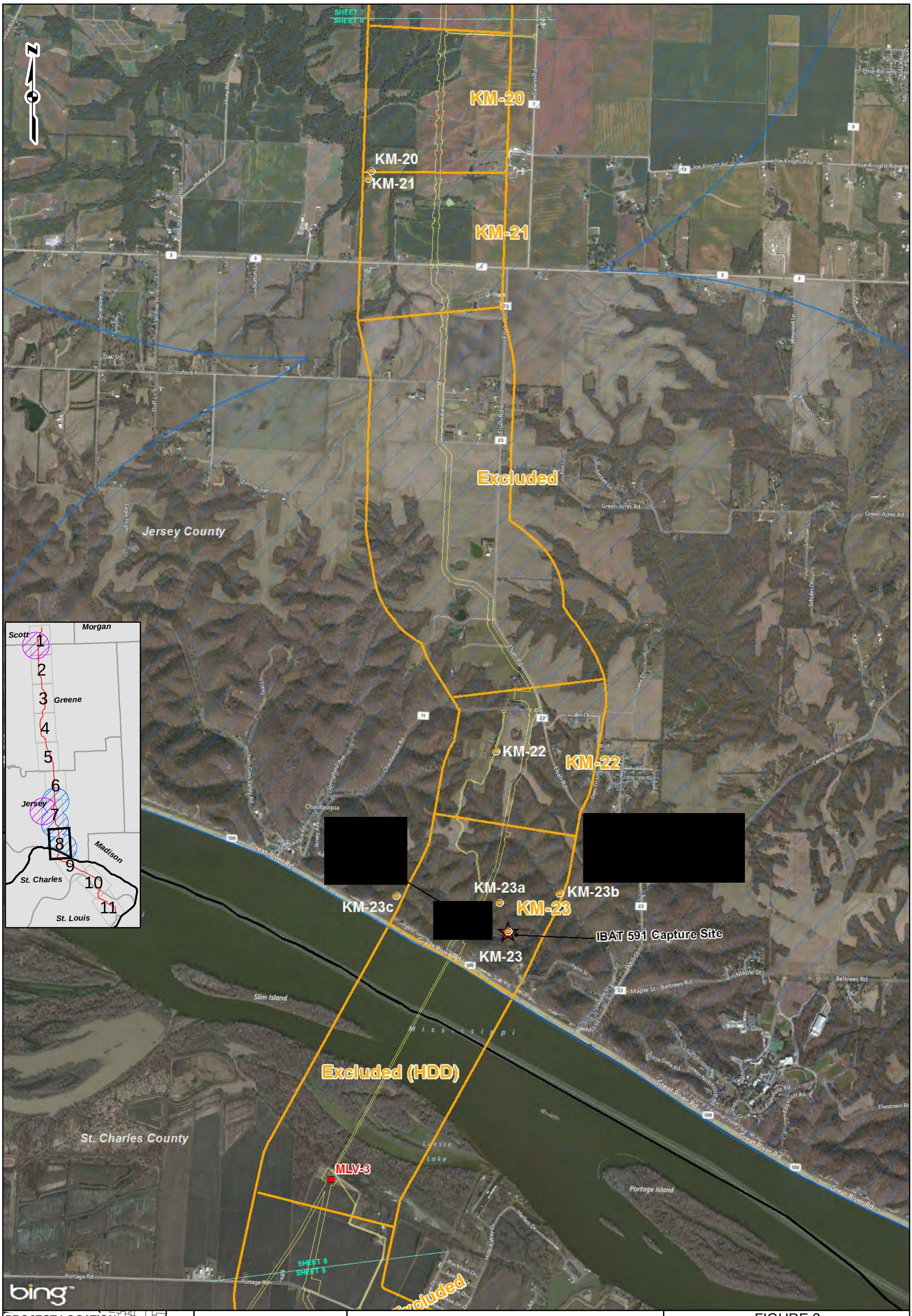

PROJECT LOCATION

REFERENCE: NAIP
USDA, FSA, ILLINOIS 2015
MISSOURI 2014
ACCESSED : 07/2017

GREENE, JERSEY
AND SCOTT COUNTIES, IL
ST.CHARLES AND
ST.LOUIS COUNTIES, MO

LEGEND

- Limit of Disturbance
- Facility
- Bat Survey Buffer
- Net Site
- Matchline
- Indiana Bat Capture Site
- [redacted]
- County Boundary
- State Boundary
- Indiana Bat Summer Non-maternity Habitat

0 1,000 2,000 4,000 Feet

FIGURE 2
BAT PRESENCE/ABSENCE SURVEY
SHEET 8 OF 11

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SPIRE STL PIPELINE PROJECT

spire

DRAWN BY: PK DATE: 7/11/2017
CHECKED: JAD APPROVED: JAD

C:\Users\kudlup\Desktop\Priya\2016\Spire\MXD\Mist Net Report\Figure 2 Mist Net Sites_07112017.mxd

PROJECT LOCATION

REFERENCE: NAIP
USDA, FSA, ILLINOIS 2015
MISSOURI 2014
ACCESSED : 07/2017

GREENE, JERSEY
AND SCOTT COUNTIES, IL
ST.CHARLES AND
ST.LOUIS COUNTIES, MO

LEGEND

- Limit of Disturbance
- Facility
- Bat Survey Buffer
- Net Site
- Matchline
- County Boundary
- State Boundary
- Indiana Bat Summer Non-maternity Habitat

0 1,000 2,000 4,000 Feet

FIGURE 2
BAT PRESENCE/ABSENCE SURVEY
SHEET 9 OF 11

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SPIRE STL PIPELINE PROJECT

spire

DRAWN BY: PK DATE: 7/11/2017
CHECKED: JAD APPROVED: JAD

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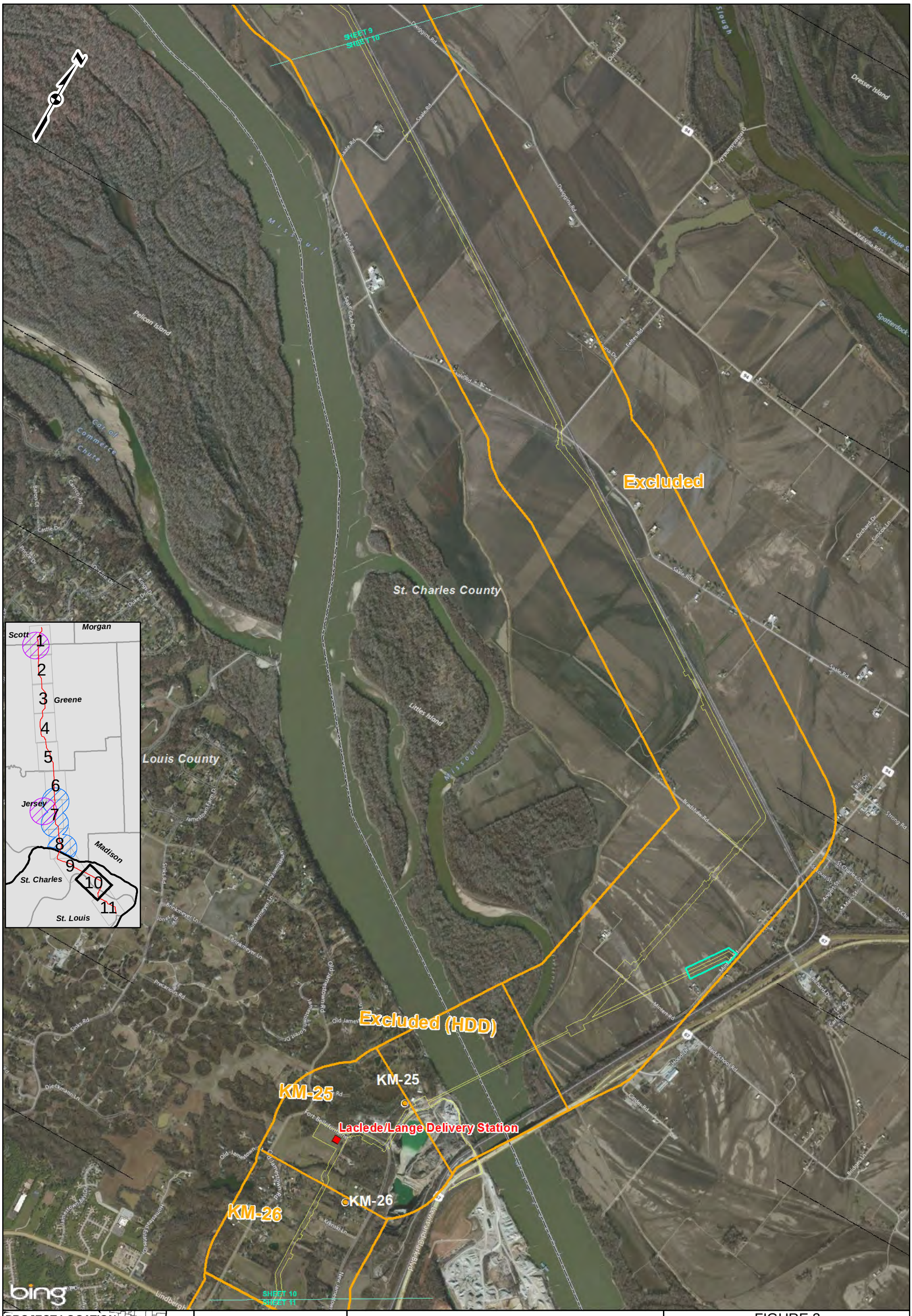

PROJECT LOCATION

REFERENCE: NAIP
USDA, FSA, ILLINOIS 2015
MISSOURI 2014
ACCESSED : 07/2017

GREENE, JERSEY
AND SCOTT COUNTIES, IL
ST.CHARLES AND
ST.LOUIS COUNTIES, MO

LEGEND

- Limit of Disturbance
- Facility
- Bat Survey Buffer
- Net Site
- Matchline
- County Boundary
- State Boundary
- Portal Search Outstanding

0 1,000 2,000 4,000 Feet

FIGURE 2
BAT PRESENCE/ABSENCE SURVEY
SHEET 10 OF 11

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SPIRE STL PIPELINE PROJECT

spire

DRAWN BY: PK DATE: 7/11/2017
CHECKED: JAD APPROVED: JAD

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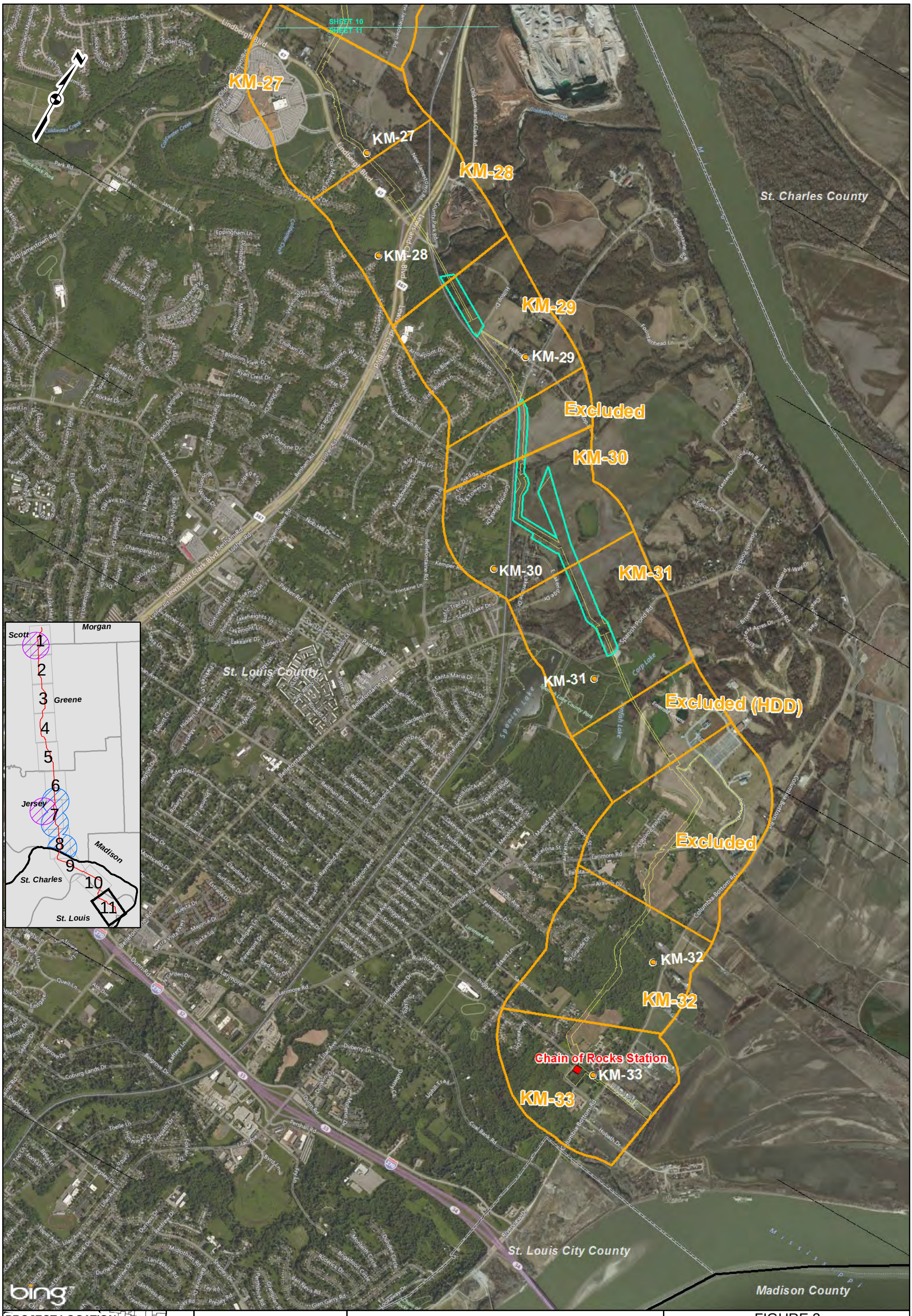

PROJECT LOCATION

REFERENCE: NAIP
USDA, FSA, ILLINOIS 2015
MISSOURI 2014
ACCESSED : 07/2017

GREENE, JERSEY
AND SCOTT COUNTIES, IL
ST.CHARLES AND
ST.LOUIS COUNTIES, MO

LEGEND

- Limit of Disturbance
- Facility
- Bat Survey Buffer
- Net Site
- Matchline
- County Boundary
- State Boundary
- Portal Search Outstanding

0 1,000 2,000 4,000 Feet

FIGURE 2
BAT PRESENCE/ABSENCE SURVEY
SHEET 11 OF 11

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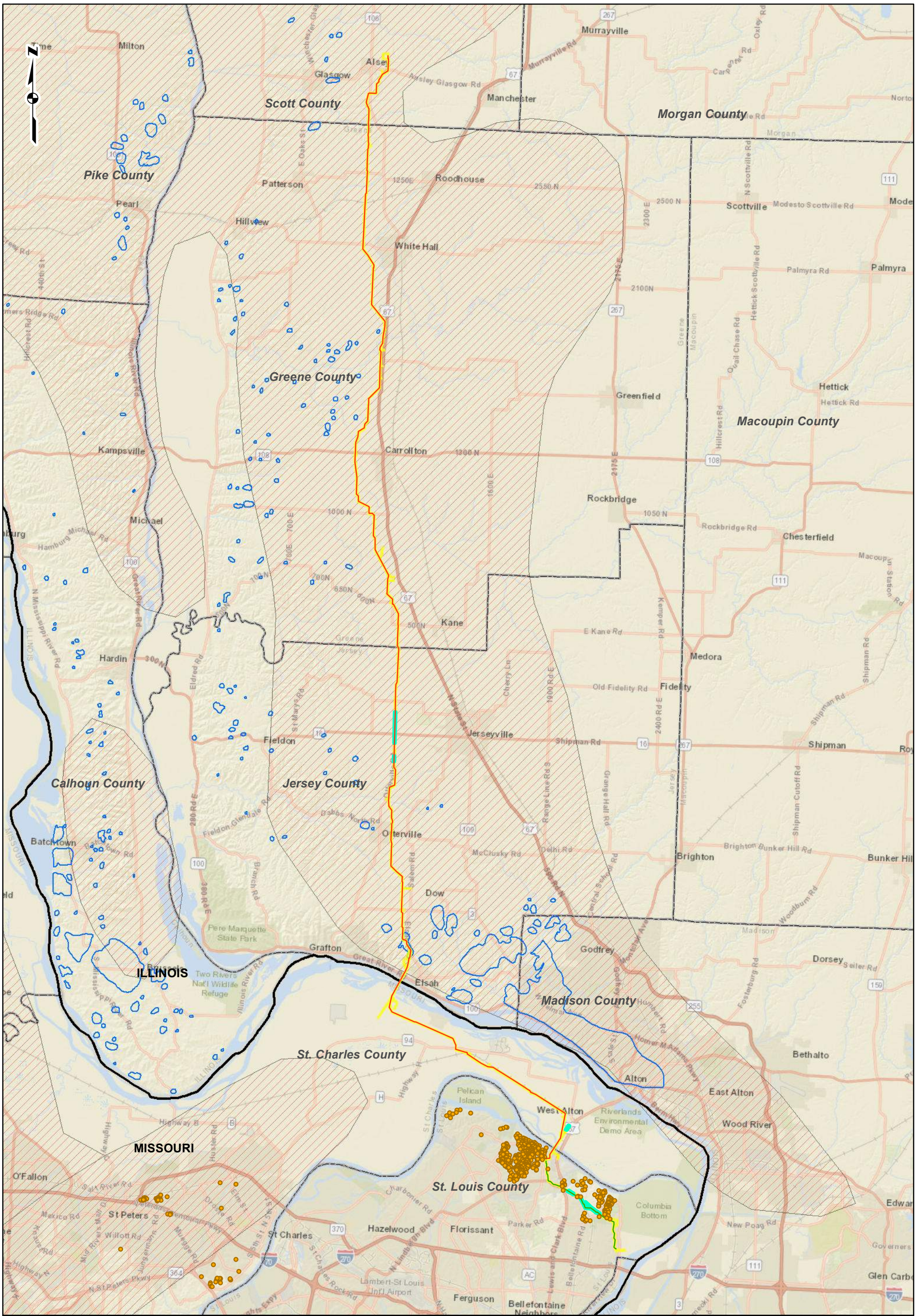
SPIRE STL PIPELINE PROJECT

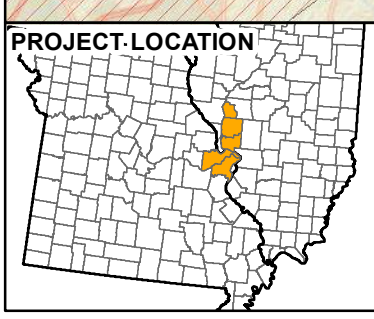
spire

DRAWN BY: PK DATE: 7/11/2017
CHECKED: JAD APPROVED: JAD

C:\Users\kudlup\Desktop\Priya\2016\Spire\MXD\Mist Net Report\Figure 2 Mist Net Sites_07112017.mxd



PROJECT LOCATION



REFERENCE:WORLD STREET MAP, ESRI, 2017
ACCESSED : 07/2017

GREENE, JERSEY AND SCOTT COUNTIES, IL
ST.CHARLES AND ST.LOUIS COUNTIES, MO

LEGEND

- 24-inch Pipeline
- North County Extension
- Limit of Disturbance
- Sinkhole Areas in Illinois
- Sinkholes in Missouri
- Karst Areas
- Portal Search Outstanding
- County Boundary
- State Boundary

0 2 4 8 Miles

FIGURE 3
KARST AREA AND SINKHOLE LOCATIONS

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SPIRE STL PIPELINE PROJECT

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DRAWN BY: PK DATE: 7/11/2017
CHECKED: JAD APPROVED: JAD

C:\Users\kudlup\Desktop\Priya\2016\Spire\MXD\Mist Net Report\Figure 3 Spire Karst Areas_07112017.mxd

Figure 4
Percent Bat Capture by Species during Mist Net Survey

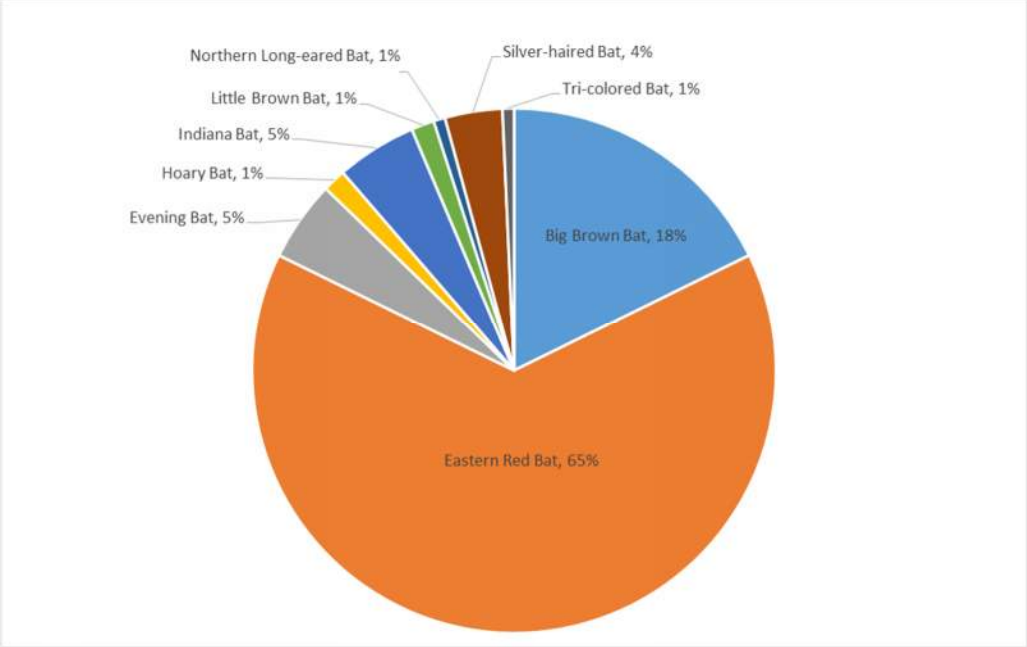

Figure 5
Ambient Temperature during Mist Net Survey

APPENDIX A
Correspondence

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Illinois – Iowa Field Office
1511 47th Avenue
Moline, Illinois 61265
Phone: (309) 757-5800 Fax: (309) 757-5807

IN REPLY REFER TO:

Mr. Jason Duffy
GAI Consultants

May 9, 2017
Electronic Mail

Mr. Duffy,

GAI is authorized to conduct northern long-eared bat and Indiana bat mist netting surveys for Spire STL Pipeline LLC project in Scott, Jersey, and Greene counties in Illinois, and St. Charles and St. Louis counties, Missouri, as outlined in the Bat Survey Study Plan submitted by you on March 24, 2017. All activities should conform to the conditions of the U.S. Fish and Wildlife Service (Service) permits TE03494B-1 (GAI Consultants Inc.) and TE03450B-1 (Erin Lynn Basiger).

We strongly encourage you to report data from this survey to the Illinois - Iowa Field Office utilizing the 2017 Bat Reporting Spreadsheets for Region 3, to fulfill the reporting requirements of your permit. The spreadsheet and instructions can be found on the Service's website http://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html.

Kristen Lundh
U.S. Fish & Wildlife Service
Illinois – Iowa Ecological Services Field Office
1511 47th Ave
Moline, IL 61265
ph: 309-757-5800 x 215
fax: 309-757-5807

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Illinois – Iowa Field Office
1511 47th Avenue
Moline, Illinois 61265
Phone: (309) 757-5800 Fax: (309) 757-5807

IN REPLY REFER TO:

Ms. Amber Nolder
GAI Consultants

May 9, 2017
Electronic Mail

Ms. Nolder,

You are authorized to conduct northern long-eared bat and Indiana bat mist netting surveys for Spire STL Pipeline LLC project in Scott, Jersey, and Greene counties in Illinois, and St. Charles and St. Louis counties, Missouri, as outlined in the Bat Survey Study Plan submitted by you on March 24, 2017. All activities should conform to the conditions of the U.S. Fish and Wildlife Service (Service) permits TE88797B-0 (Amber Dawn Nolder).

We strongly encourage you to report data from this survey to the Illinois - Iowa Field Office utilizing the 2017 Bat Reporting Spreadsheets for Region 3, to fulfill the reporting requirements of your permit. The spreadsheet and instructions can be found on the Service's website http://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html.

Kristen Lundh
U.S. Fish & Wildlife Service
Illinois – Iowa Ecological Services Field Office
1511 47th Ave
Moline, IL 61265
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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Illinois – Iowa Field Office
1511 47th Avenue
Moline, Illinois 61265
Phone: (309) 757-5800 Fax: (309) 757-5807

IN REPLY REFER TO:

Ms. Vona Kuczynska
SCI Engineering Inc.

May 9, 2017
Electronic Mail

Ms. Kuczynska,

You are authorized to conduct northern long-eared bat and Indiana bat mist netting surveys for Spire STL Pipeline LLC project in Scott, Jersey, and Greene counties in Illinois, and St. Charles and St. Louis counties, Missouri, as outlined in the Bat Survey Study Plan submitted by GAI on March 24, 2017. All activities should conform to the conditions of your U.S. Fish and Wildlife Service (Service) permit TE71041B-0 (Iwona Kuczynska).

We strongly encourage you to report data from this survey to the Illinois - Iowa Field Office utilizing the 2017 Bat Reporting Spreadsheets for Region 3, to fulfill the reporting requirements of your permit. The spreadsheet and instructions can be found on the Service's website http://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html.

Kristen Lundh
U.S. Fish & Wildlife Service
Illinois – Iowa Ecological Services Field Office
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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Illinois – Iowa Field Office
1511 47th Avenue
Moline, Illinois 61265
Phone: (309) 757-5800 Fax: (309) 757-5807

IN REPLY REFER TO:

Mr. Jason Duffy
GAI Consultants

June 12, 2017
Electronic Mail

Mr. Duffy,

GAI and associated sub-contractors are authorized to conduct additional mist netting sites on the Principia College property as part of the northern long-eared bat and Indiana bat mist netting surveys for the Spire STL Pipeline Project. These additional survey nights are an amendment to the study plan submitted by you on March 24, 2017. All activities should conform to the conditions of the U.S. Fish and Wildlife Service (Service) permits TE0394B-1 (GAI Consultants), TE88797B-0 (Amber Nolder) and TE1041B-0 (Vona Kuczynska).

We strongly encourage you to report data from this survey to the Illinois - Iowa Field Office utilizing the 2017 Bat Reporting Spreadsheets for Region 3, to fulfill the reporting requirements of your permit. The spreadsheet and instructions can be found on the Service's website http://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html.

Kristen Lundh
U.S. Fish & Wildlife Service
Illinois – Iowa Ecological Services Field Office
1511 47th Ave
Moline, IL 61265
ph: 309-757-5800 x 215
fax: 309-757-5807

Appendix B
Photographs

Photograph 1. Site KM-1 Net B.

Photograph 2. Site KM-2 Net A.

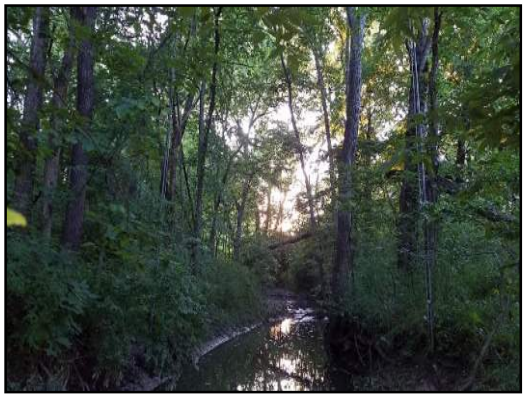
Photograph 3. Site KM-3 Net A.

Photograph 4. Site KM-4 Net A.

Photograph 5. Site KM-5 Net A.

Photograph 6. Site KM-6 Net A.

Photograph 7. Site KM-7 Net A.



Photograph 8. Site KM-8 Net B.

Photograph 9. Site KM-9 Net B.

Photograph 10. Site KM-10 Net B.

Photograph 11. Site KM-11 Net A.

Photograph 12. Site KM-12 Net A.

Photograph 13. Site KM-13 Net A.

Photograph 14. Site KM-14 Net C

Photograph 15. Site KM-15 Net A.

Photograph 16. Site KM-16 Net A

Photograph 17. Site KM-17 Net A.

Photograph 18. Site KM-18 Net A

Photograph 19. Site KM-19 Net A.

Photograph 20. Site KM-20 Net A

Photograph 21. Site KM-21 Net A.

Photograph 22. Site KM-22 Net B

Photograph 23. Site KM-23 Net B.

Photograph 24. Site KM-23a Net C

Photograph 25. Site KM-23b Net A.

Photograph 26. Site KM-23c Net A

Photograph 27. Site KM-24 Net B.

Photograph 28. Site KM-25 Net A

Photograph 29. Site KM-26 Net A.

Photograph 30. Site KM-27 Net B

Photograph 31. Site KM-28 Net B.

Photograph 32. Site KM-29 Net A

Photograph 33. Site KM-30 Net A.

Photograph 34. Site KM-31 Net A

Photograph 35. Site KM-32 Net A.

Photograph 36. Site KM-33 Net A

Photograph 37. Eastern Red Bat (Site KM-19).

Photograph 38. Northern Long-eared Bat (Site KM-11)

Photograph 39. Indiana Bat (Site KM-04)

Photograph 40. Indiana Bat (Site KM-15)

Photograph 41. Indiana Bat (Site KM-15)

Photograph 42. Indiana Bat (Site KM-17)

Photograph 43. Indiana Bat Foot and Calcar (Site KM-17)

Photograph 44. Indiana Bat (Site KM-19)

Photograph 45. Evening Bat (Site KM-03)

Photograph 46. Tri-colored Bat (Site KM-03)

Photograph 47. Big Brown Bat (Site KM-01)

Photograph 48. Indiana Bat (Site KM-23)

Photograph 49. Little Brown Bat (Site KM-23b)

Photograph 50. Silver-haired Bat (Site KM-04)

Photograph 51. Hoary Bat (Site KM-07)

Photograph 52. Roost 177-1

Photograph 53. Roost 177-2

Photograph 54. Roost 500-1

Photograph 55. Roost 500-2

Photograph 56. Roost 500-3

Photograph 57. Roost 533-1

Photograph 58. Roost 533-2

Photograph 59. Roost 644-1

Photograph 60. Roost 644-2

Photograph 61. Roost 591-1

Photograph 62. Roost 591-2

APPENDIX C
Data Sheets

REDACTED - CONFIDENTIAL

gai consultants
transforming ideas into reality

ATTACHMENT 6
BLASTING PLAN

Spire STL Pipeline Project

Blasting Plan

FERC Docket Nos. CP17-40-000 and CP17-40-001

January 2017

Public

Table of Contents

Attachments

Acronyms and Abbreviations

CFR	Code of Federal Regulations
CSR	Code of State Regulations
Engineer	Company Engineer
FERC	Federal Energy Regulatory Commission
lb	pound
mm/s	millimeters per second
NRCS	Natural Resources Conservation Service
OSHA	Occupational Safety and Health Administration
PPV	peak particle velocity
Project	Spire STL Pipeline Project
Spire	Spire STL Pipeline LLC

Blasting Plan

Spire STL Pipeline LLC ("Spire") is seeking authorization from the Federal Energy Regulatory Commission ("FERC") pursuant to Section 7(c) of the Natural Gas Act to construct and operate the proposed Spire STL Pipeline Project ("Project") located in Scott, Greene, and Jersey Counties, Illinois, and St. Charles and St. Louis Counties, Missouri.

1.1 Introduction

This Blasting Plan has been prepared to outline the procedures and safety measures to which the Contractor will adhere where blasting is required for installation of the pipeline. It should be noted that the contractor will be required to submit a detailed blasting plan to Spire prior to construction that is consistent with the provisions in this Blasting Plan and Spire Blasting Specifications, provided as Attachment A.

1.1.1 Objective

This Blasting Plan is intended to identify blasting operations, including safety, use, storage, and transportation of explosives, that are consistent with minimum safety requirements, as defined by applicable federal [e.g., Title 27 Code of Federal Regulations ("CFR") 181 - Commerce in Explosives; Title 49 CFR 177 - Carriage by Public Highway; Title 29 CFR 1926.900 et seq. Subpart U - Safety and Health Regulations for Construction - Blasting and Use of Explosives; Title 29 CFR 1910.109 - Explosives and Blasting Agents; 29 CFR 1926.900 - General Provisions and Standards Nos. 901, 902, and 904-912], state, and local regulations consistent with the conditions of the FERC Certificate.

Prior to commencing any blasting activities, Spire's Contractor will also contact and coordinate with the Missouri Division of Fire Safety, Illinois Department of Natural Resources, and county and local municipalities and stakeholders such as code enforcement officials and fire protection officials, as necessary, prior to the start of work. Work shall be conducted in accordance with State of Missouri 11 Code of State Regulations ("CSR") 40-7: Rules of Department of Public Safety Division 40 - Division of Fire Safety - Chapter 7 - Blasting; as well as the State of Illinois Explosives Act contained within 225 Illinois Compiled Statutes 210.

1.1.2 Potential Blasting Locations

The Natural Resources Conservation Service ("NRCS") defines shallow depth to bedrock as being within five feet of the ground surface (NRCS 2015). Rock encountered during trenching will be removed using one of the following techniques, typically in the order listed below:

- conventional excavation with a backhoe;
- hammering with a pointed backhoe attachment or a pneumatic rock hammer, followed by backhoe excavation;
- ripping with a bulldozer; and
- blasting followed by backhoe excavation.

The rock removal technique will depend on rock properties, such as relative hardness, fracture susceptibility, expected volume, and location. Areas of shallow depth to bedrock crossed by the Project were determined by review and analysis of published soil survey data from the NRCS Soil Data Mart program which includes the NRCS *Soil Survey Geographic (SSURGO) Database* and *Web Soil Survey* (NRCS 2015). At locations where conventional methods of rock removal are not considered feasible, Spire anticipates rock removal will be required as defined in the following plan.

1.2 Types of Blasting

The primary type of blasting will be for ditch excavation. Blasting may also be required during the right-of-way grading operation. Blasting for grade or trench excavation will be utilized only after all other reasonable means of excavation have been used and are unsuccessful in achieving the required results. Spire may specify locations (e.g., foreign utility line crossings, roadways and near-by structures) where consolidated rock must be removed by approved mechanical equipment, such as rock-trenching machines, rock saws, hydraulic rams, or jack hammers instead of blasting.

If any streams and wetland areas require blasting to perform the ditch excavation, the streams and wetland areas will be tested for rock and shot by the mainline trenching crew except when not specifically possible due to timing completion requirements. A final determination on the need for in-stream blasting will be made at the time of construction. In the event in-stream blasting is required, Spire will apply for and receive a permit for use of explosives for each perennial waterway that is proposed to be impacted by the Project. Stream beds impacted by the use of explosives will be restored to their original contour by backfill of the top one-foot of trench with clean gravel or native cobbles.

1.3 Pre-Blast Inspection

If the contractor has to blast near buildings or wells, as required by FERC, Spire's Blasting Contractor will retain an independent firm to conduct pre-blast surveys, with owner permission, to assess the conditions of structures (interior and exterior), wells, springs, and utilities within 150 feet of the proposed construction right-of-way. Should local or state ordinances require inspections in excess of 150 feet from the work area, the local or state ordinances will prevail.

As per State of Missouri 11 CSR 40-7(8)(A)(3), "Any person using explosives, which will conduct blasting within the jurisdiction of a municipality, shall notify the owner or occupant of any residence or business

located within a scaled distance of fifty-five from the site of blasting prior to the start of blasting at any new location." Also, as per State of Missouri 11 CSR 40-7(8)(A)(7), the blasting contractor shall, "Make at least three documented attempts to contact the owner of any uncontrolled structures within a scaled distance of thirty-five from the blast site in order to conduct a pre-blast survey of such structures. A pre-blast survey is not required if the owner of any such structure does not give permission for a survey to be conducted."

For structures, this survey will include:

- discussions with adjacent owners and receptors to familiarize them with the activities to be conducted and planned precautions to be taken including pre-blast and post-blast condition surveys and vibration monitoring;
- determination of the existence and location of structures, utilities, septic systems, and wells at the nearby property location;
- detailed examination, photographs, and/or video records of adjacent structures and utilities; and
- detailed mapping and measurement of large cracks, crack patterns, and other evidence of structural distress.

For wells and springs utilized for extraction of water, this survey will include:

- discussion with adjacent owner to identify the type of well, water bearing zone, and end-use of water from the well or spring system; and
- determination of pre-blasting flow rate and sampling for pre-blasting total dissolved solids.

For buried utilities, this survey will include:

- discussion with utility owner/operators to identify the type of utility, number and size of utility structures, material type and construction date, depth to utility, and protective coatings, if applicable; and
- if required, exposure of section of utility within closest radial distance to proposed blasting activities to conduct pre-blasting visual condition assessment.

The results will be summarized in a condition report that will include:

- description of construction and condition of existing structure, well, or utility;
- photo documentation; and
- any structure-specific precautions such as vibration limit or air blast limit thresholds to be implemented for nearby blasting activities to be completed.

Post-blast inspections by a Spire representative will also be performed as warranted and discussed in Section 1.16.

1.4 Monitoring of Blasting Activities and Blasting Procedure

The potential for blasting along the pipeline segments to affect any structure, utility, well, septic system, spring, or other sensitive feature will be minimized by controlled blasting techniques and by using mechanical methods for rock excavation as much as possible.

Controlled blasting techniques have been effectively employed by Spire and other companies to protect active gas pipelines up to within 12 feet of trench excavation. The following sections present details of procedures for blasting that will be implemented in areas requiring blasting:

1.4.1 General Provisions

During blasting, Spire's blasting Contractor will take precautions to minimize damage to adjacent areas and structures. The Contractor will provide all personnel, labor, and equipment to perform necessary blasting operations related to the work. The Contractor will provide a permitted/licensed blaster who possesses all permits and licenses required by the states in which blasting is required during construction, and having a working knowledge of all federal, state, and local laws and regulations that pertain to the storage, use and transportation of explosives. Any failure to comply with the appropriate law and/or regulations is the sole liability of the contractor. The contractor and the contractor's permitted/licensed blaster shall be responsible for the conduct of all blasting operations, which shall be subject to inspection requirements.

1.4.2 Storage of Explosives and Related Materials

Explosives and related materials shall be stored in approved facilities required under the provisions contained in 27 CFR Part 555 and all other applicable federal, state, and local regulations pertaining to blasting and the transportation, storage and use of explosives. The handling of explosives may be performed by the person holding a permit to use explosives or by other employees under his or her direct supervision provided that such employees are at least 21 years of age.

1.4.3 Pre-Blast Operations

The contractor is required to submit a planned schedule of blasting operations to the Company Engineer ("Engineer") or his designated representative for approval, prior to commencement of any blasting or pre-blast operation, which indicates the maximum charge weight per delay, hole size, spacing, depth, and blast layout. As per notification requirements of the State of Missouri codified in 11 CSR 40-7(8)(A), "Any person using explosives that will conduct blasting within the jurisdiction of a municipality shall notify the appropriate representative of the municipality in writing or by telephone at least two business days in advance of blasting at that location." As per 11 CSR 40-7(8)(A)(1) and (2), "Any appropriate representative shall be deemed to be the city's public works department, code enforcement official, or an official at the main office maintained by the municipality" and "In any area where blasting will be conducted, whether in a municipality or in an unincorporated area, the person using explosives also shall notify the appropriate

fire protection official for the jurisdiction where blasting will occur, which may be a city fire department, fire protection district, or volunteer fire protection association."

The blasting schedule is to include the blast geometry, hole spacing, burden, drill hole dimensions, type and size of charges, explosive product data, stemming materials, and delay timing patterns and should also include a location survey of any dwelling or structures that may be affected by the proposed operation. Face material shall be carefully examined before drilling to determine the possible presence of unfired explosive material. Drilling shall not be started until all remaining butts of old holes are examined for unexploded charges, and if any are found, they shall be re-fired before work proceeds. No person shall be allowed to deepen the drill holes that have contained explosives.

For blasting in vicinity of utility lines, the blasting Contractor shall make every reasonable effort to verify the exact location of utility lines located in the vicinity of such operations. When the blasting Contractor has no verification of the location of utility lines in the vicinity of such operations, but it is reasonable to assume that there are utility lines, the Contractor conducting the blasting operations shall make a concentrated effort to locate the lines with regard to their horizontal distance from the nearest blast hole and their depth below the earth's surface.

Whenever blasting is being conducted within 50 feet of electric, water, sewer, fire alarm, telephone, telegraph, or steam utilities, the blasting Contractor shall notify the appropriate representatives of such utilities at least 72 and 24 hours in advance of such blasting. Verbal notice shall be confirmed with written notice.

Whenever blasting is being conducted within 200 feet of any pipe distributing liquefied petroleum, manufactured, mixed or natural gas, the blasting Contractor shall notify the gas utility company having control of such gas at least three full working days (excluding Sundays or holidays) prior to blasting. Such notice shall be in writing and served personally or by registered mail.

If blasting is to be conducted adjacent to an existing Spire/Laclede pipeline, approval must be received from Spire. The contractor shall provide this schedule to the Engineer at least three working days prior to any pre-blast operation for approval and use. Where residences are within 50 feet of the blasting operation, the Engineer may require notification of 10 business days.

Whenever blasting is being conducted within 200 feet of a railroad, the blasting Contractor shall notify the appropriate representative of the railroad 24 hours in advance of such blasting. Verbal notice shall be confirmed with written notice.

A maximum loading powder factor shall not exceed the site-specific allowable pounds ("lbs") of explosive per cubic yard of rock to be excavated. However, should the loading fail to effectively fragment the rock, a higher powder factor may be allowed if the charge weight per delay is reduced by a proportional amount and approved by the Engineer.

1.4.4 Discharging Explosives

The following list of steps will be performed by the Contractor for all blasting. These steps represent a minimum requirement and give a general order to the blasting procedure:

a. Completion of all necessary pre-blast surveys will be confirmed prior to blasting activity to document existing conditions before blasting and any other physical factors that blasting could affect.

b. The contractor shall obtain Spire's approval and provide Spire at least 72-hour notice prior to the use of any explosives. The contractor shall comply with local and state requirements for pre-blast notifications, such as "One Call", which requires a 72-hour notice.

c. Whenever blasting is being conducted in the vicinity of gas, electric, water, fire alarm, telephone, telegraph, and steam utilities, the blaster shall notify the appropriate representatives of such utilities a minimum of 72 hours in advance of blasting. Verbal notice shall be followed-up with written notice. In an emergency, the local authority issuing the original permit may waive this time limit.

d. A safety meeting will be held prior to any blasting activities. All Project personnel involved with the blasting in any way must attend. Safety rules and signalling will be reviewed.

e. Warning signs will be erected.

f. Lightning detectors will be set up.

g. Drilled holes will be measured accurately for depth and location.

h. Seismic equipment will be set-up to measure velocities at any structures 150 feet or less from the blast.

i. Distances to any nearby structure (aboveground or below ground) suspected of being less than 300 feet from the blast will be measured.

j. The blasting affected zone will be cleared.

k. The warning signal will be given.

l. The blast signal will be given.

m. The blast will be detonated.

n. After the blaster has checked for misfires and gives the "ALL CLEAR" signal, inspectors will inspect any aboveground or below ground facilities for damage.

During the blasting operations, excessive vibration will be controlled by limiting the size of charges and by using charge delays which stagger or sequence the detonation times for each charge.

All blasting will be performed by registered licensed blasters and monitored by experienced blasting inspectors. Recording seismographs will be installed by the contractor at selected monitoring stations

under the observation of Spire personnel. During construction, the contractor will submit blast reports for each blast and keep detailed records as described in Section 1.4.7.

Ground vibration and air overpressure effects of each blast will be monitored by seismographs. If a charge greater than eight lbs per delay is used, the distance of monitoring will be in accordance with the U.S. Bureau of Mines Report of Investigations 8507.

To maximize its responsiveness to the concerns of affected landowners, Spire will evaluate all complaints of well or structural damage associated with construction activities, including blasting. A toll-free landowner hotline will be established by Spire for landowners to use in reporting complaints or concerns. In the unlikely event that blasting activities temporarily impair well water, Spire will provide alternative sources of water or otherwise compensate the owner. If well or structural damage is substantiated, Spire will either compensate the owner for damages or arrange for a new well to be drilled.

Blasting operations, except by special permission of the authority having jurisdiction, shall be conducted during daylight hours.

When blasting is done, the blast shall be covered with blasting mats, constructed so that it is capable of preventing rock fragments (or flyrock) from being thrown. In addition, all other possible precautions shall be taken to prevent damage to livestock and other property and inconvenience to the property owner or tenant during blasting operations. In the event any rock is scattered outside the right-of-way by blasting operations, pending landowner permission, it shall immediately be retrieved or returned to the right-of-way.

Precautions shall be taken to prevent accidental discharge of electric blasting caps from currents induced by radar and radio transmitters, lightning, adjacent power lines, dust and snow storms, or other sources of extraneous electricity. Per 29 CFR 1926.900(k), these precautions shall include:

- Detonators shall be short-circuited in holes which have been primed and shunted until wired into the blasting circuit;
- Suspension of all blasting operations and removal of all personnel from the blasting area during the approach and progress of an electrical storm. Work will continue only after the nearest lightning activity is at least five miles beyond the blasting area. A approved lightning detector that is capable of measuring the degree of electrical activity associated with an approaching storm, and the distance to the storm front from the instrument located on the Construction right-of-way will be on-site;
- The posting of all signs warning against the use of mobile radio transmitters on all roads within 350 feet (107 m) of blasting operations;
- Ensuring that mobile radio transmitters which are less than 100 feet away from electric blasting caps, in other than original containers, shall be de-energized and effectively locked; and

- Observance of the latest recommendations with regard to blasting in the vicinity of radio transmitters or power lines, as set forth in the Institute of Makers of Explosives Safety Library Publication No. 20, *Safety Guide for the Prevention of Radio Frequency Radiation Hazards in the Use of Electric Blasting Caps*.

No blast shall be fired until the blaster-in-charge has made certain that all surplus explosive materials are in a safe place, all persons and equipment are at a safe distance or under sufficient cover, and that an adequate warning signal has been given.

Only the person making leading wire connections in electrical firing shall fire the shot. All connections should be made from the bore hole back to the source of firing current, and the leading wires shall remain shorted until the charge is to be fired. After firing an electric blast from a blasting machine, the leading wires shall be immediately disconnected from the machine and short-circuited. If there are any misfires while using cap and fuse, all persons shall remain away from the charge for at least one hour. If electrical blasting caps are used and a misfire occurs, this waiting period may be reduced to 30 minutes.

Misfires shall be handled under the direction of the person in charge of the blasting and all wires shall be carefully traced in search for the unexploded charges.

Explosives shall not be extracted from a hole that has once been charged or has misfired unless it is impossible to detonate the unexploded charge by insertion of a fresh additional primer.

1.4.5 Waterbody Crossing Blasting Procedures

To facilitate planning for blasting activities for waterbody crossings, rock drills or test excavations may be used in waterbodies to test the ditch-line during mainline blasting operations to evaluate the presence of rock in the trench-line. For testing and any subsequent blasting operations, stream flow will be maintained through the site. During blasting operations, the contractor shall comply with the waterbody crossing procedures specified in Spire's documents, as well as any Project-specific permit conditions.

1.4.6 Disposal of Explosive Materials

All explosive materials that are obviously deteriorated or damaged shall not be used and shall be destroyed according to applicable local, state, and federal requirements.

Empty containers and packages, and paper or fiberboard packing materials that have previously contained explosive materials shall not be reused for any purpose. Such packaging materials shall be destroyed by burning at an approved outdoor location or by other approved method. All personnel shall remain at a safe distance from the disposal area.

All other explosive materials will be transported from the job site in approved magazines in compliance with all local, state, and federal regulations.

1.4.7 Blasting Records

A record of each blast shall be made and submitted, along with seismograph reports, to the Engineer. In accordance with Federal, State, and local requirements, the record shall contain the following minimum data for each blast:

a. name and address of company or contractor;

b. name, signature, and license number of contractor and of blaster in charge;

c. location, date, and time of blast;

d. a plan indicating blast hole layout and a cross-section of a blast hole showing the maximum lbs per delay, burden, spacing, depth of hole, subdrilling, stemming depth, decking location, and locations of detonators and explosives;

e. the horizontal distance and direction to the nearest construction from the blast site, that is neither owned nor leased by the person conducting or contracting for the blasting operation closest to the nearest loaded blast hole to be detonated;

f. identification number for each blast;

g. type of material blasted;

h. number of holes, burden, spacing, and depth of stemming;

i. diameter and depth of holes;

j. volume of rock in shot;

k. types of explosives used, specific gravity, energy release, lbs of explosive per delay, number of explosive cartridges (sticks) used and total lbs of explosive per shot;

l. number, brand name, and type of electric blasting caps used and the number of individual delay periods;

m. actual firing time where electric delay blasting caps do not fall within the manufacturer's sequence of delay time;

n. size and total length of detonating cord, when used, delay periods, and type of precaution to deaden sound effects;

o. delay type, interval, total number of delays, and holes per delay;

p. maximum amount of explosives per delay period of 17 ms or greater;

q. powder factor;

r. method of firing and type of circuit;

s. weather conditions, including wind speed direction, temperature, and cloud cover conditions;

t. type and height or length of stemming;

u. if mats or other protection were used; and

v. type of detonators and delay periods used.

The person taking the seismograph reading shall accurately indicate exact location of the seismograph, if used, and shall also show the distance of the seismograph from the blast.

Seismograph records, where required, should include:

a. identification of the instrument used;

b. the name of the observer;

c. the name of the interpreter;

d. the distance in feet and direction of the nearest construction from the blast site that is neither owned nor leased by the person conducting or contracting for the blasting operation closest to the nearest loaded blast hole to be detonated;

e. the distance in feet and direction of the instrument locations from the blast site;

f. the type of surface at the instrument location;

g. the maximum peak particle velocity of any one of the three mutually perpendicular components of the ground motion in the vertical and horizontal directions at the specific location in inches per second and the frequency range of the blast; and

h. the sound measurement in decibels measured on the linear frequency response or the overpressure in lbs per square inch.

1.5 Method to be Used to Minimize Hole-to-Hole Propagation

Hole-to-hole propagation problems are not anticipated with the proposed products and pattern for the following reasons:

- Only cartridge explosives will be used.
- The amount of explosives per borehole will be limited by the proximity of existing structures and utilities.

1.6 Types of Explosives/Initiation System to be Used

a. Dyno Nobel Unimax®: An extra gelatine dynamite with a specific gravity of 1.51 and a detonation rate of 19,600 feet per second (unconfined). The cartridge size will generally be two inches by eight inches (1.25 lbs/cartridge) or two inches by 16 inches (2.50 lbs/cartridge). 1055 cal/gram.

b. Dyno Nobel Unigel®: A semi-gelatine dynamite with a specific gravity of 1.30 and a detonation rate of 14,200 feet per second (unconfined). The cartridge size will generally be two inches by eight inches (1.15 lbs/cartridge) or two inches by 16 inches (2.30 lbs/cartridge). 955 cal/gram.

c. Dyno Nobel Dynomax Pro™: A propagation resistant dynamite, with a specific gravity of 1.45 and a detonation rate of 19,700 feet per second (unconfined). The cartridge size will generally be two inches by eight inches (1.225 lbs/cartridge) or two inches by 16 inches (2.45 lbs/cartridge). 1055 cal/gram.

d. Dyno TX or Blastex TX as a packaged emulsion product to use as a non-primed stick. 2.2 lb sticks. 808 cal/gram.

e. Dyno Nobel NONEL® 17 or 25 Millisecond Delay Connectors or Dyno Nobel NONEL EZ Det® (nonelectric) 25/350 or 25/500 or 25/700 millisecond delay.

f. A Dyno Nobel NONEL nonelectric shock tube system detonator will initiate all shots. This NONEL will be attached at one point only for initiation of the entire shot and will not be used for down hole priming.

1.7 Drill and Blast Pattern

The anticipated drilling program will be based on one or two rows of 2½-inch diameter holes drilled in a line two to four feet or with a grid spacing of approximately three to four feet wide by four to six feet along the ditch line. This shot pattern may be adjusted on a site-specific basis to compensate for different geology, nearby structures, utilities, or other sensitive areas. The drill pattern will be established using a powder factor of about 2.0 to 3.5 lbs per cubic yard to achieve the desired explosive energy ratio needed to break the rock and pull the ditch. Higher powder factors may be needed in extra deep ditch which will be addressed with a site-specific plan.

1.8 Charge Weight and Delays

Delays will be used accordingly to control the vibration as well as limiting the transmission of energy below the damaging levels at any existing structure. The delay pattern will be created to provide the energy relief immediately down the ditch in preference to a horizontal direction.

The main type of delays will be NONEL® MS-25, 17 ms or 42 ms, which are color-coded for easy identification of delay length. The amount of dynamite used in each hole will be limited to the manufacturer's recommendations and specifications. We will also use down hole delays where they are needed to meet specifications on maximum lbs per delay allowed.

When using Digishot® fully programmable electronic detonators a signature hole analysis will be performed to determine optimum timing for the specific geology. The signature hole data will be interpreted by Dyno Nobel Engineers who will specify timing to the blasters for in field detonator programming. Ongoing signature hole analysis will be necessary to adapt to the changing geology. How

often this is completed will depend on the site-specific conditions. Digishot® detonators are not affected by radio frequency, static electricity from power lines, etc. The detonators can only be detonated by a proprietary device made specifically for this product.

1.9 Flyrock Control Plan

All shots will be carefully designed by the Licensed Blaster to control flyrock. All hole loading activity will be supervised by the Licensed Blaster. The Licensed Blaster will communicate with the drillers to obtain geological information for each shot.

Matting and or padding may be utilized at the discretion of the licensed blaster. A good quality, non-stemming material that completely fills any voids in the drill hole will also be used to reduce the amount of flyrock. A minus three-eighths-inch crushed rock will be used. This stemming size has been a standard for United States Army Corps of Engineers for decades.

1.10 Selection of Blasting Products and Methods

Spire anticipates the use of blasting products as manufactured by Dyno Nobel Inc. These blasting products have been chosen because of many years of dependable use and positive results which are demonstrated by the:

- quality, safety, and reliability of the product;
- support offered by the manufacturer;
- availability;
- price; and
- similar product was used to conduct the pre-construction ground vibration calibration tests.

A Dyno Nobel NONEL nonelectric detonator will initiate all shots. This completely nonelectric system (including initiation) has been selected for several important reasons:

a. Due to the proximity of the high voltage power lines, stray current may be an issue that could result in the premature firing of an electric detonator.

b. The numerous radio equipped trucks belonging to all personnel (surveyors, inspectors and other subcontractors) on the Project mandate that all shots be totally nonelectric to eliminate accidental detonation of electric caps. Furthermore, there may be other commercial and/or non-commercial radio users in the area not associated with the Project (logging operations, quarry sites, etc.) who could compromise the safety of the blasting operations.

c. The Dyno Nobel NONEL nonelectric detonator shock tube system works instantaneously (like electric blasting caps). This allows for precise and reliable initiation of shots in congested areas, adjacent to

highways or in other locations where blast initiation control is an issue. Unlike electric blasting caps, the Dyno Nobel NONEL nonelectric detonator shock tube system is unaffected by extraneous electric currents from known and/or unknown sources.

1.11 Monitoring, Reporting, and Controlling Ground Cracking and Displacement

It is not expected that this type of rock will fracture in such a way as to cause any type of ground displacement outside the temporary construction easement. Following each blast, the area will be examined for signs of ground cracking. Any indication of overbreak (cracks greater than half the distance to nearby adjacent structures) will be brought to the attention of the blaster and noted on the blast report. The shot pattern and/or loading will be adjusted to minimize or eliminate overbreak.

1.12 Explosives Storage and Transportation Procedures

Explosives storage and transportation shall follow the guidelines contained within the Federal guidelines as defined by Title 27 CFR 181, Title 49 CFR 177, Title 29 CFR 1926.900 et seq. Subpart U, and 29 CFR 1910.109, as well as "The Illinois Explosives Act" found under Title 62: Part 200 and Missouri's Department of Public Safety found under Title 11 CSR 40-7.

1.13 Peak Particle Velocity Monitoring, Air Blast Effects, and Control

Each blast will be monitored by an independent third-party firm experienced in monitoring blasts using a seismograph machine. Seismographs shall be Instantel Blastmate III GeoSconics 3000-LCP unit, or an instrument capable of monitoring trial-axial ground particle velocity, frequency response range, and continuous data recording. The seismograph shall have a seismic range from 0.005 to 10 inches per second and have a frequency response range from 2 to 300 hertz. The equipment's transducers shall be firmly coupled to the ground in accordance with manufacturer's recommendations.

Seismographs shall be placed at the "point of interest" which, in most cases, will be next to the foundation of the closest building, power line foundation, utility, or well. In all cases, both the sensor and seismograph will be protected from flyrock. Multiple seismographs may be needed if several sensitive receptors are located within proximity of the blasting area.

During the blasting activities, the seismograph shall be set to continuously record direct peak particle velocity ("PPV") readings as well as decibel readings to capture sound levels. After each blast, a blast report will be compiled and the PPV at the point of interest shall be submitted to the Engineer within three days of the blasting activities.

The industry standard for many years has been 12 inches per second maximum PPV on any underground structures. Based on US Bureau of Mines Report of Investigations 8507, the PPVs expected for this Project are below a threshold of four inches per second or lower on underground structures and two inches per second or lower on wells and above ground structures.

An approved instrument shall be utilized to measure air blast during blasting activities. The maximum allowable air blast at any building resulting from blasting operations shall not exceed 130 decibels peak when accurately measured by an instrument having a flat frequency response (plus or minus three decibels) over the range of at least 6 to 200 Hertz of following local authority's regulations, whichever is more stringent.

1.14 Fire Prevention

Following the required waiting period after each shot, the blast area will be inspected for any indication of fire or fire hazard. Particular attention will be paid to the vegetated areas outside of the right-of-way. Normally, the explosives vaporize at the instant of detonation and there is no fiber or other material left to smolder or be a source of concern. Any plastic shock tube from the initiation system that remains after the blast will be picked up for proper disposal immediately after the blast.

a. The blasting operation will generally take place after the grading operation has graded the right-of-way to bare mineral soil. The blaster shall ensure that the initiating detonator is placed on bare mineral soil and that there is no vegetation within a 20-foot radius.
b. The initiating detonator will be a minimum of 650 feet from the nearest loaded hole.
c. When fire danger is high due to forest conditions, a two-person fire watch team may patrol.
d. Each blast area for a period of one hour after the required waiting period.

1.15 Environmental Concerns

All residents within 300 feet of the blast will be notified one day before the blast day. All residents within 100 feet of the blasting operation shall be notified in accordance with the local land agent's site-specific procedure.

All necessary measures will be taken to exclude livestock from the blasting area. During the normal safety check prior to blasting, the area will be checked for both livestock and wildlife. The blast will not be initiated until the area is clear.

For major stream crossings, the Blasting Contractor shall comply with applicable Stream and Wildlife Construction and Mitigation Procedures and site-specific requirements.

1.16 Post-Blast Inspections

Once blasting operations are completed, Spire will then document the post-blasting conditions by repeating a similar inspection as the pre-blasting condition survey described in Section 1.3. The results of the pre-blasting condition survey will be compared against the post-blasting condition survey. Should any damage or change occur during the blasting operations, Spire's blasting Contractor will perform remedial measures to restore the feature to pre-blasting condition. In the unlikely event that blasting activities temporarily impair well water, Spire will provide alternative sources of water or otherwise compensate the owner. If well or structural damage is substantiated, Spire will either compensate the owner for damages or arrange for a new well to be drilled.

1.17 Blasting Damage

Blasting will create air and ground vibration that may damage adjacent structures. Adjustments to the blasting plan will be made based on the assessments of damage potential. Should the blasting operations or accidental detonations cause any damages to structures, property, wells, or other facilities, immediate action will be undertaken to repair the property, structure, or facility back to safe and usable conditions. Thereafter and without delay, all permanent repairs, reconstruction, and other work necessary to restore the property, structure, or facility to at least as good of condition as that preceding the event causing the damage shall be completed.

1.18 References

Church, Horace K. 1981. *Excavation Handbook*. New York: McGraw-Hill.

Natural Resources Conservation Service. 2015. Web Soil Survey.

Occupational Safety and Health Administration. *Blasting Requirements, 29 CFR 1926.900(k)*.

United States Code of Federal Regulations. *27 CFR Part 55, Commerce in Explosives; 49 CFR Parts 171 through 178, Hazardous Materials Regulations; and 49 CFR Parts 390 through 397, Federal Motor Carrier Safety Regulations*.

ATTACHMENT A

Spire Blasting Specifications

Attachment A Spire Blasting Specifications

1 Pre-Requisites for Use of Explosives

Prior to the use of any explosives, the Contractor shall:

a. Submit a blasting procedure/plan a minimum of two weeks prior to any blasting activities and receive Company approval. The blasting procedure shall take into account adjacent pipelines, power lines and specific requirements outlined in the Contract Documents and shall include as a minimum:

   i. storage of explosives;

   ii. transportation of explosives;

   iii. inspection of drilling areas;

   iv. loading of explosives;

   v. non-electric detonation methods - electric detonation methods are not acceptable;

   vi. control of flyrock during blasting, including mat placement if used;

   vii. security procedures;

   viii. sequence of events leading up the detonation of explosives;

   ix. proposed hours of blasting;

   x. true distances to buildings or operating pipelines;

   xi. maximum charge mass per delay interval;

   xii. borehole diameter;

   xiii. hole pattern, burden, and spacing;

   xiv. borehole depth, subgrade depth, and unloaded collar length;

   xv. sketch showing borehole loading details;

   xvi. explosive names, properties, and delay sequences;

   xvii. calculated powder factor (weight per volume of rock), based on explosive energy of 1000 calories per gram;

   xviii. geology description;

   xix. borehole stemming depth;

xx. special conditions or variations for grade rock, trench rock, underwater blasting, and blasting at undercrossings of existing utilities; and

xxi. blast to open face.

b. Obtain Company approval and provide a notice of 72 hours prior to detonation of any explosives.

c. Obtain approval from the Company if the blasting parameters vary from the requirements set out in this specification or the Contract Documents.

2 Use of Explosives

a. The Contractor shall secure and comply with all the applicable permits required for the handling, transportation, storage, and use of explosives.

b. The Contractor shall not endanger life, livestock, or adjacent properties.

c. The Contractor shall minimize inconveniences to the property owners or tenants during all phases of blasting.

d. The Contractor shall provide physical protection to any above-grade utilities and equipment in the area of the blast.

e. The Company is to be given the opportunity to set up any required monitoring equipment.

f. The Contractor shall provide monitoring equipment to ensure vibrations are limited to two inches per second [50 millimetres per second (mm/s)] PPV, when measured at dwellings, buildings, structures, and power line towers. For power line towers, this limit applies to the greatest of the three vectors; otherwise this limit is the vector sum of the three planes. The Contractor limits vibrations to one-inch per second (25 mm/s) PPV for vibration-sensitive structures specified by the Company. In no case shall vibration amplitude exceed 0.004-inch (0.15 mm).

g. Any blasting in close proximity to existing in-service piping is to be in accordance with the Contract Documents.

h. Charge loading is to be spread in order to obtain the optimum breakage of rock. The Contractor shall attempt to achieve a fragmentation rate of at least 75 percent of the trench rock to less than six inches (150 mm) in diameter.

i. All delay connectors used shall have a delay interval of at least 17 milliseconds.

j. There are to be no loaded holes left overnight, and the site is inspected after each blast for any un-detonated charges.

k. The Contractor shall discuss the blasting plan with the Company prior to each blast, including the maximum charge weight per delay, hole sizes, spacing, depths and layout. Upon completion of blasting each day, the Contractor shall provide the Company with the following data for each blast:

i. blasting contractor license number;

ii. date, time, and location of blast;

iii. hole sizes, spacing, depths, layout, and volume of rock in blast;

iv. delay type, interval, total number of delays, and holes per delay;

v. explosive type, specific gravity, energy release, weight of explosive per delay, and total weight of explosive per shot;

vi. powder factor; and

vii. copies of any draft seismographic data.

3 Evaluation of Close-In Blasts

The following additional limitations apply for blasting at distances of less than 25 feet from the pipeline. These criteria were extrapolated from a 1970 US Bureau of Mines Study on cratering in granite and refined based on a 2004 failure investigation by others.

a. Blasting on Pipeline Right-of-Way: Blasting should not be allowed on the pipeline right-of-way except when conducted for the benefit of the Company and under the supervision of a Company representative or qualified Blasting Inspector familiar with the Company's blasting requirements.

b. Minimum Offset from Blast Holes to Pipeline:

i. No blast holes should be loaded at an offset of less than 25 feet from the centerline of an in-service pipeline except in cases where precise measurements are taken to ensure that the pipeline will have at least one-foot of Clearance (C) from the theoretical area surrounding the blast hole in which the ground could be permanently deformed by the blast under worst case conditions.

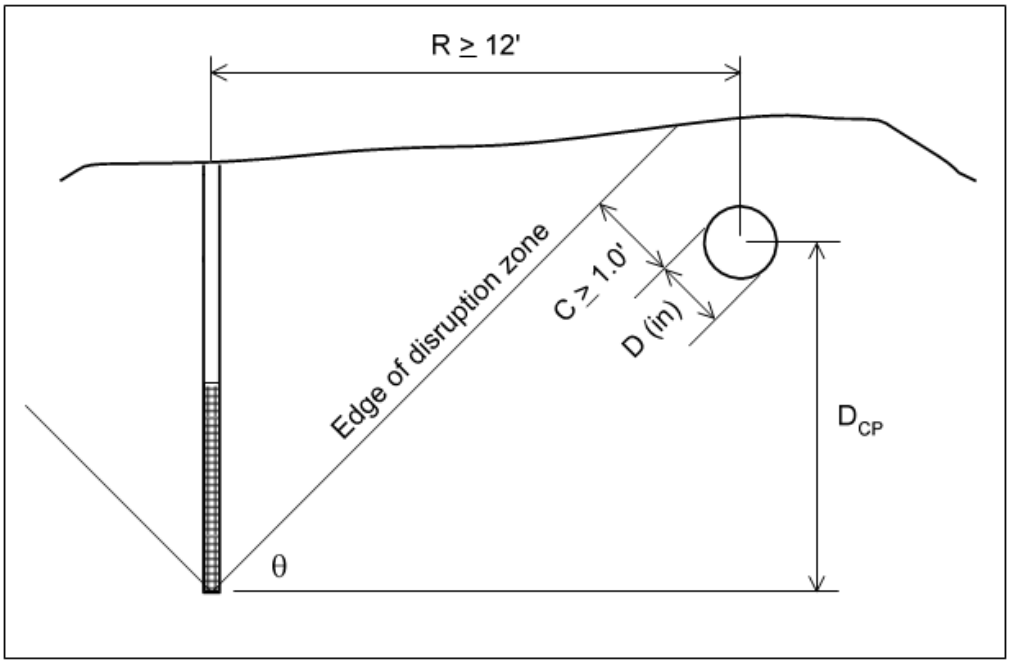
ii. This theoretical area is a conical shape originating at the bottom of the blast hole and extending out at an angle up to the ground surface as depicted on Figure 1.

iii. The clearance value C can be calculated by:

$$C = R \times \sin\theta - D_{CP} \times \cos\theta - \frac{D}{24}$$

with D in inches and the other dimensions in feet, and where θ is the angle from the horizontal of the theoretical zone of permanent disruption.

Figure 1. Separation from Blast Hole



iv. The disruption zone angle θ shall be taken to be 32°, except when both of the following special circumstances hold. If both of these conditions hold, the disruption zone angle θ may be taken to be 45°.

v. Charge weight per delay does not exceed 0.9 times the ordinary maximum allowable charge weight and

vi. Charge weight per delay in lbs must not be greater than effective hole depth in feet, divided by 2.5 lb/foot. (Example: for 15-foot hole depth, maximum charge no greater than 15 feet/2.5 lb/foot. = 6 lb).

c. If the calculated clearance C would be less than one-foot, the minimum offset distance must be increased accordingly. The minimum offset R to achieve one-foot clearance is:

$$R = \frac{1\,ft}{\sin\theta} + \frac{D}{24 \times \sin\theta} + \frac{D_{cp}}{\tan\theta} \quad \text{, or:}$$

- $\theta = 32°$: $R = 1.887\,ft + \frac{D}{12.718} + 1.6 \times D_{cp}$
- $\theta = 45°$: $R = 1.414\,ft + \frac{D}{16.971} + D_{cp}$

d. When blast holes are angled from the vertical, this can have the effect of directing the disruption from the blast in one direction (the surface acts as a free face, allowing movement in that direction). For this reason, blast holes within 25 feet of an existing pipeline must be drilled vertically or angled away from the pipeline as the hole gets deeper.

e. In all cases, the absolute minimum offset R is 12 feet.

4 Mechanical Rock Removal

a. Mechanical rock removal shall occur between the hours of 7:00 am and 7:00 pm, unless otherwise specified by the Company.

b. The Contractor shall achieve a fragmentation rate of at least 75 percent of the trench rock to less than six inches (150 mm) in diameter.

ATTACHMENT B

Explosives Safety Program

Attachment B Explosives Safety Program

1 Federal and State Regulations

The Blasting Contractor will follow all Federal and State regulations:

a. Bureau of Alcohol, Tobacco and Firearms - 27 CFR 181 (Commerce in Explosives).

b. Occupational Safety and Health Administration (OSHA) - 29 CFR 1926.90 (Safety and Health Regulations for Construction Blasting and Use of Explosives).

c. Carriage by Public Highway peak particle velocity 49 CFR 177 (self-explanatory).

d. Explosives and Blasting Agents - OSHA, 29 CFR 1910.109 (Safety in the Workplace When Using Explosives).

e. Guidelines to be Followed by Natural Gas Pipeline Companies in the Planning, Locating, Clearing and Maintenance of Right-of-Way and the Construction of Above Ground Facilities - 18 CFR 2.69.

2 General Regulations

a. Only authorized and qualified personnel shall handle explosives and shall always be under the direct supervision of a blaster licensed, if required, by the States of Missouri and Illinois.

b. No flame, heat, radio transmitter, or spark-producing device shall be permitted in or near explosives during handling, transport, or use.

c. No person shall be allowed to handle, use or work in the area while under the influence of liquor, narcotics, or dangerous drugs.

d. Explosives shall be accounted for at all times. Explosives not in use shall be kept in locked, approved storage magazines. A running inventory shall be maintained at all times. Appropriate authorities shall be notified of any loss, theft or unauthorized entry into a magazine.

e. No explosives shall be abandoned.

f. No fires shall be fought where contact with explosives is imminent. All personnel shall be cleared and area guarded against other intruders.

g. Separate Class I and II magazines shall be used for transport of detonators and explosives from magazine storage area to blast site. Magazines shall be kept locked except for removal of material for use. In addition, explosives will be loaded directly to each shot point from the magazines on approved ground transportation equipment.

h. When blasting in areas of congestion or in close proximity of other structures or services, special precaution will be taken to avoid damage or personal injury.

i. Every reasonable precaution shall be used to notify others of use of explosives (visual, audible, flags, barricades, etc.). No onlookers or unauthorized personnel will be permitted within 1,000 feet during loading or blasting. Flaggers shall be stationed on roadways that pass through the danger zone to stop traffic during blasting operations.

j. All necessary precautions shall be taken to prevent accidental current discharge from any possible source. The exclusive use of a nonelectric initiation system will eliminate this possibility in nearly every situation with the possible exception of lightning strikes. Lightning detectors will be used in all loading and shooting operations.

    1) Electrical Storms:

        a) All blasting operations shall be suspended and all persons shall be removed from the blasting areas during the approach and progress of an electrical storm. The following rules must be followed:

        b) A lightning detector will be used to monitor the proximity of lightning to the shot. When the storm is 10 miles distant as identified by the lightning detector, notify all persons in the blasting crew of approaching storm. Stop all loading of holes and evacuate all personnel, except blaster and assistant, to a safe distance (1,000 feet) from the blast area.

        c) If the blast cannot be initiated before the storm arrives (within 10 miles as indicated by the lightning detector), the blaster and assistant shall evacuate the site to a safe distance.

        d) Personnel may return to worksite when the storm has passed and is 10 miles distant as determined by the lightning detector or after the completion of blast which allows for inspection of site and/or misfire.

k. Empty packing material shall not be used again for any purpose. It shall be burned at an approved location. Typically, this will be in the excavated trench or other designated area.

l. Damaged or deteriorated blasting supplies shall not be used.

m. Delivery and issue of explosives shall only be under, by and to authorized persons and into authorized magazine or temporary storage handling areas.

n. Blasting operations shall not be carried out in the proximity of other utilities or property owners without prior approval. “ONE CALL” notification requirements shall be followed.

o. All loading and firing shall be directed and supervised by a competent and experienced licensed blaster.

p. No loaded holes shall be left unattended or unprotected. No explosives or blasting agents shall be abandoned on the right-of-way. Explosives shall not be primed until immediately before use and shall not be allowed to lay overnight in drilled holes.

q. All jurisdictional authorities shall be granted unrestricted access to all explosive records as well as site access for procedural inspections. All personnel not involved with the current blasting operation must check in with the blaster before entering the blasting zone.

r. Warning signs, indicating the blast area, shall be erected and maintained at all approaches to the blast area. Warning sign lettering shall be a minimum of four inches in height on a contrasting background. Warning signs shall comply with the requirements of the jurisdictional authorities.

s. The warning signs (four-inch lettering) will be erected and maintained at all approaches to the blast area. Flaggers will be stationed on all roadways passing within 1,000 feet of the blast area and be responsible to stop all traffic during blasting operations. All personnel not involved in the actual blast shall stand back at least 1,000 feet and workers involved in the actual blast shall stand back 650 feet from the time the blast signal is given until the "All Clear" has been sounded. An audible blasting signal (air horn or siren) shall be used. The following blast signals will be used during blasting:

    1) Warning Signal: A one minute series of long horn or siren sounds will be made five minutes prior to the blast.

    2) Blast Signal: A series of short horn or siren sounds will be made one minute prior to the blast.

    3) All Clear Signal: A prolonged horn or siren sound following the inspection of the blast area.

t. Blaster qualifications shall meet all federal, state and local standards.

u. Misfires:

    1) If there are any misfires, all employees shall remain away from the suspected misfire area for at least 15 minutes. Misfires shall be handled under the direction of the person in charge of the blasting. All leads shall be carefully traced and a search made for unexploded charges.

    2) If a misfire is found, the blaster shall provide proper safeguards for excluding all employees from the danger zone.

    3) No other work shall be done except that necessary to remove the hazard of the misfire and only those employees necessary to do the work shall remain in the danger zone.

    4) A new primer shall be inserted into the hole and the hole shall be reshot. If re-firing of the misfired hole presents a hazard, the explosives may be removed by hand, vacuum, washing out with water or, where the misfire is underwater, blown out with air.

    5) No drilling, shall be permitted until all missed holes have been located, detonated or the authorized representative has approved that work can proceed.

    6) It may be recommended that the excavator digging on the suspect misfire, be shielded with Plexiglas or equivalent.

v. Initiation will be accomplished using a NONEL (nonelectric) shock tube detonator, electronic, detonating cord or comparable product.

ATTACHMENT 7
KARST MITIGATION PLAN

Spire STL Pipeline Project

Karst Mitigation Plan

FERC Docket Nos. CP17-40-000 and CP17-40-001

April 2017

Public

Table of Contents

Acronyms and Abbreviations

CFR	Code of Federal Regulations
NRCS	Natural Resources Conservation Service
Plan	FERC's Upland Erosion Control, Revegetation, and Maintenance Plan
Procedures	FERC's Wetland and Waterbody Construction and Mitigation Procedures
Project	Spire STL Pipeline Project
Spire	Spire STL Pipeline LLC
USDA	United States Department of Agriculture

Karst Mitigation Plan

1.1 Introduction

This Karst Mitigation Plan describes the general measures to be implemented by Spire STL Pipeline LLC ("Spire") and its contractors to ensure that correct measures for construction in karst formations are taken during construction of the Spire STL Pipeline Project ("Project"). Measures identified within this Karst Mitigation Plan outline methods that will be used in all work areas, including temporary workspaces and access roads. Additionally, this plan outlines the recommended records to be maintained onsite during construction.

1.2 Pre-Construction Review

For the 24-inch pipeline construction, geotechnical hazard information was gathered utilizing Illinois Geospatial Data Clearinghouse. This information is from multiple sources and is compiled within their dataset. This dataset is considered general in nature, but provides the possibility that a geophysical formation may be present. A similar review was conducted utilizing the Missouri Spatial Data Information Service. While the dataset indicates the possibility of sink areas, only one sink area has been confirmed in the field at milepost 2.0 along the North County Extension. Geotechnical investigations near this area will be conducted as this location is encompassed as part of a proposed horizontal directional drill of Coldwater Creek. Additionally, Laclede Gas Company, a related company of Spire Inc., has a long history of working in the area and has not encountered issues related to sink holes or karst features.

For the trenchless crossings of the Mississippi and Missouri Rivers, a geotechnical investigation was conducted. Hazardous geological formations are not anticipated within the planned path of the horizontal directional drill installations. A portion of the geotechnical work has been conducted at the Coldwater Creek and Spanish Lake Park HDD crossing locations where survey access has been granted; remaining geotechnical work will be conducted as survey permission is granted.

1.3 Training and Awareness

Spire will conduct awareness training for karst-like features, including portals, voids, or sinkholes. Prior to construction, the contractor's field supervisory personnel and Spire's supervisory personnel, including the Chief Inspector, Craft Inspectors, and the Environmental Inspectors, will be trained on unanticipated karst features that could be discovered during trenching operations. The training will also provide the protocol for work stoppage if a karst feature is discovered in the immediate area and a communication plan to alert the appropriate Spire and contractor supervisors of such discovery. This training will comply with 49 Code of Federal Regulations ("CFR") Part 192.613 which requires the surveillance during construction.

1.4 Inspection, Monitoring, and Surveillance

As required by 49 CFR Part 192.613, Spire will conduct route surveillance during construction and operation of the facilities, along with training of surveillance personnel, to monitor the pipeline right-of-way for evidence of subsidence, surface cracks, or depressions which could indicate sinkhole formation. Should any of these conditions be identified, Spire will implement corrective actions.

1.5 Construction Phase and Karst Remediation

If an unanticipated karst feature is discovered during trenching or other construction activities, work in the immediate area will be stopped immediately and the communication plan will be implemented to alert appropriate Spire and contractor supervisors. Erosion and sedimentation controls will be modified at the direction of an Environmental Inspector to install the measures necessary to minimize the potential for surface water runoff intrusion into the karst feature. A designated Project geotechnical engineer will be contacted and directed to the feature to conduct a detailed evaluation. The Project geotechnical engineer will develop specific design and mitigation measures depending on the site conditions and nature of the karst feature.

The mitigation methods detailed by the Project geotechnical engineer would provide enhanced stability to the void and increase the long term stability and integrity to the pipeline right-of-way. The principal approach to avoid aggravating dormant sinks, or possible areas of subsidence and karst activity, is to maintain rates of recharge and discharge in the subsurface at the desired natural levels. In this context, desired natural levels refer to the pre-development recharge and discharge rates. Final grading of contours and any necessary permanent erosion and sediment controls will be designed to prevent runoff from accumulating in the area of the void. In addition, during the discharge of any hydrostatic test water from the pipeline, a discharge location will be selected that will prevent the discharged water from encountering any unanticipated karst features discovered during trenching activities. These methods will help control the flow of water into underlying karst areas, which meets the intent of maintaining rates of subsurface recharge and discharge to pre-development conditions. Stormwater control measures in areas of known and verified karst terrain will be enhanced to include detention, diversion, or containerization to prevent construction influenced stormwater from flowing to the karst feature drainage point.

In the event that an unanticipated karst feature or void is discovered during construction or post-construction monitoring and karst mitigation is required, the Class 1 pipe specified for the 24-inch pipeline is capable of spanning a 28-foot void, should one unexpectedly occur, and continue to operate safely. During construction of the project, should an unanticipated cavern feature or sinkhole be encountered of size less than the maximum unsupported span length, a mitigation strategy as identified in Sections 1.5.1 or 1.5.2 below may be implemented by the Project geotechnical engineer. Should the karst feature approach or exceed the size of the maximum unsupported length, an investigation and mitigation strategy as identified in Section 1.5.3 may be implemented. It should be noted that the mitigation strategies identified below are provided as options, and each mitigation measure to be employed will be specifically selected by the Project geotechnical engineer at the time of intersection.

spire

1) Mitigation Measures for Sinkhole Throats

If new sinkhole throats develop within the construction area while work is commencing, work in the area will be halted and the sinkhole area will be isolated and cordoned off to an area extending 100 feet radially from the feature. The sinkhole will be inspected by a geotechnical engineer and remedial measures such as filling of the sinkhole using inverted filter approach or adjustment of the pipeline alignment may be implemented. The inverted filter approach is often used for sinkhole repair, especially when the sinkhole is not located near structures. The sinkhole area is excavated to expose either bedrock or the throat of the sinkhole. A course of rock large enough to bridge the throat of the sinkhole is placed at the bottom of the excavation. Courses of progressively finer rock and gravel are compacted above the base course. A geotextile fabric may be placed above the finest gravel course to prevent excessive loss of the uppermost course, which may consist of sand and/or soil. The inverted filter method provides filtration treatment of storm water and allows controlled storm water infiltration and groundwater recharge.

2) Mitigation Measures for Subsurface Voids and Caverns

If an existing subsurface void is intersected within the work area, work will similarly be halted and cordoned off for further evaluation by a qualified geotechnical engineer. As indicated earlier, the principal approach to maintain rates of recharge and discharge at pre-development conditions, a filter fabric secured over the void may be implemented in addition to an inverted filter.

Methods to mitigate sinkhole collapses and similar subsurface voids have been recommended by the United States Department of Agriculture ("USDA") Natural Resources Conservation Service ("NRCS"). These typical details are provided as Attachments A through C and may also be implemented depending on the karst feature encountered. The mitigation methods would provide enhanced stability to the void and increase the long term stability and integrity to the pipeline right-of-way. Final grading of contours and any necessary permanent erosion and sediment controls will be designed to prevent runoff from accumulating in the area of the void. In addition, during the discharge of any hydrostatic test water from the pipeline, a discharge location will be selected that will prevent the discharged water from encountering any unanticipated features discovered during trenching activities.

3) Mitigation Strategies for Karst Features Greater than Maximum Unsupported Span Length

If a karst feature greater than 50 feet long in largest measured dimension is intercepted during work activities including drilling, blasting, excavation, or trenching, all work within a 300-foot radius will immediately be stopped and Spire and Contractor Supervisors will be notified. The Project geotechnical engineer will be subsequently contacted and directed to the feature to conduct a detailed evaluation to review suspected features for evidence of areas of soft soils, highly fractured bedrock, ground subsidence, surface water flow toward the feature, and diminishing flow in nearby surface streams or waterbodies. At this time, Project geotechnical engineer may increase or decrease the work stoppage buffer based on the observation of site conditions and in consultation with state or regulatory agencies, as necessary.

Should any of the abovementioned indicators be identified, the Project geotechnical engineer will commence a characterization program to determine the full extents of the feature along and within proximity to the pipeline alignment. The characterization method may consist of, but not be limited to, one or more of the following strategies:

a. visual assessment (field inspection) or Aerial Assessment (drone or aerial);
b. LiDAR or field topographic survey;
c. installation of geotechnical instrumentation or survey monuments to determine movement;
d. geophysical investigation (microgravity, multi-channel analysis of surface waves, or electrical resistivity);
e. track drill probing and/or geotechnical drilling;
f. test pit excavation; and/or
g. infiltration or dye trace testing.

Once sufficient detail is achieved to delineate the extents of the feature, it is anticipated that several options may be considered as a mitigative strategy, including subsurface grouting within the right-of-way, structurally supporting (cradling) the pipeline on a deep foundation system, or relocating the pipeline to a less sinkhole-prone portion of an adjacent property. As each karst feature is unique, the mitigative strategy selected will be on a case-by-case basis by the Project geotechnical engineer and in consultant with project stakeholders.

Under any situation, in the event that an unanticipated karst feature or void is discovered during construction or post construction monitoring and karst mitigation is required, Spire will notify and coordinate with applicable agencies to ensure any necessary and appropriate agency review or approvals are acquired.

1.6 Post-Construction Monitoring

Spire will conduct visual post-construction inspections of the right-of-way to evaluate the success of any mitigation activities performed for any karst features or voids discovered and mitigated during construction. The frequency of inspections will generally comply with those required under the FERC's Upland Erosion Control, Revegetation, and Maintenance Plan ("Plan") and Wetland and Waterbody Construction and Mitigation Procedures ("Procedures"), but would more specifically be based on the severity of the mitigation activities and the Project geotechnical engineer recommendations with a decreasing frequency over the two year monitoring period. As required by the Plan and Procedures, monitoring will be conducted for up to two years after construction completion. If a new karst feature or void were to develop within the right-of-way as a result of Spire's subsequent construction activities, Spire would contact the Project geotechnical engineer to evaluate the feature and make additional remedial recommendations. Spire will provide updates on the status of all discovered and mitigated karst features or voids in its bi-weekly and quarterly activity reports. During operation of facilities, staff performing routine inspections of facility and related assets will be made aware in areas of carbonate formations that the potential for sinks and karst features exists, and that surface expressions of sinks, disappearing streams or runoff, and change in topography should be noted and brought to the attention of the Project geotechnical engineer for further review and consideration. Should the potential for karst be documented, a mitigation measure, as identified in Section 1.5, may be implemented.

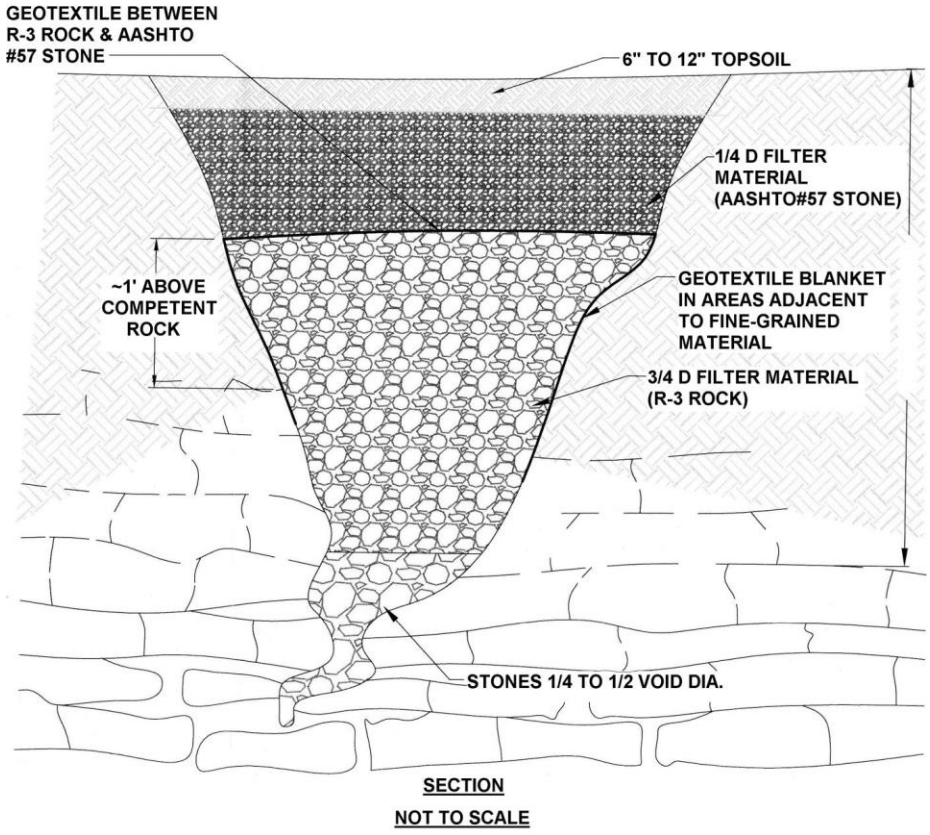
1.7 Plan Maintenance

A copy of this Karst Mitigation Plan will be retained onsite, and will be made available to the federal, state, and local agencies upon request.

ATTACHMENT A

USDA NRCS Sinkhole Repair with Pervious Cover Detail

USDA NRCS Sinkhole Repair with Pervious Cover Detail



Source: Adapted from USDA NRCS

Notes

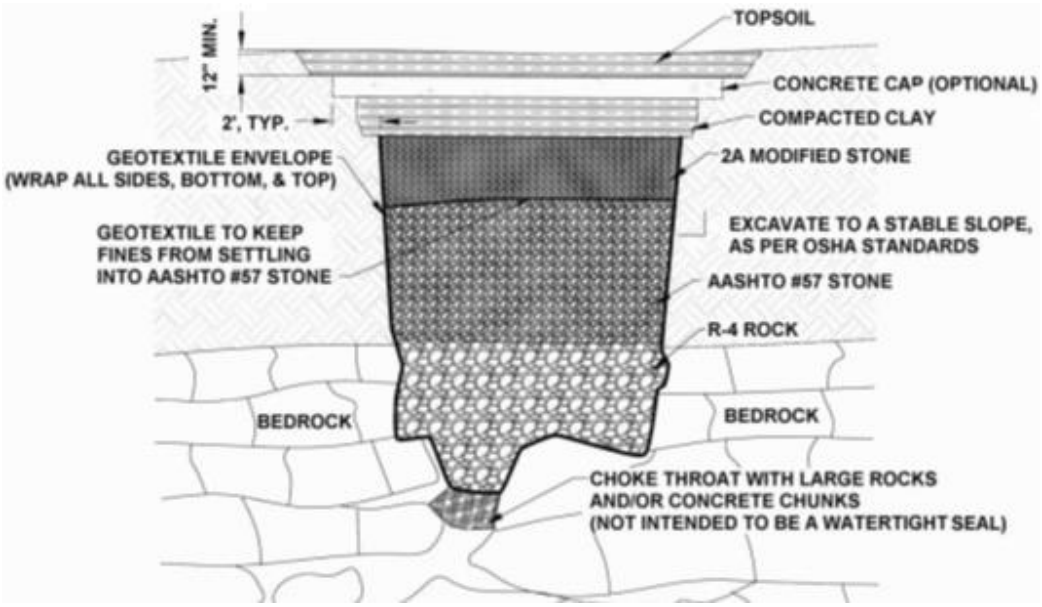
1. Loose material shall be excavated from the sinkhole and expose solution void(s) if possible. Enlarge sinkhole if necessary to allow for installation of filter materials. OSHA regulations must be followed at all times during excavation.

Stones used for the “bridge” and filters shall have a moderately hard rock strength and be resistant to abrasion and degradation. Shale and similar soft and/or non-durable rock are not acceptable.

ATTACHMENT B

USDA NRCS Sinkhole Repair with Impervious Cover Detail

USDA NRCS Sinkhole Repair with Impervious Cover Detail



Source: Adapted from USDA NRCS

Notes:

1. Loose material shall be excavated from the sinkhole and expose solution void(s) if possible. Enlarge sinkhole if necessary to allow for installation of filter materials. OSHA regulations must be followed at all times during excavation.

2. Geotextile shall be non-woven with a burst strength between 100 and 200 psi.

3. Select field stone(s) about 1.5 times larger than solution void(s) to form "bridge." Place rock(s) so no large openings exist along the sides. Stones used for the "bridge" and filters shall have a moderately hard rock strength and be resistant to abrasion and degradation. Shale and similar soft and/or non-durable rock are not acceptable.

4. Minimum thickness of R-4 rock is 18." AASHTO #57 stone thickness shall be ¼ to ½ that of the R-4 rock. Minimum thickness of 2A modified crushed stone shall be 9" AASHTO #57 stone and 2A modified crushed stone shall be compacted after each placement.

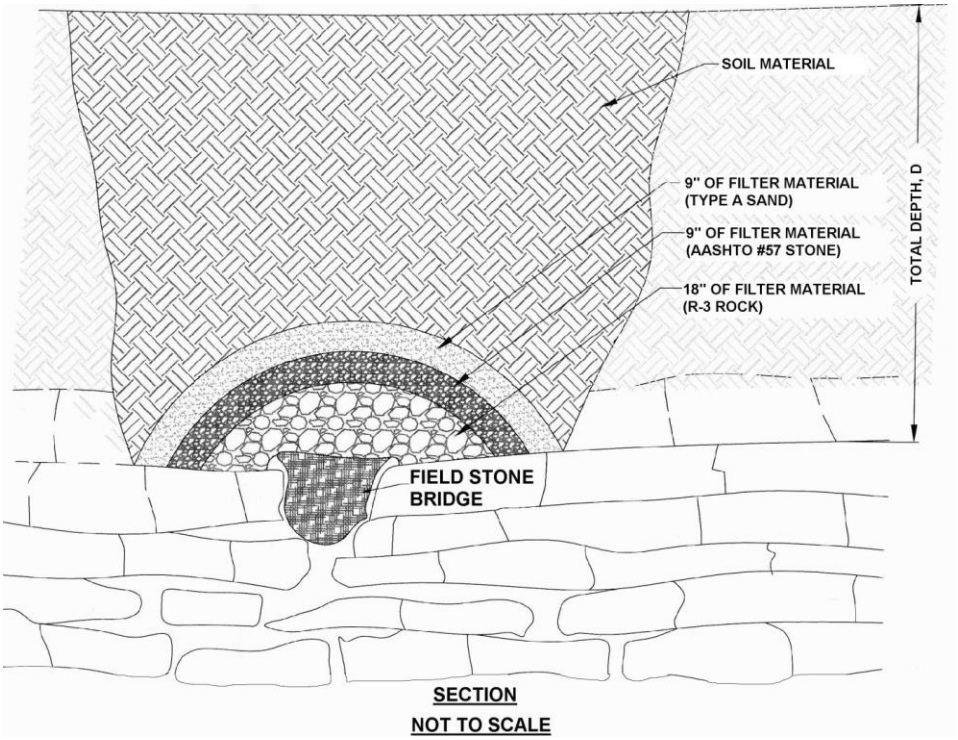
5. Compacted clay seal shall be a minimum of 12" thick. Clay shall be placed in 6" to 9" lifts and thoroughly compacted. Concrete cap, which is optional, shall be a minimum of 8" thick. Use 4,000 psi concrete with 6" X 6" - 6 gauge welded wire fabric, or # 3 rebar on 18" O.C. both ways.

Topsoil shall be a minimum of 12" thick. Grade for drainage away from sinkhole area.

ATTACHMENT C

USDA NRCS Sinkhole Repair with Soil Cover Detail

USDA NRCS Sinkhole Repair with Soil Cover Detail



Source: Adapted from USDA NRCS

Notes:

1. Loose material shall be excavated from the sinkhole and expose solution void(s) if possible. Enlarge sinkhole if necessary to allow for installation of filter materials. OSHA regulations must be followed at all times during excavation.

2. Select field stone(s) about 1.5 times larger than solution void(s) to form “bridge”. Place rock(s) so no large openings exist along the sides. Stones used for the “bridge” and filters shall have a moderately hard rock strength and be resistant to abrasion and degradation. Shale and similar soft and/or non-durable rock are not acceptable.

3. Minimum thickness of R-3 rock is 18” AASHTO #57 stone thickness shall be a minimum of 9” thick. Minimum thickness of type A sand shall be 9”. NOTE: A non-woven geotextile with a burst strength between 100 and 200 psi may be substituted for the AASHTO#57 stone and type A sand.

4. Soil shall be mineral soil with at least 12% fines and overfilled by 5% to allow for settlement. Suitable soil from the excavation may be used. Any available topsoil shall be placed on top surface.

ATTACHMENT 8
ESA SECTION 7 CONSULTATION

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Illinois & Iowa ES Field Office
1511 47th Avenue
Moline, Illinois 61265
Phone: (309) 757-5800 Fax: (309) 757-5807

IN REPLY REFER TO:
FWS/RIFO

October 26, 2017

Mr. David Swearingen
Federal Energy Regulatory Commission
Gas Branch 4
Division of Gas – Environment
and Engineering
Washington, D.C. 20426

Dear Mr. Swearingen:

This letter acknowledges the U.S. Fish and Wildlife Service's (Service) September 29, 2017 receipt of the Environmental Assessment (EA) (Spire STL Pipeline Project Docket Nos. CP17–40-000; CP17-40-001) for the Spire STL Pipeline Project and your letter requesting initiation of formal consultation under Section 7 of the Endangered Species Act. The consultation concerns the possible effects to threatened and endangered species by the construction of 65 miles of new, 24-inch-diameter natural gas pipeline in two segments in Scott, Greene, and Jersey counties in Illinois, and St. Louis County, Missouri, and facilities associated with the project.

All information required for you to initiate formal consultation was included in the Biological Assessment (BA) appended to your EA or is otherwise accessible for our consideration and reference. The BA addresses the effects of the project on the Indiana bat (*Myotis sodalis*) and decurrent false aster *(Boltonia decurrens)*. Surveys conducted for the decurrent false aster within the action area for the project subsequent to the writing of the BA indicate the absence of this species. Therefore, we believe the project will have no effect on decurrent false aster and this consultation will specifically address the effects of the project as described in the EA and BA on the federally endangered Indiana bat.

The project may also affect the northern long-eared bat. The Project is not within 0.25 mile of a known northern long-eared bat hibernaculum or within 150 feet from a known occupied maternity roost tree. There are no effects beyond those previously disclosed in the Service's programmatic biological opinion for the final 4(d) rule dated January 5, 2016. This project is consistent with the description of the proposed action in the programmatic biological opinion, and the 4(d) rule does not prohibit incidental take of the northern long-eared bat that may occur

as a result of this project. Therefore, the programmatic biological opinion satisfies the FERC's responsibilities under ESA section 7(a)(2) relative to the northern long-eared bat for this project.

We also acknowledge receipt of the Northern Long-eared Bat 4(d) Streamlined Consultation Form included in Appendix K to the EA

The Service also concurs that the project is not likely to adversely affect the gray bat, least tern, piping plover, red knot, and pallid sturgeon.

Section 7 allows the Service up to 90 calendar days to conclude formal consultation with your agency and an additional 45 calendar days to prepare our biological opinion unless our agencies mutually agree to an extension. Thus, we would expect to provide you with our biological opinion no later than February 11, 2018.

As a reminder, the Endangered Species Act requires that after initiation of formal consultation the Federal action agency may not make any irreversible or irretrievable commitment of resources that limits future options. This practice insures agency actions do not preclude the formulation or implementation of reasonable and prudent alternatives that avoid jeopardizing the continued existence of endangered or threatened species or destroying or modifying their critical habitats.

If you have any questions or concerns regarding this consultation or the consultation process in general, please contact Kristen Lundh of this office at (309) 757-5800, extension 215.

Sincerely,

Kraig McPeek
Field Supervisor

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Illinois & Iowa ES Field Office
1511 47th Avenue
Moline, Illinois 61265
Phone: (309) 757-5800 Fax: (309) 757-5807

IN REPLY REFER TO:
FWS/RIFO

February 2, 2018

Mr. David Swearingen
Federal Energy Regulatory Commission
Gas Branch 4
Division of Gas – Environment
and Engineering
Washington, D.C. 20426

Dear Mr. Swearingen:

This document transmits our final biological opinion for the construction and operation of the Spire STL Pipeline Project in Scott, Greene, and Jersey Counties, Illinois; and St. Charles and St. Louis Counties, Missouri. Spire has applied for a Certificate of Public Convenience and Necessity pursuant to Section 7(c) of the Natural Gas Act [15 USC 717f(c)] from the Federal Energy Regulatory Commission (FERC), and permits and easements from the U.S. Army Corps of Engineers (USACE). Formal Consultation was initiated by FERC with the transmittal of the Spire STL Pipeline Project Environmental Assessment and Biological Assessment on September 29, 2017.

The enclosed biological opinion addresses effects of the project on the federally endangered Indiana bat *(Myotis sodalis)* and provides a statement of expected incidental take as a result of the project.

This letter provides comments under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.); and the Endangered Species Act of 1973, as amended.

If you have any questions or concerns regarding this consultation, please contact Kristen Lundh of this office at 309/757-5800.

Sincerely,

Kraig McPeek
Field Supervisor

Enclosure

cc: ILDNR (Skufka)
GAI (Ferry)
FWS (Rigby)
FWS (crabill)

S:\Office Users\Kristen\Technical Assistance\Section 7\Individual Consulations\Spire\Biological Opinion\Spire Transmission Letter 2-2-18.doc

United States Department of the Interior

IN REPLY REFER TO:

FISH AND WILDLIFE SERVICE
Illinois-Iowa Field Office
1511 47th Avenue
Moline, Illinois 61265
Phone: (309) 757-5800 Fax: (309) 757-5807

Biological Opinion

For the
Spire STL Pipeline Project

Prepared by:
U.S. Fish and Wildlife Service
Illinois-Iowa Field Office

Submitted to:
Federal Energy Regulatory Commission

Kraig McPeek 2/2/2018

Kraig McPeek
Field Supervisor
Illinois – Iowa Field Office

Date

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INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion (BO) based on the Service's review of the biological assessment (BA) for the construction and operation of the Spire STL Pipeline Project in Scott, Greene, and Jersey Counties, Illinois; and St. Charles and St. Louis Counties, Missouri. Spire has applied for a Certificate of Public Convenience and Necessity (Certificate) pursuant to Section 7(c) of the Natural Gas Act [15 USC 717f(c)] from the Federal Energy Regulatory Commission (FERC), and permits and easements from the U.S. Army Corps of Engineers (USACE). Formal Consultation was initiated by FERC with the transmittal of the Spire STL Pipeline Project Environmental Assessment (EA) and Biological Assessment on September 29, 2017.

This biological opinion was prepared in accordance with Section 7(a)(2) of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 et seq.) and is the culmination of formal Section 7 consultation under the Act. The purpose of formal Section 7 consultation is to ensure that any action authorized, funded, or carried out by the Federal government is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of any officially designated critical habitat of such species.

CONSULTATION HISTORY

June 8, 2016 – GAI Consultants, Inc. (GAI) contacted the Service's Illinois-Iowa Field Office (ILIAFO) via phone and email to initiate an informal review of the Project in an effort to identify survey needs and threatened and endangered species.

June 30, 2016 – GAI sent an email to the Service's Two Rivers National Wildlife Refuge requesting information about potential Project effects to migratory birds.

July 8, 2016 – GAI and Spire met with the ILIAFO to discuss the Project and threatened and endangered species.

August 2, 2016 – GAI contacted the ILIAFO via phone and email to discuss and transmit information regarding surveys for the decurrent false aster.

August 12, 2016 – GAI sent a letter to the ILIAFO requesting technical assistance on threatened and endangered species records and survey requirements for the Indiana bat, northern long-eared bat, gray bat, tree nesting migratory birds and bald eagles, Higgins eye pearlymussel, Spectaclecase, pallid sturgeon, Illinois cave amphipod, decurrent false aster, and running buffalo clover.

September 29, 2016 – GAI sent a letter to the ILIAFO requesting additional information and review of initial effects determinations and proposed survey protocol for threatened and endangered species. The letter indicated the Project is not likely to adversely affect the least tern, piping plover, Higgins eye pearlymussel, or pallid sturgeon due to the use of horizontal directional drill (HDD) crossing methods for the Mississippi and Missouri Rivers. The letter also

indicated the Project is not likely to adversely affect the red knot due to lack of habitat of the species in the Project footprint, and would not affect the Illinois cave amphipod due to the species not being present in counties crossed by the Project. The letter concludes that GAI would conduct habitat and/or species surveys for all remaining previously-identified federal threatened and endangered species, and would also include the eastern prairie fringed orchid and Mead's milkweed.

September 30 to November 7, 2016 – GAI and the ILIAFO exchanged emails on the review of the September 29, 2017 letter.

December 8, 2016 – The ILIAFO sent a letter to GAI requesting additional information on HDD methods to support the preliminary not likely to adversely affect determinations for the least tern, piping plover, red knot, Higgins eye pearlymussel, and pallid sturgeon. The letter indicated surveys should be conducted for the following species that may occur in the counties crossed by the Project: decurrent false aster, eastern prairie fringed orchid, Mead's milkweed, running buffalo clover, Indiana bat, northern long-eared bat, gray bat, and bald eagle. The letter also recommended seasonal tree clearing restrictions for migratory birds and the development of a migratory bird habitat impact analysis.

January 4, 2017 – FERC, the ILIAFO, Spire, and GAI held a conference call to discuss summer presence/absence bat surveys and other threatened and endangered species surveys. Parties involved decided that Spire should begin preparation of a draft BA in consultation with Service.

January 20, 2017 – GAI sent an email to the ILIAFO providing a schedule for draft BA preparation.

January 25, 2017 – GAI sent a letter to the ILIAFO providing information on HDD methods supporting not likely to adversely affect determinations for the least tern, piping plover, red knot, Higgins eye pearlymussel, and pallid sturgeon. The letter also included additional information and a negative survey result for decurrent false aster. The letter also indicated GAI will conduct habitat and/or species surveys for the eastern prairie fringed orchid, Mead's milkweed, running buffalo clover, Indiana bat, northern long-eared bat, gray bat, and bald eagle. The letter committed to seasonal tree clearing restrictions for migratory birds and included a migratory bird habitat impact analysis.

February 7, 2017 – GAI contacted the ILIAFO via phone and email requesting technical assistance on summer presence/absence bat survey site locations.

February 14, 2017 – The ILIAFO returned the call and discussed the summer presence/absence bat survey and preparation of a draft BA.

March 23, 2017 – The ILIAFO, Spire, and GAI held a conference call to discuss preparation of the BA.

April 13, 2017 – Telephone call with GAI Consultants and K. Lundh and T. Crabill of the Service to discuss decurrent false aster surveys and other threatened and endangered surveys.

April 26, 2017 – FERC, the Service, and the USACE held a conference call and discussed, among other topics, the agency representatives' option to participate as a cooperating agency and schedule of review.

May 25, 2017 – FERC, the Service, the Illinois Department of Agriculture, and the USACE held a conference call and discussed, among other topics, the tree clearing window proposed by Spire.

June 29, 2017 – The ILIAFO, Spire, and GAI held a meeting to discuss preparation of the BA.

June 30, 2017 – FERC and the ILIAFO held a conference call to discuss the status of Service's review of the draft BA.

July 13, 2017 – The Service and GAI held a conference call to discuss preparation of the BA.

July 27, 2017 – FERC, the Service, the Illinois Department of Agriculture, and the USACE held a conference call and discussed the draft BA and EA) review schedule. The Service confirmed that the running buffalo clover is not present in the Project area as currently proposed.

September 29, 2017 – FERC submits BA to Service.

October 26, 2017 – The Service sent a letter to GIA confirming bald eagle surveys had been conducted within the Project area indicating absence of the species.

October 26, 2017 – The Service responds to FERC's request initiating formal consultation. The Service indicates consultation on the northern long-eared bat has been concluded, and confirmed that the decurrent false aster is not present in the Project area. The Service provided concurrence that the Project is not likely to adversely affect the gray bat, least tern, piping plover, red knot, and pallid sturgeon.

BIOLOGICAL OPINION

1 DESCRIPTION OF THE PROPOSED ACTION

The Federal actions evaluated in this biological opinion (BO) are the issuance of a certificate by the Federal Energy Regulatory Commission (FERC) and permits and easements by the U.S. Army Corps of Engineers (USACE) which would allow Spire STL Pipeline LLC (Spire) to construct and operate the Spire STL Natural Gas Pipeline (Pipeline) in Scott, Greene, and Jersey Counties, Illinois; and St. Charles and St. Louis Counties, Missouri.

Pursuant to Section 7 of the Endangered Species Act of 1973, direct and indirect effects of Federal actions and their interrelated or interdependent activities are analyzed to ensure they are not likely to jeopardize the continued existence of federally listed or proposed endangered or threatened species. Indirect effects of the Federal actions include, "…effects that are caused by or result from the action, are later in time but are reasonably certain to occur…" Interdependent actions have no independent utility apart from the proposed action, and interrelated actions are part of a larger action and depend on the larger action for their justification (50 CFR §402.02). The Federal action under review is the issuance of the certificate for the construction of the Spire Pipeline. Without such Federal authorization, the Spire Pipeline would not be able to go forward. Therefore, the focus of this BO is the effects of the Spire Pipeline (Project), including all preconstruction, construction, operation, and maintenance activities associated therewith, regardless of permit jurisdiction or land ownership.

1.1 Federal Actions

The FERC is the lead federal agency for the authorization of interstate natural gas transmission facilities under the Natural Gas Act (NGA) and the lead federal agency for the preparation of the EA and BA. Spire has applied for a Certificate of Public Convenience and Necessity (Certificate) pursuant to Section 7(c) of the Natural Gas Act [15 USC 717f(c)]. The USACE participated as a cooperating agency in the preparation of the EA and BA. The USACE has authority pursuant to Title 33 of the United States Code Section 1344 [33 U.S.C. 1344]; Section 404 of the Clean Water Act (CWA), which governs the discharge of dredged or fill material into waters of the United States; Section 14 of the River and Harbors Act (33 U.S.C. 408), which authorizes the review of requests that could modify USACE civil works projects (e.g., federal channels); and Section 10 of the Rivers and Harbors Act (33 U.S.C. 403), which regulates any work or structures that potentially affect the navigable capacity of a waterbody. A complete list of the federal permits related to the construction and operation of the Project is located in Table A-7 in the EA.

1.2 Action Area

Service regulations define "action area" as all areas affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR §402.02). Because there may be indirect effects from the Federal actions included in the consultation that occur outside of the geographic area of the proposed action as described by the action agency, the

action area of the BO may not be the same as the actual geographic area of the proposed action.

The federal actions (as described above) will result in the construction, operation, and maintenance of the Pipeline. The construction, maintenance, and operation of the pipeline will result in direct effects and indirect effects throughout the entire pipeline. Therefore, the action area for this consultation is the entire 65 mile length of the Pipeline, including the permanent right-of-way (ROW), additional temporary workspace, access roads, staging areas, and other aboveground facilities.

The Project as proposed would remove about 59.0 acres of upland forest and 0.8 acre of forested wetland. Approximately 30.0 acres of upland forest and 0.3 acre of forested wetland will be lost permanently due to maintenance and operation of the Project within the 50-foot wide permanent ROW. Spire has reduced the permanent ROW in forested wetlands to about 30 feet wide. Spire would selectively trim trees within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline coating in accordance with the FERC's Wetland and Waterbody Construction and Mitigation Procedures. In addition, this acreage excludes forested areas between Spire's proposed HDD entry and exit locations which would not be cleared during construction or operation. Therefore, this acreage differs from the forested land use acreage reported in the EA by about 6 acres, as those acreages included the forested areas that would be crossed by the HDD and within the proposed 50-foot wide permanent easement. A full description of the action area can be found in the EA and BA.

1.3 Description of the Action

The Spire STL Pipeline Project consists of 65 miles of new, greenfield, 24-inch diameter pipeline in two segments. The first segment (referred to as the "Mainline" portion of the Project) would originate at a new interconnect with the Rockies Express Pipeline LLC (REX) pipeline in Scott County, Illinois and extend about 59 miles through Greene and Jersey Counties in Illinois before crossing the Mississippi River and extending east through St. Charles County, Missouri. The Mainline then crosses the Missouri River into St. Louis County, Missouri, and terminates at a new interconnect with Laclede Gas Company (Laclede). The second segment of new, greenfield pipeline (referred to as the North County Extension), would consist of a 24-inch-diameter pipeline which would extend about six miles from the Laclede interconnect through the northern portion of St. Louis County and terminate at a new interconnect with Enable MRT and Laclede. The total length of the Project pipeline would be about 65 miles (see EA for complete description).

1.4 Conservation measures

Conservation measures are actions that benefit or promote the recovery of a listed species that a Federal agency includes as an integral part of its proposed action and that are intended to avoid, minimize or compensate for potential adverse effects of the action on the listed species. These measures are synthesized from the BA. Spire has committed to follow all of these conservation measures as written below through review of this biological opinion (all measures can be found in Section B5 or the BA). As such, these measures are mandatory.

- Seasonal tree clearing – Spire is proposing to conduct clearing activities within non-cultivated areas prior to April 1, 2018, if regulatory permits are received on schedule and allow for sufficient time to conduct clearing activities within the Project area. If clearing is not completed by April 1, 2018, Spire will conduct clearing between April 1 and April 30, followed by a clearing restriction from May 1 to July 31, and resume on August 1to avoid impacting non-volant pups. Post-construction operational and routine vegetation and mowing or tree clearing in the permanent ROW would take place prior to April 15 and after August 1.

- Minimize limits of disturbance – The Project has been routed in open areas and was collocated along existing road and pipeline corridors, where practical, to avoid impacts to forests and known and unknown Indiana bat roost trees. About one-third of the Mainline in Illinois would be collocated with existing rights-of-way. Collocating would further reduce effects to the forest or other land uses, including through the contiguous forest north of the Mississippi River, thereby minimizing new fragmentation to other relatively undisturbed tracts of interior forest.

- Avoidance of riparian areas and wetlands wherever practical – The Project area has been generally reduced to 75-feet-wide at streams and wetlands. Stream crossings and impacts would be minimized wherever practical by routing or shifting the Project area to avoid paralleling streams.

- Soil segregation – Topsoil would be segregated during earth disturbance activities in the Project area in accordance with the Plan, as well as with the AIMA for Illinois. Soil segregation and erosion and sediment controls (described below) are general measures that encourage native plant and animal communities.

- Erosion and sedimentation controls – The Erosion and Sediment Control Plan would reduce the potential for adverse impacts from stormwater runoff during construction. Erosion and sediment control devices would be outlined in erosion and sediment control plans which would incorporate the Plan and state and local regulations.

- Invasive Species Control – Spire has prepared a Noxious Weeds/Invasive Plant Control Mitigation Plan. Implementation of this plan would avoid and/or minimize adverse effects from noxious and invasive plant species.

- HDD Crossings – The trenchless crossings (HDD) of the Mississippi River, Missouri River, Coldwater Creek, and Spanish Lake Park would minimize the potential effects of the Project on shorelines, islands, and aquatic habitat in and along these waterbodies. No in-stream construction or disturbance to the streambed is anticipated at these locations.

2 STATUS OF THE SPECIES

This section presents the biological or ecological information relevant to formulating this BO. Appropriate information on the species' life history, its habitat and distribution, and other data on factors necessary to its survival are included to provide background for analysis in later sections. This analysis documents the effects of past human and natural activities or events that have led to the current range-wide status of the species. Portions of this information are also presented in listing documents, the recovery plan (USFWS 1983), and the draft recovery plan, first revision (USFWS 2007), and are referenced accordingly.

2.1 Species Description

The Indiana bat was originally listed as an endangered species by the Service in 1967. Thirteen winter hibernacula (11 caves and two mines) in six states were designated as critical habitat for the Indiana bat in 1976 (USFWS 1976). No critical habitat is within the range of the Spire Pipeline.

The Indiana bat is an insectivorous, temperate, medium-sized bat that migrates annually from winter hibernacula to summer habitat in forested areas. The bat has a head and body length that ranges from 41 to 49 mm, with a forearm length of 35 to 41 mm. The fur is described as dull pinkish-brown on the back but somewhat lighter on the chest and belly, and the ears and wing membranes do not contrast with the fur (Barbour and Davis 1969). Although the bat resembles the little brown bat and the northern long-eared bat, it is distinguished by its distinctly keeled calcar and a long, pointed, symmetrical tragus.

2.2 Life History and Biology

The key stages in the annual cycle of Indiana bats are: hibernation, spring staging, pregnancy, lactation, volancy/weaning, migration and swarming. While there is variation based on weather and latitude, generally bats begin winter torpor in mid-September through late-October and begin emerging in April. Females depart shortly after emerging and are pregnant when they reach their summer area. Birth of young occurs between mid-June and early July and then nursing continues until weaning, which is shortly after young become volant (able to fly) in mid- to late-July. Migration back to the hibernaculum may begin in August and continue through September.

Winter Hibernation

After the summer maternity period, Indiana bats migrate back to traditional winter hibernacula. Some male bats may begin to arrive at hibernacula as early as July. Females typically arrive later and by September the number of males and females are present in comparable numbers. Autumn "swarming" occurs prior to hibernation. During swarming, bats fly in and out of cave entrances from dusk to dawn and use trees and snags as day roosts (Cope and Humphrey 1977). Swarming continues for several weeks and mating occurs during the latter part of the period. Fat supplies are replenished as the bats forage prior to hibernation. By late September many females have entered hibernation, but males may continue swarming well into October in what is believed to be an attempt to breed with late arriving females.

All cohorts of Indiana bats are hibernating by November and remain in hibernacula through April (Hall 1962, LaVal and LaVal 1980), depending upon local weather conditions. Indiana bats hibernate in caves and mines with cold, stable microclimates. They form large, dense clusters, ranging from 300 bats per square foot to 484 bats per square foot (Clawson et al. 1980, Clawson, pers. observ. October 1996 in USFWS 2000). Clusters form in the same area in a cave each year, with more than one cluster possible in a particular cave (NatureServe 2007). Indiana bats, especially females, are philopatric to hibernacula (i.e., they return annually to the same hibernaculum). Bands returns from a mine in Missouri during winter surveys have documented one female Indiana bat present in a cluster in the same location for three years (USFWS unpublished data).

Summer Roosting and Foraging

After hibernation ends in late March or early April, most Indiana bats migrate to summer roosts. Females emerge from hibernation ahead of males. Reproductively active females store sperm from autumn copulations through winter, and ovulation takes place after the bats emerge from hibernation. The period after hibernation and just before spring migration is typically referred to as "staging," a time when bats forage and a limited amount of mating occurs (USFWS 2007). In spring when fat reserves and food supplies are low and females are pregnant, migration is probably hazardous (Tuttle and Stevenson 1977). Consequently, mortality may be higher in the early spring, immediately following emergence. Once en route to their summer destination, females move quickly across the landscape. Radio-telemetry studies in New York documented females flying between 10 and 30 miles in one night after release from their hibernaculum, arriving at their maternity sites within one night. Indiana bats can migrate hundreds of miles from their hibernacula. Observed migration distances range from just 34.1 to 356.5 miles (USFWS 2007).

Females seek suitable habitat for maternity colonies, which is a requisite behavior for reproductive success. They exhibit strong site fidelity to summer roosting and foraging areas, generally returning to the same summer range annually to bear their young (Garner and Gardner 1992). For example, surveys conducted in summer 2014 in a maternity colony homerange first documented in 1985, indicated continued presence of a maternity colony in the area. Females arrive in their summer habitats as early as April 15 in Illinois (Garner and Gardner 1992), and usually start grouping into larger maternity colonies by mid-May. Garner and Gardner (1992) reported that Indiana bats first arrived at their maternity roost in early May in Indiana, with many individuals arriving in mid-May. During this early spring period, a number of roosts may be used temporarily until a roost with larger numbers of bats is established.

In general, Indiana bats roost in large, often dead or partially dead trees with exfoliating bark and/or cavities and crevices (Callahan et al. 1997; Farmer et al. 2002; Kurta et al. 2002). Trees in excess of 16 inch diameter at breast height (dbh) with exfoliating bark are considered optimal for maternity colony roost sites, but trees in excess of 9 inches dbh appear to provide suitable maternity roosting habitat (Romme et al. 1995). Rittenhouse et al. (2007) considered roost trees as suitable at approximately 7 inches dbh, but the suitability index (SI, SI = 0.00 to 1.00) of roost trees increased with greater dbh with trees reaching a SI of 0.50 at approximately 12 inches dbh

and a SI of 1.00 at approximately 20 inches dbh or greater.

Indiana bat maternity roosts can be described as primary or alternate based upon the proportion of bats in a colony consistently occupying the roost site. Maternity colonies typically use 10 to 20 trees each year, but only one to three of these are primary roosts used by the majority of bats for some or all of the summer (Gardner and Gardner 1992; Miller et al. 2002). Alternate roosts are used by individuals, or a small number of bats, and may be used intermittently throughout the summer or used only once or for a few days. Females frequently switch roosts to find optimal roosting conditions, switching roosts every few days on average, although the reproductive condition of the female, roost type, and time of year affect switching. When switching between day roosts, Indiana bats may travel as little as 23 feet or as far as 3.6 miles (Kurta et al. 1996; Kurta et al 2001; Kurta et al. 2002). In general, moves are relatively short and typically less than 0.6 mile (USFWS 1997).

Maternity colonies typically contain 100 or fewer adult females (Harvey 2002), but as many as 384 have been observed from a single maternity roost tree in Indiana (Whitaker and Brack 2002). The average sized maternity colony in Indiana was 80 females (Whitaker and Brack 2002). Birth of young occurs in late June and early July (Easterla and Watkins 1969, Humphrey et al. 1977). The young are able to fly between mid-July and early August (Mumford and Cope 1958, Cope et al. 1974, Humphrey et al. 1977, Clark et al. 1987, Gardner et al. 1991, Kurta et al. 1996). An exit count conducted on July 17, 2014 on USACE property (Wappapello Lake) in Missouri yielded a count of 195 individuals exiting a 26-inch dbh cottonwood snag (York-Harris, pers. comm). Volant pups likely were included in the count, but at least 96 adults were present in the primary tree.

The home range of a maternity colony is the area within a 2.5-mile radius (i.e., 12,560 acres) around documented roosts or within a 5-mile radius (i.e., 50,265 acres) around capture location of a reproductive female or juvenile Indiana bat or a positive identification of Indiana bat from properly deployed acoustic devices and acceptable analysis of data. Based on data provided in the Indiana bat draft revised recovery plan (USFWS 2007), a maternity colony needs at least 10% suitable habitat (i.e., forested habitat that provides adequate roost sites and foraging areas) to exist at a given point on the landscape. Garner and Gardner (1992) found that females in Illinois utilized larger foraging ranges than males, whereas Menzel et al. (2005) found no difference in homerange sizes of males and females in west-central Illinois.

Male Indiana bats may be found throughout the entire range of the species. Some males spend the summer near hibernacula, as has been observed in Missouri (LaVal and LaVal 1980) and West Virginia (Stihler, pers. observ. October 1996, in USFWS 2000). Males appear to roost singly or in small groups, except during brief summer visits to hibernacula. Males have been observed roosting in trees as small as 3 inches dbh, but the average roost diameter for male Indiana bats is 13 inches (USFWS 2007).

Indiana bats forage over a variety of habitat types but prefer to forage in and around the tree canopy of both upland and bottomland forest, along roads, or along the corridors of small streams. Menzel et al. (2005) found that females foraged significantly closer to forests, roads, and riparian habitats than agricultural land and grasslands. Womack et al. (2012) documented

selection by reproductive females of forests with higher canopy cover but more open mid-stories caused by management via prescribed fire. Females in Illinois were found to forage most frequently in areas with canopy cover of greater than 80% (Garner and Gardner 1992). Bats forage between dusk and dawn at a height of approximately 6-90 feet above ground level and feed exclusively on flying insects, primarily moths, beetles, and aquatic insects (Humphrey et al. 1977).

2.3 Population Dynamics

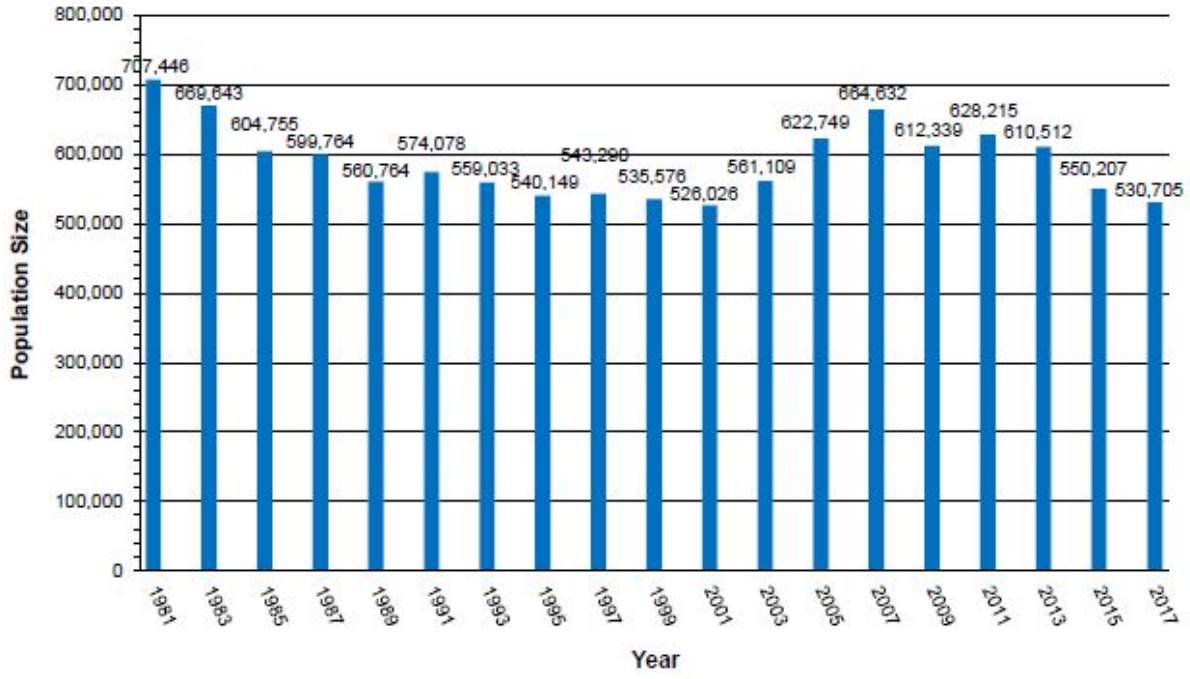
The population of the Indiana bat has decreased significantly from an estimated 808,000 in the 1950s (USFWS 2007). Based on censuses taken at all hibernacula, the current total known Indiana bat population in 2017 is estimated to be about 530,705 bats. Population trend data showed a steady increase from 2001 to 2007, a drop in 2009, an increase in 2011, and continually dropping populations until 2017.

Missouri, Indiana, and Kentucky have historically had the highest estimated numbers of hibernating bats; all had estimates of greater than 10,000 bats in 1965. Over the period 1965 to 2005, estimated numbers of hibernating bats in Missouri and Kentucky clearly declined (USFWS 2007). Among the group of states in which aggregate hibernaculum surveys have never reached 100,000 bats, hibernaculum surveys in Arkansas, Tennessee, and Virginia consistently declined from 1965 to 2000. Hibernacula surveys in Illinois, New York, Ohio, and West Virginia were greater in 2000 than in 1965, but trends are not entirely consistent through the period. Thus, the southern tier of states in the species' range shows declines in counts at hibernacula, whereas some states in the upper Midwest show increasing counts (USFWS 2007).

2.4 Status and Distribution

The current species range includes much of the eastern half of the United States, from Oklahoma, Iowa, and Wisconsin east to Vermont, and south to northwestern Florida. The species has disappeared from, or greatly declined, in most of its former range in the northeastern United States. The current revised recovery plan (USFWS 2007) delineates recovery units based on population discreteness, differences in population trends, and broad level differences in land-use and macro-habitats. There are currently four recovery units for the Indiana bat: Ozark-Central, Midwest, Appalachian Mountains, and Northeast.

Figure 1. Indiana bat rangewide population estimates from 1981 – 2017 https://www.fws.gov/midwest/endangered/mammals/inba/pdf/2017IBatPopEstimate5July2017.pdf; (USFWS 2017)).



Historically, the Indiana bat had a winter range restricted to areas of cavernous limestone in the karst regions of the east-central United States. Hibernacula are divided into priority groups that have been redefined in the Service's Draft Recovery Plan (USFWS 2007): Priority 1 (P1) hibernacula typically have a current and/or historically observed winter population of greater than or equal to 10,000 Indiana bats; P2 have a current or observed historic population of 1,000 or greater, but fewer than 10,000; P3 have current or observed historic populations of 50 to 1,000 bats; and P4 have current or observed historic populations of fewer than 50 bats. Based on 2009 winter surveys, there were a total of 24 P1 hibernacula in seven states: Illinois (one); Indiana (seven); Kentucky (five); Missouri (six); New York (three); Tennessee (one); and West Virginia (one). One additional P1 hibernaculum was discovered in Missouri in 2012. A total of 55 P2, 151 P3, and 229 P4 hibernacula are also known from the aforementioned states, as well as 15 additional states.

The historical summer range of the Indiana bat is thought to be similar to its modern range. However, the bat has been locally extirpated due to loss of summer habitat. The majority of known maternity sites have been located in forested tracts and riparian areas in agriculturally dominated landscapes such as Missouri, Iowa, Indiana, Illinois, southern Michigan, western Ohio, and western Kentucky. They have been documented to use roost trees in highly fragmented areas as well as more contiguous forested patches.

The reasons for listing the Indiana bat were summarized in the original Recovery Plan (USFWS 1983) including: declines in populations at major hibernacula despite efforts to implement cave protection measures, the threat of mine collapse and the potential loss of the largest known hibernating population at Pilot Knob Mine, Missouri, and other hibernacula throughout the species range were not adequately protected. Although several known human-related factors have caused declines in the past, they may not solely be responsible for recent declines.

Documented causes of Indiana bat population decline include: 1) human disturbance of hibernating bats; 2) improper cave gates and structures rendering them unavailable or unsuitable as hibernacula; and 3) natural hazards like cave flooding and freezing. Suspected causes of Indiana bat declines include: 1) changes in the microclimate of caves and mines; 2) dramatic changes in land use and forest composition; and 3) chemical contamination from pesticides and agricultural chemicals. Current threats from changes in land use and forest composition include forest clearing on private and public land within the summer range, woodlot management and wetland drainage by landowners, and other private and municipal land management activities that affect the structure and abundance of forest resources.

The greatest current threat to Indiana bats is white nose syndrome (WNS). WNS was first documented in New York in February of 2006 and has since been confirmed in 31 states and 5 Canadian Provinces (www.whitenosesyndrome.org/resources/map). It is currently unknown if WNS is the primary cause or a secondary indicator of another pathogen, but it has been correlated with erratic behavior such as early or mid-hibernation arousal that leads to emaciation and mortality in several species of bats, including the Indiana bat (http://whitenosesyndrome.org/; www.fws.gov).

Overall mortality rates, primarily of little brown bats, have ranged from 90 to 100 percent in hibernacula in the northeastern United States. It is currently estimated that more than 5.7 million bats have died from WNS in infected regions (www.whitenosesyndrome.org/about-white-nose-syndrome). Apparent losses of 685 Indiana bats in Hailes Cave and 12,890 (previous population was 13,014) Indiana bats in the Williams Preserve Mine in New York were documented during the first winter WNS was observed at each site. Additionally, Indiana bat surveys conducted at hibernacula in New York during early 2008 estimated the population declined 15,662 bats, which represents 3.3% of the 2007 revised rangewide population estimate. The number of confirmed cases of WNS has increased significantly in the Ozark-Central Recovery Unit since 2011 (www.whitenosesyndrome.org/resources/map) and if trends continue, it is likely that additional reductions in the Indiana bat population will occur in this region.

WNS is thought to be transmitted by direct bat contact with an infected bat and by transmission of the causative agent from cave to cave. The distribution of WNS appears to be expanding in all directions from its epicenter in New York. Between 2007 and 2008, it was documented to have spread from a 9 km radius to a 200 km radius, and at the end of the 2008-2009 winter, it was documented in all major hibernacula in New York. Most recently it has been found in Minnesota, Nebraska, Oklahoma, Texas, and Washington. The Service and partners are conducting research to develop management strategies to reduce the spread and impacts of WNS. However, it remains a significant and immediate threat to the Indiana bat.

At the time the revised recovery plan was drafted in 2007, the causative agent for WNS had not yet been discovered and the additive impacts to the already declining Indiana bat were not yet considered. Given the documented deaths of Indiana bat due to WNS in the Northeast since 2006, the species is further threatened with extinction. Numerous research projects have been completed and are ongoing at a rapid rate since the first discovery of WNS, a national response plan has been completed (available at www.whitenosesyndrome.org), multiple states and agencies have approved or are in the process of developing response action plans, and various management actions have been undertaken with the hope of slowing the spread of the disease (e.g., cave closures, the development of decontamination protocols, etc.). Despite these efforts, there is no known cure for the disease and all bats in North America that hibernate in caves could be threatened with extinction.

Climate change is also an emerging threat to the Indiana bat, primarily because temperature is an essential feature of both hibernacula and maternity roosts. Potential impacts of climate change on temperatures within Indiana bat hibernacula were reviewed by V. Meretsky (pers. comm., 2006 in USFWS 2007). Climate change may be implicated in the disparity of population trends in southern versus northern hibernating populations of Indiana bats (Clawson 2002), but Meretsky noted that confounding factors are clearly involved. Potential impacts of climate change on hibernacula can be compounded by mismatched phenology in food chains (e.g., changes in insect availability relative to peak energy demands of bats) (V. Meretsky, pers. comm., 2006 in USFWS 2007). Changes in maternity roost temperatures may also result from climate change, and such changes may have negative or positive effects on development of Indiana bats, depending on the location of the maternity colony. The effect of climate change on Indiana bat populations is a topic deserving additional consideration.

2.5 Status within the Ozark-Central Recovery Unit

The Indiana bat populations in the Ozark-Central Recovery Unit (RU) have declined significantly since 1990 showed modest increases in 2011 and 2013, declined in 2015 and increased again slightly in 2017 (USFWS 2007, USFWS 2017). Historically, the Ozark-Central Recovery Unit had the largest numbers of Indiana bats in hibernacula; however, populations have declined such that the Midwest RU unit hosts the largest populations of Indiana bats. Prior to 2012, the majority of hibernating bats in the Ozark-Central RU were assumed to overwinter in Pilot Knob Mine in Missouri. Dramatic declines in the hibernating population at this site occurred since the early 1980s from an original estimation of approximately 100,000 in the 1970s to an estimation of 1,678 in the 2000s. The discovery of a previously unknown P1 hibernation site has increased the baseline size of the population in the Ozark-Central RU, but not the overall trend across the range of the species. The newly discovered site houses approximately 197,419 hibernating Indiana bats (USFWS 2017). Based on observations by private cavers, the site has been occupied by a similar number of Indiana bats since the 1970s and would have concurrently occupied both sites; these bats are not considered to be bats that moved from Pilot Knob Mine. After incorporating bats from the newly discovered site, the current 2013 population estimate for the Ozark-Central RU is approximately 271,965 (USFWS 2017).

3 ENVIRONMENTAL BASELINE

The environmental baseline is the current status of listed species and their habitats, and critical habitat, as a result of past and ongoing human and natural factors in the area of the proposed action. Also included in the environmental baseline are the anticipated impacts of other proposed Federal projects in the action area that have already undergone formal section 7 consultation.

3.1 Status of the Species in the Action Area

Spire conducted mist netting surveys in 2017 to detect Indiana bats along the Project alignment. Of the 141 bats captured, 7 were Indiana bats (5 male and 2 female) indicating both maternity and non-maternity habitat overlapping the Pipeline route in Scott and Jersey Counties Illinois. Two maternity colonies were documented occupying suitable habitat that transects the Spire Pipeline action area in Illinois. The females were tracked back to roost trees 668.3, 673.2, 3,081.1, and 3,221.6 feet from the proposed Project tree clearing. Although Indiana bats are known to occur in parts of St. Charles and St. Louis Counties, Missouri, and Greene County, Illinois; surveyors found no Indiana bats within the Project action areas.

The Action Area is within the Ozark-Central recovery unit of the Indiana bat. Although the population in this recovery unit has declined since 1990 (USFWS 2007) the Ozark-Central Recovery Unit now has the largest population of any of the recovery units at 271,965 (USFWS 2017). The conservation status of the species in the action area is assumed to be declining at the same rate as it is in the Ozark-Central RU.

Based on the documentation of current Indiana bat presence in the action area, it remains suitable habitat (maternity roosting, roosting, and foraging) for the Indiana bat. The action area plays a role in the persistence and recovery of Indiana bats in the Ozark-Central RU. Portions of the action area provide summer habitat for males, non-reproductive females, and at least 2 maternity colonies of Indiana bats. Persistent maternity colonies in this core area that remain stable or increase in number of individuals are vital to the recovery of the species.

3.2 Factors Affecting the Species Environment within the Action Area

The Project action area will impact approximately 972 acres of land, of which 396.08 will be enduringly impacted by the 50-foot ROW. Roughly 86 percent is used for agricultural production (totaling 840.3 acres). A total of 64.6 acres of the action area is forested of which 34.9 acres are within the 50-foot permanent ROW. Most of the wooded habitat is held in private ownership and not protected from harvest.

The action area is expected to continue to produce agricultural crops as normal, and no major land use changes are expected during the time of the action. After construction of the pipeline, agricultural landuse will continue. Wooded habitat outside of the 50-foot permanent ROW will be allowed to reforest naturally.

4 EFFECTS OF THE ACTION

This section of the biological opinion provides an analysis of the effects of the action on listed species, and on critical habitat. Both direct effects (those immediately attributable to the action), and indirect effects (those caused by the action, but which will occur later in time, and are reasonably certain to occur) are considered. Finally, the effects from interrelated and interdependent activities are also considered. These effects will then be added to the environmental baseline in determining the proposed action's effects to the species or its critical habitat (50 CFR Part 402.02).

4.1 Factors Considered

This section includes an analysis of the direct and indirect effects of the proposed action on the species and critical habitat and its interrelated and interdependent activities. Our analysis considers the following factors:

Proximity of the action: The proposed action will affect occupied habitat of maternity and non-maternity Indiana bats.

Distribution: The action area includes a small fraction of the range of the Indiana bat.

Timing: Spire is proposing to complete all tree clearing prior to April 1. However, tree clearing could take April 1 – April 30, and August 1 – September 30. Spring migration and staging occurs from early April through mid-May at which point maternity colonies begin to form. The federally-permitted activities addressed in this BO will directly affect Indiana bats during the first four weeks of spring staging and migration (April 1- 30) and the end of the maternity period (August 1 – September 30). Indirect impacts will occur during the summer and maternity periods of their life cycle due to permanent loss of suitable roosting and foraging habitat.

Nature of the effect: Direct effects are described below.

Duration: The duration of the effects will be both short-term (felling trees in April 2018, and between August 1 and September 30, 2018) and long-term (permanent loss of suitable roosting and foraging habitat), but should be primarily localized to the Action Area. Some indirect impacts due to the increase in the permanent ROW will be permanent. Periodic operation and maintenance activities are expected to be intermittent and short-term.

Disturbance Frequency: Pipeline construction activities will result in a prolonged, one-time disturbance to habitat within the Action Area. Additional operation and maintenance activities over the life of the pipeline will occur and disturbance frequency will vary. The most predictable disturbance will occur during vegetation maintenance of the permanent ROW.

Disturbance intensity and Severity: The intensity and severity of the disturbance are also described below.

4.2 Analysis for Effects of the Action

Mist netting surveys were conducted within the action area during the summer of 2017 following the Service's 2017 Indiana Bat Summer Survey Guidance. Of the 141 bats captured, seven were Indiana bats (5 adult males, 2 adult females) captured in 5 mist netting locations. Based on the survey, maternity and non-maternity summer roosting habitat and foraging habitat was identified overlapping the Project action area. The following criteria were used to classify occupied hibernation, maternity, and non-maternity habitat: within 5 miles of a known extant hibernaculum; within 5 miles of a summer maternity capture without a known roost; within 2.5 miles of a known maternity roost; and within 2.5 miles of a summer non-maternity record. There is no known extant hibernaculum within 5 miles of the action area. Overall, Spire anticipates that approximately 10.6 acres of maternity habitat and 18.2 acres of non-maternity habitat for Indiana bats will be removed as a result of the Project (see Table 9 in BA).

None of the maternity or non-maternity roosts identified during the survey were located within the action area. The 4 identified maternity roosts were located 668.3, 672.2, 2081.1, and 3,221.6 feet from the tree clearing area for the Project. The closest roost was a non-maternity roost occupied by a single male and was located 26.9 feet from the tree clearing area.

There are three potential primary impacts of the construction of the Spire Pipeline on Indiana bats: 1) direct impacts to individuals if a roost tree is felled during the active season while occupied (April 1 to September 30; 2) indirect effects from the removal of active maternity roost trees during the inactive season that may result in decreased viability of the maternity colony; and 3) indirect effects from the removal of summer habitat resulting in substantial habitat degradation.

Direct Effects to Individuals from Active Season Clearing

Removal of roost trees while Indiana bats are present may result in direct effects by killing, injuring, or otherwise harming maternity or non-maternity individuals. Clearing during the active season may impact migratory bats (females, males, and juveniles), non-maternity individuals in summer habitat (males and non-reproductive females), females and juveniles roosting in an unidentified maternity tree. In order to minimize direct effects, Spire plans to clear Indiana bat habitat prior to April 1, 2018, if possible. If tree clearing cannot be completed by March 30, 2018, a restriction between May 1 and July 31, 2018 will be imposed to avoid impacting non-volant pups.

While there is the potential for Indiana bats to be adversely affected, the likelihood of bats occupying the felled trees has been reduced for several reasons. Bats emerge from their winter hibernacula in April and quickly return to their summer habitat grouping into larger maternity colonies in mid-May. During this time many roosts may be used temporarily until a roost with a large number of bats is established. Pups are born in mid-June to July and are generally flying and eating on their own by early August, and maternity colonies are beginning to disperse. The tree clearing restrictions proposed by Spire confine tree clearing to times when fewer bats will be located in any one tree at the same time. No occupied maternity or non-maternity trees were identified within the Project action area. The closest occupied maternity tree was 668.3 feet

from the clearing area for the Project.

Spire has estimated 11,697.7 forested acres within the maternity habitat identified from the 2017 survey. Of this habitat the Project will result in the clearing of 10.6 acres (less than 0.1% of available maternity habitat). Spire has estimated 8,761.6 acres of non-maternity habitat. Of this habitat the Project will result in the clearing of 18.2 acres (0.1% of the available non-maternity habitat). In order for direct effects to occur, bats will need to be present in a tree when it is felled. The relatively small amount of habitat being impacted by the Project limits the potential of this occurring. Although still possible if an occupied roost tree is felled between April 1 - April 30, or August 1 - September 30, adoption of the conservation measures further reduces the risk of direct effects to all bats.

Indirect Effects from Removing Active Maternity Roost Trees

Indirect effects to Indiana bats may also occur if active maternity roost trees (i.e., occupied in the summer) are cleared during the hibernation period (inactive season). Removal of maternity roost trees during this time renders them unavailable to pregnant bats that exhibit maternity area and/or maternity roost tree fidelity following migration in the spring. Active primary maternity roost trees are larger trees that are rare across the landscape, and we do not have complete understanding of how they are selected. It can be difficult for a maternity colony to find a suitable replacement even if a suite of alternate maternity roost trees in the area are already being used. Periods of pregnancy, birth, and lactation are the most sensitive and energetically demanding times of year for reproductive females. Resulting indirect effects from the loss of maternity trees during these periods may include a reduction in foraging, increases in energetic demands, exposure to inter and intra-specific competition, exposure to predation, and decreases in the long-term reproductive success and viability of the colony in the area. Substantial habitat modification may result in harm by significantly impairing behavioral patterns, including breeding, feeding, or sheltering within a maternity colony. If no adequate primary and alternate maternity roosts remain adjacent to the area of impact, indirect effects would be expected to occur as pregnant females search potentially unfamiliar habitat for new roosting and foraging areas the following year.

As stated above, the total amount of maternity colony habitat being impacted by the Project is small and no occupied roosts were identified within the action area greatly reducing the potential of indirect effects to returning females.

Indirect Effects from Removing Summer Habitat

Minor indirect effects may also occur through the removal of foraging and roosting habitat. Due to the relatively small amount of suitable habitat that will be removed for the Project, significant impairment of behavioral patterns, including breeding, feeding, or sheltering are not anticipated.

Summary

Direct and indirect effects occurring during the construction phase of the Project are likely to adversely affect Indiana bats through the following means: 1) removal of occupied roost trees

during the active season resulting in death or injury of individuals, and 2) removal of active maternity roost trees during the inactive season may result in decreased viability of the maternity colony. Although clearing may be completed by April 1, 2018, all impacts will not be avoided. Indirect effects of the removal of foraging and roosting habitat are also likely to occur, but we do not expect the habitat loss to affect the quality and quantity of habitat within the Action Area.

All impacts to Indiana bat habitat are expected to occur during the construction of the Spire Pipeline. No impacts are expected on Indiana bat habitat during operation and maintenance. Although some ecological succession will occur on the permanently maintained ROW, regular maintenance via mowing, brush clearing, and branch trimming will ensure that the ROW will be an open area for the term of the Project.

4.3 Species Response to the Action

Despite the conservation measures, we anticipate that some male, female, and juvenile Indiana bats may be killed or injured if clearing occurs in the active season April 1, 2018 to April 30, 2018, and August 1, 2018 to September 30, 2018. Adverse effects will occur if a tree is felled while bats are occupying it. However, the time frame in which the clearing will occur will restrict the likelihood of impacting large numbers of bats. Female Indiana bats usually do not come together to form their large maternity colonies until mid-May and begin to disperse again when their young are volant and feeding on their own. Females are less restrictive in their choice of roost trees after their young are independent. Males emerge from hibernacula and migrate to summer habitat later than females and the majority of males begin migration back to hibernacula by August making it less likely that they will be on the landscape when the clearing takes place. The proposed Project will impact no more than 0.1 % of the wooded habitat within the maternity and non-maternity colonies identified. All maternity colony trees identified were at least 660 feet from the action area. The clearing restrictions have been designed to avoid impacting non-volant bats and to reduce clearing to times when females either have not formed large colonies and are starting to disperse across the landscape.

Although individual impacts are possible, these individual impacts are not likely to incur population-level effects. Losses from habitat removal are not likely to affect maternity colony fitness (i.e., long-term reproductive potential or persistence of the colony). The disturbance, injury or death of individuals are not likely to be confined to a single colony but rather spread among the colonies. Thus, the death of one or several bats from a single colony over the life of the Project is not likely to affect the fitness of that colony. We believe the maternity colonies within the Action Area can withstand the anticipated losses that may occur as a result of the Project

Given the conservation measures we anticipate that any roost tree felled on a given day will be occupied by only a few female bats or individual males. Also, it is likely that most of the maternity roosts are located away from the proposed clearing area, based on the 2017 survey results. We also assume that 95% of disturbed adult bats would escape a tree when felled (Belwood 2002). In view of this information, it is very difficult to calculate an accurate number of bats that may be taken by this action. Therefore the Service will use acreage of habitat as a surrogate for the number of individuals. Impacts to maternity colonies, non-maternity colonies,

and individuals will occur from the loss of approximately 28.8 acres of suitable roosting and foraging habitat in the Project area (10.6 acres are within known occupied maternity colonies and 18.2 acres within occupied non-maternity areas).

4.4 Interrelated and Interdependent Actions

We must consider along with the effects of the action the effects of other activities that are interrelated to, or interdependent with, the proposed action (50 CFR sect. 402.02). Interrelated actions are part of a larger action and depend on the larger action for their justification. Interdependent actions have no independent utility apart from the proposed action. At this time, the Service is unaware of actions that are interrelated and interdependent with the construction, operation, and maintenance of the Spire Pipeline that have not already been considered in this biological opinion.

5 CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the Action Area considered in this BO. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Indiana bats within the Action Area may be affected by developments and tree clearing activities on private land. Although this is reasonably certain to occur in the Action Area, we have no way to predict the spatial or temporal extent of the impact.

6 CONCLUSION

The proposed action is anticipated to modify 28.8 acres of Indiana bat habitat (not to exceed 29.8 acres) over the 65 miles of the pipeline and may result in the mortality of individual Indiana bats. Our analysis, however, indicates that these impacts are not likely to cause maternity colony impacts. Because maternity colony and hibernaculum impacts are not anticipated, we do not expect that this Project will result in a loss of fitness at the population level or recovery unit level. For these reasons, it is unlikely that the anticipated effects from this proposed action will affect the likelihood of achieving the recovery needs of the species, and therefore, is not likely to appreciably reduce the survival and recovery of the Indiana bat.

After reviewing the current status of the listed species, the environmental baseline for the Action Area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the proposed construction, operation, and maintenance of the Spire Pipeline will not jeopardize the continued existence of the Indiana bat. No critical habitat occurs within the Action Area; therefore, no critical habitat will be affected. However, the proposed action likely will result in incidental take of Indiana bats.

7 INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering [50 CFR §17.3]. Incidental take is defined as take that is incidental to, and not the purpose of, an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of an Incidental Take Statement (ITS).

The measures described below are non-discretionary, and the FERC and USACE must insure that they become binding conditions of any certificate, contract, or permit issued to carry out the proposed action for the exemption in section 7(o)(2) to apply. Federal agencies have a continuing duty to regulate the action covered by this incidental take statement as it relates to their permit and easement actions. If the FERC and USACE: (1) fail to assume and implement the terms and conditions or, (2) fail to require any contracted group to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the FERC and USACE must report the progress of the action and its impact on the species to the Service as specified in the ITS [50 CFR §402.14(I)(3)].

7.1 Amount or Extent of Take Anticipated

Although conservation measures will be employed to avoid impacts to Indiana bats, we anticipate that some male, female, and juvenile Indiana bats may be killed or injured during clearing that occurs during construction of the Spire Pipeline in the active season from April 1 – April 30, and from August 1 – September 30 over 28.8 acres of maternity and non-maternity habitat. This is likely to occur if an occupied roost tree is felled during summer roosting/foraging or migration. Take will be measured by the number of acres of suitable forest habitat that are removed during implementation of the Project covered in this BO. Direct Take also will be detected by observing disturbance, injury, or mortality of individuals or colonies

The FERC must reinitiate consultation with the Service if more than 29.8 acres of habitat is modified or removed by actions covered in this BO. It is possible that there may be slight alignment changes before and during construction that may result in alteration of the clearing zones within the occupied maternity or non-maternity zone. These deviations from the original alignment are generally consisting of very small changes within workspaces required to avoid obstructions or for other causes that cannot be foreseen. Reinitiation of consultation should occur if workspace changes are proposed within these occupied areas that require a net increase of more than 1 additional acre of clearing from the proposed 28.8 acres in the BA.

7.2 Effect of the Take

Overall, the harm, harassment, injury, or death of individuals caused by removal of 29.8 acres of forested habitat is not likely to affect the status of Indiana bats in the Ozark-Central Recovery Unit. In the accompanying opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy of the Indiana bat.

7.3 Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize the impacts of incidental take of Indiana bats during the construction, operation, and maintenance of the Spire Pipeline.

To minimize potential take of the Indiana bats, the Service recommends the following RPMs:

1. Implement the conservation measures described in section 1.4.
2. The FERC and USACE will ensure the permittee will monitor take of individual bats.
3. The FERC and USACE will ensure that the permittee will monitor maternity and non-maternity Indiana bats to determine their response to the proposed actions and the efficacy of the Conservation Measures.

7.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the FERC and USACE must comply with the following terms and conditions, which implement the RPMs described above. These terms and conditions are mandatory.

1. Take by injury and mortality during pipeline construction when trees are being cleared from the construction ROW April 1 – April 30, and August 1 – September 30 will be monitored. If dead or injured bats are encountered, the number and location will be reported through the chain of command to Spire. These data will be reported to the Service as described below
    a. Contact Kristen Lundh of our office at kristen_lundh@fws.gov (309-757-5800) for deposition of specimens. She will contact appropriate individuals regarding final deposition and use of any specimen pending condition of the recovered carcass
    b. Specimens should be frozen in a plastic bag and include date and location with latitude and longitude coordinates
    c. Provide a report on the circumstances surrounding the discovery and incidental taking

2. The FERC will ensure the permittee will monitor presence and habitat use of maternity and non-maternity Indiana bats documented during 2017 survey efforts to determine the response to the proposed actions and the efficacy of the Conservation Measures by conducting mist netting as follows:
    a. In all survey areas where Indiana bats were captured during initial surveys, follow-up mist net surveys, telemetry, and exit counts will be conducted on two occasions. Mist netting suveys, telemetry, and roost counts shall follow the same

protocols used in the 2017 survey for the Project and conform to the most up-to-date Service Mist Netting Guidance.

b. The first monitoring event should be conducted during the maternity season 2 years after completion of the construction of the Spire Pipeline. One additional survey should also be conducted 5 years later (in year 7 post construction). In order to adequately monitor the response of the maternity colony all surveys should encompass the same scope to ensure scientific comparability. All active maternity roost trees located initially (in the 2017 survey) and in the year-2 survey will be monitored in the subsequent year's survey. New maternity roost trees located during the year-7 survey will not require subsequent monitoring, only exit counts.

3. All monitoring results shall be submitted to the Illinois-Iowa Field Office of the Service by December 31 of the year in which the monitoring event occurred. Reports must contain:
    a. Any management or habitat manipulations that have occurred to date;
    b. The results of the mist netting survey, including number, sex, age (mature or juvenile) and reproductive status of all bat captured, including Indiana bats, if any;
    c. Status and occupancy of previously documented maternity roost trees;
    d. Location and occupancy of newly documented maternity roost trees.

8 REINITIATION NOTICE

This concludes formal consultation on the action outlined in the BO. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information shows that the action may affect listed species in a manner or to an extent not considered in this BO; (3) the action is subsequently modified in a manner that causes an effect to the listed species not considered in this BO; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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