Appendix G8. Indiana Bat and Northern Long-Eared Bat Habitat Assessment

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Indiana Bat and Northern Long-Eared Bat Habitat Assessment

West Lake Corridor Project

Federal Transit Administration
and
Northern Indiana Commuter Transportation District

March 2018

NORTHERN INDIANA COMMUTER TRANSPORTATION DISTRICT

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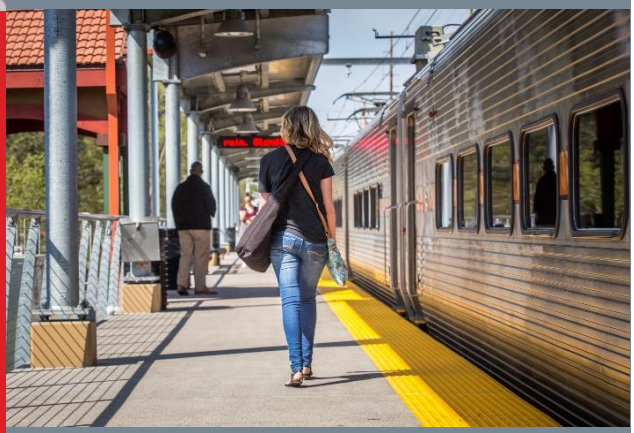

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Acronyms and Abbreviations

°F	degrees Fahrenheit
CN	Canadian National Railway
CSX	CSX Transportation
dbh	diameter at breast height
DEIS	Draft Environmental Impact Statement
EcoCAT	Ecological Compliance Assessment Tool
et al.	and others
FEIS	Final Environmental Impact Statement
FPDCC	Forest Preserve District of Cook County
FR	Federal Register
FTA	Federal Transit Administration
GIS	geographic information systems
GPS	global positioning system
I-80	Interstate 80
ID	identifier
IDNR	Illinois Department of Natural Resources
INDNR	Indiana Department of Natural Resources
IPaC	Information for Planning and Conservation
MP	milepost
n.d.	no date
NEPA	National Environmental Policy Act
NICTD	Northern Indiana Commuter Transportation District
NIPSCO	Northern Indiana Public Service Company
NIRPC	Northwestern Indiana Regional Planning Commission
NS	Norfolk Southern
sp.	unknown species
SSL	South Shore Line
TPSS	traction power substation
USFWS	United States Fish and Wildlife Service
WNS	White-Nose Syndrome

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Executive Summary

The Federal Transit Administration (FTA) and the Northern Indiana Commuter Transportation District (NICTD) are conducting the environmental review process for the West Lake Corridor Project (Project) in Lake County, Indiana, in accordance with the National Environmental Policy Act (NEPA) and other regulatory requirements. The purpose of the current study is to determine whether building a 9-mile southern extension of the existing NICTD South Shore Line (SSL) between Dyer and Hammond, Indiana, would negatively affect either of the following two bat species: Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*).

In accordance with Phase 1 of the *2016 Range-Wide Indiana Bat Summer Survey Guidelines* (USFWS 2016b), the Project team conducted a desktop review and on-site habitat assessments for the target bat species of concern. This effort focused on 13 woodland habitats within the environmental survey area designated for the Project. These habitats were evaluated for suitable habitat for Indiana bat and northern long-eared bat in terms of the presence or absence of potential suitable roost trees and the general landscape setting. The on-site habitat assessments occurred from April 28 to May 10 and on June 19, 2017.

The investigation concluded that 3 of the 13 woodland areas had a low potential for occupancy by Indiana bat and/or northern long-eared bat. Although some of the remaining 10 woodland areas had one or more low-quality potential roosts, the Project team did not regard these locations as possible habitat for these species because of the high level of disturbance in the surrounding urban and suburban landscapes. The Project team estimates that 15.79 acres of woodland habitat would require clearing within the Project footprint, 8.21 acres of which have a low potential for occupancy by Indiana bats and/or northern long-eared bats.

Coordination with the United States Fish and Wildlife Service's (USFWS) Northern Indiana Suboffice did not indicate that there is any critical habitat (summer or winter) in the Project Area. Furthermore, no potential winter hibernacula habitat (caves or mines) in or near the Project Area was identified through field investigations.

Considering the urban and suburban environmental landscape of the Project Area, it is improbable that either bat species is using woodland habitats for roosting in the proposed area of disturbance. However, since low-quality habitat connected with the Little Calumet River was observed at three woodland areas, coordination with USFWS is warranted to determine what additional actions might be required to avoid potential adverse impacts to either bat species and to maintain compliance with Section 7 of the Endangered Species Act.

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1 Introduction

The Federal Transit Administration (FTA) and the Northern Indiana Commuter Transportation District (NICTD) are conducting the environmental review process for the West Lake Corridor Project (Project) in Lake County, Indiana, in accordance with the National Environmental Policy Act (NEPA) and other regulatory requirements. A Final Environmental Impact Statement (FEIS) has been prepared as part of this process, with the FTA as the federal lead agency and NICTD as the local Project sponsor responsible for implementing the Project under NEPA.

1.1 Purpose of Report

The purpose of this report is to provide information regarding natural resources in the Project Area, including location and general quality, and to provide a preliminary indication regarding the impacts of the Project.

1.2 Project Description

The environmental review process builds on NICTD's prior West Lake Corridor studies that examined a broad range of alignments, technologies, and transit modes. The studies concluded that a rail-based service between the Munster/Dyer area and Metra's Millennium Station in downtown Chicago would best meet the transportation needs of the northwest Indiana area. Thus, NICTD advanced a Preferred Build Alternative (referred to as the FEIS Preferred Alternative) for more detailed analysis in the FEIS. NEPA also requires consideration of a No Build Alternative to provide a basis for comparison to the Build Alternative.

1.2.1 No Build Alternative

The No Build Alternative is defined as the existing transportation system, plus any committed transportation improvements included in the Northwestern Indiana Regional Planning Commission's (NIRPC) *2040 Comprehensive Regional Plan* (NIRPC 2011) and the Chicago Metropolitan Agency for Planning's *GO TO 2040 Comprehensive Regional Plan* (CMAP 2014) through the planning horizon year 2040. It also includes capacity improvements to the existing Metra Electric District line and Millennium Station, documented in NICTD's *20-Year Strategic Business Plan* (NICTD and RDA 2014).

1.2.2 Build Alternative

The Project is an approximate 9-mile southern extension of the existing NICTD SSL between the town of Dyer and city of Hammond, Indiana. Traveling north from the southern terminus near Main Street at the Munster–Dyer municipal boundary, the Project would include new track operating at grade on a separate right-of-way to be acquired adjacent to the CSX Transportation (CSX) Monon Subdivision rail line in Dyer and Munster. The Project alignment would be elevated from 45th Street to the Canadian National Railway (CN) Elsdon Subdivision rail line at Maynard Junction. North of the CN line, the Project alignment would return to grade and join with the publicly owned former Monon Railroad corridor in Munster and Hammond, Indiana, and continue north. The Project would relocate the existing Monon Trail pedestrian bridge crossing

over the Little Calumet River and build a new rail bridge at the location of the former Monon Railroad bridge. The Project alignment would cross under Interstate 80/94 (I-80/94) and continue north on the former Monon Railroad corridor to Sibley Street. From Douglas Street north, the Project would be elevated over all streets and rail lines using a combination of retaining walls, elevated structures, and bridges. The Project would terminate just east of the Indiana Harbor Belt at the state line, where it would connect with the SSL. Project trains would operate on the existing MED line for the final 14 miles, terminating at Millennium Station in downtown Chicago.

Four new stations would be constructed along the alignment; Munster/Dyer Main Street, Munster Ridge Road, South Hammond, and Hammond Gateway Stations. Each station would include station platforms, parking facilities, benches, trash receptacles, bicycle racks, and other site furnishings. Shelter buildings would only be located at the Munster/Dyer Main Street and Hammond Gateway Stations.

The Project would include a vehicle maintenance and storage facility with a layover yard and traction power substation (TPSS) to power the overhead contact system, located just south of the Hammond Gateway Station, west of Sheffield Avenue. Additional TPSSs would be located at the South Hammond Station parking lot and Munster/Dyer Main Street Station. The TPSS would be enclosed to secure the electrical equipment and controls, with a footprint of about 20 feet by 40 feet.

2 Coordination with the United States Fish and Wildlife Service, Indiana Department of Natural Resources, and Illinois Department of Natural Resources

2.1 Federal Threatened and Endangered Species

The United States Fish and Wildlife Service (USFWS) administers regulatory authority over federally listed endangered and threatened species under Section 7 of the Endangered Species Act of 1973 (16 United States Code 1531–1544). Under Section 7(a)(2), "each Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary, after consultation as appropriate with affected States, to be critical, unless such agency has been granted an exemption for such action by the Committee pursuant to subsection (h) of this section."

As part of the initial efforts to identify potential federal threatened and endangered species in the West Lake Corridor Project Area in Lake County, Indiana, and Cook County, Illinois, NICTD (2016) accessed the USFWS Endangered Species Program website (USFWS 2014). Additionally, early coordination with the USFWS Bloomington Field Office resulted in the November 4, 2014, response letter that provided information on plant and animal species of potential occurrence in these counties, as well as known occurrences or absence of records in the Draft Environment Impact Statement (DEIS) Project Area (**Appendix A**). **Table 2.1-1** includes the two federal threatened and endangered bat species of potential occurrence in the DEIS Project Area.

Table 2.1-1: USFWS Threatened and Endangered Bat Species in the DEIS Project Area

Species	USFWS Status	Cook County, Illinois	Lake County, Indiana
Myotis sodalis Indiana bat	Endangered	Endangered	Endangered
Myotis septentrionalis Northern long-eared bat	Threatened	Threatened	Special Concern

Sources: Illinois Endangered Species Protection Board 2015; INDNR 2016, 2017; USFWS 2014, 2016a.

Since the FEIS Preferred Alternative terminates at the Indiana-Illinois state line where the proposed railroad track would connect with the existing SSL, the focus of this technical report is limited to habitat in Indiana that could support threatened and endangered species. As a follow-up, the Project team accessed the current USFWS Information for Planning and Conservation (IPaC) website (USFWS 2016a) to obtain a current listing of potential bat species for Lake County, Indiana. The Indiana bat and the northern long-eared bat remain as the only two federally-listed bat species of consideration for the FEIS Preferred Alternative.

2.2 Indiana and Illinois State Threatened and Endangered Mammal Species

State endangered and threatened species of potential concern in the Project Area for Illinois and Indiana were originally identified during the DEIS development stage as documented in the *West Lake Corridor Project Natural Resources Technical Report* (NICTD 2016). Potential state-listed species for Illinois were identified via the Illinois Department of Natural Resources (IDNR) Ecological Compliance Assessment Tool (EcoCAT) and personal communication with staff of the Forest Preserve District of Cook County (FPDCC).

Excluding the Indiana bat and the northern long-eared bat, Franklin's ground squirrel (*Spermophilus franklinii*) was the only state-listed species of potential occurrence for the Illinois portion of the DEIS Project Area. The *Indiana County Endangered, Threatened, and Rare Species List for Lake County* (INDNR 2016) includes four mammal species considered endangered (one) or of special concern (three) in the county. **Table 2.2-1** includes the four state-listed species for the two-county DEIS Project Area. Since the Project Area for the FEIS Preferred Alternative is located entirely in Indiana, this survey does not address potential habitat for species of occurrence only in Illinois. According to the Indiana Department of Natural Resources' (INDNR) Early Coordination/Environmental Assessment response dated October 6, 2014 (**Appendix A**), there were no potential state-listed mammal species of concern in the Project Area in Indiana.

Table 2.2-1: Illinois and Indiana Threatened and Endangered Mammal Species in the DEIS Project Area

Species	Cook County, Illinois[a]	Lake County, Indiana[b]
Spermophilus franklinii Franklin's ground squirrel	Threatened	Endangered
Lasiurus borealis Eastern red bat	Not listed	Special Concern
Lasiurus cinereus Hoary bat	Not listed	Special Concern
Taxidea taxus American badger	Not listed	Special Concern

Sources: FPDCC, personal communication; IDNR 2016; INDNR 2016.

[a] Potential listed species for Illinois portion of the DEIS Project Area

[b] Listed species for all of Lake County

3 Previous Investigations

3.1 NICTD West Lake Corridor Project Natural Resources Technical Report

The *NICTD West Lake Corridor Project Natural Resources Technical Report* (NICTD 2016) discussed the early coordination efforts with federal (USFWS) and state (IDNR and INDNR) fish and wildlife agencies to identify threatened and endangered species of concern, including designated critical habitat, related to potential impacts that might result from any of the three alternatives and options under consideration in the DEIS phase. This report also discussed preliminary assessments and summarized potential natural areas in the Project Area in Illinois and Indiana, the majority of which were located in Illinois. Six locations were identified in the Indiana portion of the DEIS Project Area (Areas P through U) that had potential natural habitats based on limited field reconnaissance and evaluation of aerial photographs. **Table 3.1-1** describes these six locations and the associated habitat unit designation for these areas as referenced later in this survey report.

No additional surveys or studies related to natural resources in the immediate Project Area were reviewed as part of this investigation.

Table 3.1-1: Potential Natural Areas in the Indiana Portion of the FEIS Preferred Alternative Project Area

NICTD 2016 Technical Report Designation	Description	2017 Habitat Unit Designation(s)
Area U North of 45th Street, Munster	Mowed lawn with invasive, weedy shrub and tree species intermixed throughout parcels of developed commercial and industrial property offer limited habitat potential due to small size and extent of development.	H09, H10, H11
Area T South of Fisher Street, east of Pennsy Greenway, Munster	Wetland habitat on undeveloped parcel dominated by invasive species such as common reed (*Phragmites australis*), but with scattered eastern cottonwoods (*Populus deltoides*) and willows (*Salix* sp.) that provide limited value due to small size and surroundings.	H14, H16
Area S Little Calumet River, Hammond	Highly disturbed river habitat dominated by invasive species with surrounding residential development and habitat limited to urban tolerant wildlife.	H19
Area R Vine Street to I-80, Hammond	A strip of mowed lawn and strip of moderate quality prairie and woodland adjacent to the Monon Trail, with limited habitat potential due to size and configuration.	H21, H22, H23, H24
Area Q Grand Calumet River	A narrow strip of highly disturbed habitat with scant vegetative diversity and dominated by invasive species, but with waterfowl habitat potential.	H29
Area P Wabash Avenue and Brunswick Street, Hammond	A small prairie remnant with moderate floristic quality and scattered trees adjacent to the SSL tracks between Wabash Avenue and Brunswick Street.	H30

Source: Lochmueller Group 2017; NICTD 2016.

4 USFWS Threatened and Endangered Species

4.1 Indiana Bat

4.1.1 Status

The Indiana bat was first described as a distinct species by Miller and Allen (1928) from a female specimen collected by J. O. Sibert on March 7, 1904, from Wyandotte Cave in Crawford County, Indiana. *Myotis* means "mouse ear," while *sodalis* is derived from the Latin word for "companion." The Indiana bat was listed as being in danger of extinction by USFWS under the Endangered Species Preservation Act of 1966 on March 11, 1967 (32 Federal Register [FR] 4001) and was subsequently listed as endangered under the Endangered Species Act of 1973, as amended. Critical habitat consisting of 11 caves (including Ray's Cave and Wyandotte Cave in Indiana) and two mines was established in 41 FR 41914 on September 24, 1976. A recovery plan was developed for the species in 1983 (USFWS 1983), and a draft revised version was prepared in April 2007 (USFWS 2007).

Indiana Bat
(*Myotis sodalis*)
Credit: R. Yeager
Lochmueller Group

4.1.2 Morphological Description

The Indiana bat is a small bat similar to the little brown bat in general appearance; however, it has a keel on the calcar, and small hind feet with sparse hairs on toes that do not extend beyond the claws. The fur is brownish gray, and hair around the nose is sparse, sometimes giving a pink look to the nose. The sagittal crest is narrower than in the little brown bat (Barbour and Davis 1969; Hall 1981). Total length ranges from 2.87 to 3.94 inches, and weight ranges from 0.21 to 0.39 ounce (Kurta 1995).

4.1.3 Range and Distribution

The Indiana bat range includes the eastern United States from Vermont to southern Wisconsin to eastern Oklahoma to northern Florida. USFWS (2007) reports that, based on winter 2005 surveys, there are 23 Priority 1 hibernacula in Illinois (1), Indiana (7), Kentucky (5), Missouri (6), New York (2), Tennessee (1), and West Virginia (1). In 2012, a new Priority 1 site was discovered in Missouri, bringing the total to 24. USFWS's biennial population estimate data from 1981 through 2015 indicate that the population experienced a low of 496,027 in 2001, with an apparent resurgence to 635,349 in 2007 (USFWS 2015). Possibly because of increased mortality resulting from white-nose syndrome (WNS), the population estimate declined to 523,636 in 2015. Based on the 2015 range-wide population estimate, Indiana (35 percent), Missouri (35 percent), Kentucky (13 percent), and Illinois (11 percent) provided hibernacula for 94 percent of the population in the winter range.

Thirty-four priority hibernacula exist in Indiana (USFWS 2007). Indiana populations seemingly increased slightly from estimates of 160,300 in 1965 to 238,068 in 2007; however, estimates before standardized surveys began in 1980 are unreliable (USFWS 2007). From 2007, populations have experienced a small decline to 226,572 in 2013 with a larger decline to 185,720 in 2015 (USFWS 2015). Redistribution of local winter populations from one cave to a

nearby cave over the span of a few years has been reported in some instances (USFWS 2006 unpublished data as referenced in USFWS 2009). Ray's Cave and Wyandotte Cave are critical habitat in Indiana.

A total of 269 summer maternity colonies have been documented in 16 states as of 2006, but this is considered to represent only a fraction of those that exist based on winter population estimates and average maternity colony size (USFWS 2007). Maternity colonies appear to be more abundant in the glaciated regions of the upper Midwest than in the unglaciated regions of the Midwest or the Mideast portion of the range (USFWS 2007).

4.1.4 Feeding

Indiana bats eat aquatic and terrestrial flying insects, benefiting people by consuming insects that are considered pests. Their role in insect control is remarkable, considering that they eat about half their body weight in insects each night. Examples of preferred prey include moths, beetles, midges, flies, wasps, stoneflies, flying ants, caddisflies, brown leafhoppers, treehoppers, lacewings, and weevils (Kiser and Elliott 1996; Murray and Kurta 2002; Whitaker 2004).

Some scientists believe that their population is declining today because of pesticide use, possibly through bioaccumulation from eating contaminated insects, drinking contaminated water or direct absorption of the chemicals while feeding in areas that have recently been treated (Mohr 1953; Schmidt et al. 2002; USFWS 2006, 2007).

4.1.5 Predation

Feral cats are potential predators in their hibernacula. They are also killed by natural predators such as snakes, owls, hawks, opossums, minks, and raccoons. They can also die from natural disasters such as flooding of caves, collapses in caves and mines, freezing in winter, and changes in climate and weather. Summer habitat deforestation from development activities by people can also result in direct bat deaths.

4.1.6 Winter Hibernation

In southern Indiana, winter hibernation in caves and mines generally occurs as late as November or December to as early as mid-March. Hall (1962) and LaVal and LaVal (1980) report hibernation typically from October to April, while Kurta et al. (1997) and Hicks (2004) extend hibernation from September to May in northern areas including New York, Vermont, and Michigan (USFWS 2007).

In 2005, 30 percent of the population was considered to hibernate in human-made hibernacula (mines, tunnels, dams) (USFWS 2006 unpublished data as referenced in USFWS 2009). Caves used by Indiana bats are well-ventilated (they usually have a chimney effect) and store large volumes of cool air with constant temperatures of 37.4 degrees Fahrenheit (°F) to 45°F (Tuttle and Kennedy 2002). Brack et al. (2003) observed that the highest concentrations of Indiana bats in Indiana hibernacula were found at sites with mid-winter temperatures of 42.8°F to 44.6°F. The Indiana bat is very sensitive to temperature changes and does not use caves that flood. It prefers caves that have domes, caverns, and diverse forms.

Hibernating bats form large, compact clusters with as many as 5,000 individuals, averaging 500 to 1,000 bats per cluster (USFWS 2004). The Pennsylvania Natural Heritage Program (n.d.) reported clusters with 250 bats per square foot, while the New York Department of Environmental Conservation (n.d.) reported more than 300 bats per square foot. Several

researchers have noted an inverse relationship between ambient roost temperature and the size of hibernating clusters (Brack et al. 1984; Clawson et al. 1980), as reported by USFWS (2007).

Bats go into deep hibernation (torpor) in winter but have the ability to arouse very quickly, which might be an adaptive mechanism for survival. During the hibernation period, bats arouse about once every 2 weeks and stay aroused for a short period of 1 to 2 hours (Reeder et al. 2012). Cumulative arousals throughout hibernation cause much of their stored fat energy to be metabolized and lost to the individual. The function of the arousal is not known for sure, but it might be to drink, exercise, or expel waste products. However, the purpose of arousal is not to feed.

Disturbances in the winter can be deleterious. Awakening these bats can deplete their fat reserves. For this reason, gates at the entrance or fences around these caves have been used as conservation measures. When huddled together (clustered), individuals on the perimeter of the group are more susceptible to freezing that those in the middle of the mass. Caves are most important in the survival of this species. During hibernation, bats cluster in large groups, and some winter hibernacula support from 20,000 to 50,000 bats or more.

4.1.7 Spring Staging

Spring staging generally occurs from mid-March to mid-May when males and females emerge from caves. They are hungry and thin after 3 to 4 or more months of hibernation. Indiana bats feed and congregate around these caves before migrating to their summer homes. Males usually stay near the hibernacula but might leave the area entirely (USFWS 2007). Indiana bats have been found to migrate 40 to 50 miles a day, with total distances of several hundred miles. One female released in southeastern New York moved 35 miles in about 85 minutes (Sanders et al. 2001), while one female bat released from Canoe Creek Mine in Pennsylvania traveled about 60 miles in one evening (Butchkoski and Turner 2005). Twelve female Indiana bats from maternity colonies in Michigan migrated an average of 296 miles to their hibernacula in Indiana and Kentucky, with a maximum migration of 357 miles (Winhold and Kurta 2006). Females usually migrate farther than males.

The females (as in other bat species) show delayed fertilization; that is, they mate with males in the fall and store sperm alive in pouches connected to the uterus. Upon an egg moving down into the uterus, sperm is discharged from these pockets and fertilizes the egg. The fertilized egg (embryo) then implants itself into the uterus. When females leave the cave, they are pregnant and ready to start a new generation in their summer woodland habitat.

4.1.8 Summer Habitat

Indiana bats occupy summer habitat from mid-May to mid-August. Females and males arrive at their summer habitat in May. Summer roosting sites include primarily dead trees with cavities and/or exfoliating bark or living trees with shaggy bark (for example, shagbark hickory). Larger trees are usually preferred over smaller trees because they provide an ample amount of solar radiation and protection from the wind and rain. Numerous studies indicate that Indiana bats exhibit site fidelity to their traditional summer maternity areas (Callahan et al. 1997; Gardner, Garner, and Hofmann 1991a, 1991b; Gardner, Hofmann, and Garner 1996; Humphrey et al. 1977; Whitaker and Sparks 2003; Whitaker et al. n.d.).

These nursery colonies often use several roost trees. Roost trees can be primary roost trees (emergence count greater than or equal to 30 bats) or alternate roost trees (emergence count less than 30 bats). Ideal primary roost trees are large trees with sloughing bark exposed to the sun where they secure themselves under the bark, in crevices, or in cavities during the day.

While at night, they are active feeding on insects and use the undersides of bridges on occasion as night roosts (Kiser et al. 2002). Most summer maternity colonies use large, dead trees (snags) or live trees near major streams in both bottomland and upland areas. Snags are standing dead trees and, in this report, include stage of decay classes 3 through 7 based on British Columbia's wildlife tree classification system (**Figure 6.2-1**).

A maternity colony can vary greatly in size (USFWS 2007) but typically consists of 25 to 325 adult females, averaging 80 adult females (Whitaker and Brack 2002). Although most documented maternity colonies had 100 or fewer adult females (Harvey 2002), as many as 384 bats have been reported emerging from one maternity roost tree in Indiana (Whitaker and Brack 2002).

Young are born between late June and early July. This process is called parturition, and the adult females lactate (produce milk) at that time. Females do not carry the young unless they need to move them and, under such conditions, they will carry them on their abdomen. The young become volant (able to fly) between early July and early August, at which time the adult females become non-reproductive. Most young are volant by mid-July. Males might form bachelor colonies during the summer.

4.1.9 Fall Swarming

Fall swarming generally occurs mid-August to November. With the onset of fall and cooler temperatures, males return to the caves. They are at the entrances to the caves when the females and young arrive. Males then mate with females. Swarming is a milling of the bats around and out of the cave entrance. It might have several functions, but one seems to be to bring the sexes together for mating. It is not known whether juvenile females mate their first autumn. Limited mating might occur in the spring and in the cave during winter (Hall 1962).

Members of both sexes feed and gain weight through the fall, thus putting on the fat (energy) needed to help them through hibernation. LaVal and LaVal (1980) found females to reach maximum weight in early October, while the males reached maximum weight in late October. The males follow the females into hibernation, and both sexes stay in the cave when outside temperatures trend toward freezing. The Indiana dunes do not have caves or winter hibernacula suitable for the Indiana bat.

4.1.10 Cumulative Impacts

Under Section 4(a)(1) of the Endangered Species Act (16 United States Code 1533) and its implementing regulations at 50 Code of Federal Regulations Part 424, USFWS has the authority to list a species based on any of the following five factors: "(A) present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors affecting its continued existence."

Cumulative impacts resulting from human disturbances at winter hibernacula, summer and winter habitat loss, wind farm fatalities, and WNS are threats to the species and chief factors for population declines. However, in recent years, WNS and wind farms have been considered the primary causes of death for Indiana bats (Boyles et al. 2011).

WNS is a disease caused by the cold-adaptive fungus *Pseudogymnoascus destructans* (formerly called *Geomyces destructans*) that affects bats during winter hibernation. It was first reported in 2006 in New York. Since then, USFWS estimates that at least 5.7 million to

6.7 million bats have died from WNS (USFWS 2012). The disease originally spread south along the Appalachian Mountains and north into Canada; then westward into Tennessee, Missouri, and Iowa in the south, and Canada in the north. WNS was first reported in Indiana in January 2011.

It takes some time for the fungus to attach to the skin of the bat, but once embedded into the epidermis, it causes open sores (lesions) in the epidermis and dermis in especially bare areas like the nose, forearms, and wings. If the bat survives, such lesions heal as scars. The fungus grows in temperatures of 39.2°F to 68.0°F (*Chaturvedi* et al. 2010). The upper critical temperature for growth is between 66.2°F and 67.6°F, with temperatures above 53.6°F displaying atypical morphology in the fungus that might have implications in its proliferation (Verant et al. 2012).

Bats usually come into hibernation with extra grams of fat, the majority of which is used in arousals. The remaining grams of fat are needed to sustain bats through the duration of hibernation. Fungal lesions caused by *Pseudogymnoascus destructans* cause the bat to become more active and waste critical energy reserves. When this happens, bats might leave the cave in winter in search of food, and ultimately die in or out of the cave from starvation. This is one theory for the many deaths from WNS.

Wind farms (becoming more prevalent in the landscape) are also reported to kill many bats. Most such losses affect bats that migrate long distances, such as the hoary bat (*Lasiurus cinereus*), eastern red bat (*Lasiurus borealis*), and silver-haired bat (*Lasionycteris noctivagans*). However, an Indiana bat was killed at the Fowler Ridge Wind Farm in Benton County, Indiana, in about September 2009 (Johnson et al. 2010). Bat deaths from WNS and wind farms might lower the Indiana bat population.

Boyles et al. (2011) reported that the loss of some 1 million bats equates to about 660 to 1,320 metric tons of insects not being consumed each year in WNS-affected areas. Farmers would need to offset such losses by investing more money to control insect infestations. Boyles et al. reported that between $3.7 billion per year and $53.0 billion per year ($22.9 billion per year average) would be needed to control unwanted agricultural insect pests. This equates to a most-likely scenario of an additional $74 per acre that farmers would need to spend on pesticides.

4.2 Northern Long-eared Bat

4.2.1 Status

The northern long-eared bat was first recognized as a distinct species instead of a subspecies of Keen's long-eared myotis (*Myotis keenii*) by van Zyll de Jong (1985) in 1979 based on geographic separation and morphological characteristics (78 FR 61051). On October 2, 2013, USFWS published a proposed rule (78 FR 61046) to list the northern long-eared bat as endangered. Subsequently, a proposed species-specific rule under Section 4(d) of the Endangered Species Act was published on January 15, 2015 (80 FR 2371), to list the species as threatened. On April 2, 2015, USFWS published the final rule listing the species as threatened with an Interim 4(d) Rule (80 FR 17974). The listing became effective on May 4, 2015.

Northern long-eared bat (*Myotis septentrionalis*)
Credit: R. Yeager Lochmueller Group

4.2.2 Morphological Description

The northern long-eared bat is a medium-sized bat, the most distinguishing characteristic being its long ear and long, narrow, pointed tragus (Kurta 1995; Whitaker et al. n.d.). Fur is typically light to dark brown with a yellowish venter. Size and weight are generally consistent with the little brown and Indiana bats, although the northern long-eared bat tends to be slightly smaller on average (Kurta 1995).

4.2.3 Range and Distribution

The species' range includes the eastern and north-central United States and all Canadian provinces west to the southern Yukon Territory and eastern British Columbia. In the United States, it includes 39 states from Maine west to Montana, south to eastern Kansas, eastern Oklahoma, Arkansas, and east to northern Florida. It was more commonly observed in the northeastern portion of its U.S. range than in the southern and western regions (Amelon and Burhans 2006; Caceres and Barclay 2000). Within this range, more than 780 hibernacula have been identified in 27 states, more than 60 percent of which are in Pennsylvania, Missouri, West Virginia, Michigan, and Kentucky (Whitaker and Hamilton 1998). Twenty-five hibernacula have been documented in Indiana (80 FR 17974).

The U.S. range has been divided into four populations (eastern, Midwest, southern, and western), although these are not considered isolated populations from each other (78 FR 61052). It is less common in the southern and western portions of the range, but is fairly common in the Midwest population area (Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin). Although Indiana has fewer known hibernacula than most of the other states that make up the Midwest population, the northern long-eared bat has historically been considered the fourth- or fifth-most-abundant species statewide and the most frequently captured at mine entrances.

USFWS compared captures of a 3-year survey conducted in northern Indiana (King 1993) and a three-summer survey in south-central Indiana (Sheets et al. 2013). In the former, only 4 percent of the captures were northern long-eared bats, versus 38 percent in the latter. These results suggest that habitat abundance or other environmental conditions are more favorable in the southern portion of the state. Range-wide or Indiana population estimates have not been generated by USFWS.

4.2.4 Feeding

The northern long-eared bat has a diverse diet including moths, flies, leafhoppers, caddisflies, spiders, and beetles, with diet composition differing geographically and seasonally (Brack and Whitaker 2001). The most common insects found in the diets of northern long-eared bats are moths and beetles (Brack and Whitaker 2001; Feldhamer et al. 2009), with spiders also being a common prey item (Feldhamer et al. 2009). Foraging techniques include hawking (catching insects in flight) and gleaning (picking insects off stationary features such as leaves or branches) in conjunction with passive acoustic cues (Nagorsen and Brigham 1993; Ratcliffe and Dawson 2003). Gleaning allows this species to gain a foraging advantage for preying on moths because moths are less able to detect high-frequency echolocation calls (Faure et al. 1993). Present in their feces are spiders, other non-flying insects, and green plant material, which suggest considerable gleaning behavior.

The northern long-eared bat has a very high-frequency call. Emerging at dusk, most hunting occurs above the understory, 3 to 10 feet above the ground, but under the canopy (Nagorsen and Brigham 1993) on forested hillsides and ridges rather than along riparian areas (Brack and

Whitaker 2001; LaVal et al. 1977). This coincides with data indicating that mature forests are important habitat for foraging for this species (Caceres and Pybus 1997).

4.2.5 Winter Hibernation

Caves and mines are used by the northern long-eared bat in winter. Hibernacula used are typically large, with large passages and entrances, relatively constant and cooler temperatures, high humidity, and no air currents. The sites favored by them are often in very high-humidity areas, to such a large degree that droplets of water are often observed on their fur. They are typically found roosting in small crevices or cracks in cave or mine walls and can often be overlooked in surveys. To a lesser extent, they have been found overwintering in habitats that resemble caves or mines, habitats such as abandoned railroad tunnels and storm sewers (Goehring 1954), hydroelectric dams (Kurta and Teramino 1994), aqueducts (French 2012), or other “unsuspected retreats” where caves and mines are not present.

Northern long-eared bats have shown a high degree of philopatry (using the same site multiple years) for a hibernaculum. Other species in Indiana that commonly occupy the same hibernacula with the northern long-eared bat are the little brown bat (*Myotis lucifigus*), big brown bat (*Eptesicus fuscus*), tri-colored bat (*Perimyotis subflavus*), and Indiana bat. Northern long-eared bats often move between hibernacula throughout the winter, which might further decrease population estimates. Similarly, this species has been found to fly in and out of some of the mines and caves in southern Indiana throughout the winter (Whitaker and Mumford 2009).

4.2.6 Spring Staging

Both females and males emerge from caves and mines in spring. Northern long-eared bats exhibit significant weight loss during hibernation. One Indiana study showed a 41 percent to 43 percent loss (Whitaker and Hamilton 1998). During staging, northern long-eared bats fly in and out of caves to feed and congregate before migrating to their summer homes.

The northern long-eared bat is not considered a long-distance migratory species. Short migratory movements between summer roosts and winter hibernacula are typically between 35 and 55 miles (Griffin 1945; Nagorsen and Brigham 1993). However, movements can range from 5 to 168 miles (Griffin 1945).

When females leave the cave, they are pregnant and ready to start a new generation in their summer woodland habitat. Gestation is about 60 days (van Zyll de Jong 1985). Males are reproductively inactive until late July, with testes descending in most males during August and September (Amelon and Burhans 2006; Caire et al. 1979).

4.2.7 Summer Habitat

During the summer, northern long-eared bats typically roost singly or in colonies underneath bark or in cavities or crevices of both live trees and snags. Snags are standing dead trees and, in this report, include stage of decay classes 3 through 7 based on the British Columbia’s wildlife tree classification system (**Figure 6.2-1**). Males’ and non-reproductive females’ summer roost sites can also include cooler locations such as caves and mines (Barbour and Davis 1969). They also have been found roosting in human-made structures such as buildings, barns, a park pavilion, sheds, cabins, under eaves of buildings, behind window shutters, and in bat houses (Amelon and Burhans 2006; Barbour and Davis 1969; Cope and Humphrey 1972; Kath, personal communication, April 9, 2013; Mumford and Cope 1964; Timpone et al. 2010; Whitaker and Mumford 2009). This species appears to be somewhat opportunistic in roost selection. Canopy cover at northern long-eared bat roosts has ranged from 56 percent

(Timpone et al. 2010) to greater than 84 percent (Lacki and Schwierjohann 2001). Females tend to roost in more-open areas than males, likely because of the increased solar radiation, which aids in pup development (Perry and Thill 2007). Roosts are also largely selected below the canopy, which could be attributable to the species' ability to exploit roosts in cluttered environments; their gleaning behavior suggests an ability to easily maneuver around obstacles (Foster and Kurta 1999; Menzel et al. 2002).

One study found that northern long-eared bats roost more often on upper and middle slopes than on lower slopes, suggesting a preference for higher elevations because of increased solar heating (Lacki and Schwierjohann 2001). Northern long-eared bats switch roosts often (Sasse and Pekins 1996), typically every 2 to 3 days (Carter and Feldhamer 2005; Foster and Kurta 1999; Owen et al. 2002; Timpone et al. 2010). Reasons for switching might be temperature, precipitation, predation, parasitism, and ephemeral roost sites (Carter and Feldhamer 2005).

The northern long-eared bat is comparable to the Indiana bat in terms of summer roost selection, but appears to be more opportunistic (Carter and Feldhamer 2005; Timpone et al. 2010). A small amount of overlap in roost selection might occur between these two species (Foster and Kurta 1999; Timpone et al. 2010). Maternity colonies, consisting of females and young, are generally small, numbering from about 30 (Whitaker and Mumford 2009) to 60 individuals (Caceres and Barclay 2000). Adult females give birth to a single pup. Birth likely occurs in late May or early June (Caire et al. 1979; Easterla 1968; Whitaker and Mumford 2009) but can occur as late as July (Whitaker and Mumford 2009). Juvenile volancy occurs by 21 days after birth (Krochmal and Sparks 2007; Kunz 1971). Adult longevity is estimated to be up to 18.5 years (Hall et al. 1957), with the greatest recorded age of 19 years (Kurta 1995).

4.2.8 Fall Swarming

With the onset of fall and cooler temperatures, males return to the caves. They are at the entrances when females and young arrive. Elevated hormone levels trigger males to mate with females. Hibernating females store sperm until spring, exhibiting delayed fertilization (amphigonia retardata). Swarming might have several functions, but one seems to be to bring the sexes together for mating. Members of both sexes feed and gain weight through the fall, thus putting on fat (energy) to help them survive hibernation. It is unknown whether juvenile females mate their first autumn. Limited mating might occur in the cave in winter and might even occur in the spring. When temperatures are 50°F or less, the bats start to stay inside caves. The Indiana dunes do not have caves or winter hibernacula suitable for the northern long-eared bat.

4.2.9 Cumulative Impacts

As stated in **Section 4.1.10** for the Indiana bat, USFWS has the authority to list a species based on any of five factors. No other threat is as severe and immediate to the northern long-eared bat's persistence as WNS, although habitat loss continues to be a contributing factor and a potential limiting factor in its potential for recovery.

5 Phase 1 Initial Project Screening Process

5.1 USFWS Coordination Regarding Known Occurrences (Step 1)

Step 1 of the Phase 1 Initial Project Screening process involves coordination with the USFWS to determine whether the Project is located in an Indiana bat or northern long-eared bat maternity colony home range or whether there are any known summer occurrences (that is, roost trees, bat captures, and/or foraging habitats) previously identified in the Project Area. The November 4, 2014, coordination response from the USFWS Northern Indiana Suboffice stated that “none of the Lake County listed species are known within the West Lake Corridor Project Study Area” (**Appendix A**).

5.2 Indiana and Northern Long-eared Bat Habitat Assessment (Step 2)

In accordance with Step 2 of the Phase 1 Initial Project Screening process, a habitat assessment was conducted in May 2017 within the environmental survey area designated for the Project. **Chapter 6** discusses the process used to evaluate whether potential bat habitat exists in the investigation area.

5.3 Assessment of Potential for Adverse Effects on Indiana Bats and Northern Long-eared Bats (Step 3)

In accordance with Step 3 of the Phase 1 Initial Project Screening process, **Chapter 7** summarizes the findings of the bat habitat suitability evaluation and quantifies the potential loss of such habitat.

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6 Phase 1 Bat Habitat Assessment Methodology

The bat habitat assessment (Step 2) included three tasks:

- Desktop and field reconnaissance review to determine potential bat roosting habitat locations
- On-site evaluation of potential bat habitat areas identified through desktop review
- Characterization of woodland habitat in the investigation area using tree inventory plot data collected at representative locations

6.1 Desktop and Field Reconnaissance Review

Using geographic information systems (GIS) software, the Project team superimposed the environmental survey area onto aerial photographs. All areas that exhibited woodland signatures within the boundary were regarded as potential bat roosting habitat locations that warranted on-site field evaluations to determine whether bat habitat elements were present. Google Earth's street view and later on-site field reconnaissance visits were used to substantiate the desktop review.

From this review, about 20 acres of woodland habitat were identified within the environmental survey area. In general, many of the woodland habitat locations within the environmental survey area were narrow strips of woodland along the abandoned Monon railroad corridor between 45th Street and Douglas Street. The two largest woodland areas were north of I-80: between I-80 and the Hammond water tower and between 173rd and 169th Streets.

The woodland habitat within the environmental survey area was divided into 13 woodland habitat units (B01 through B13) for the field assessment based on geographic position. Typically, each woodland habitat unit was a separate area of continuous woodland within the environmental survey area; however, in one instance (woodland habitat unit B09), two separate woodlands were aggregated. The locations of the individual woodland habitat units are shown on the 18 Bat Habitat Assessment Map and Candidate Root Evaluation Location maps in **Appendix B**.

6.2 Field Habitat Assessment for Indiana Bat and Northern Long-eared Bat

The Project team conducted the on-site bat habitat assessment within the environmental survey area on April 28; May 1, 2, 3, 9, and 10; and June 19, 2017, in accordance with the guidelines in Appendix A of the *2016 Range-Wide Indiana Bat Summer Survey Guidelines* (USFWS 2016). The assessment used the Indiana Bat Habitat Assessment Data Sheet (**Appendix C**) to evaluate 13 woodland habitat units for suitable bat habitat. As part of the evaluation for each woodland habitat unit, individual potential candidate roost trees (typically dead snags or live trees with anomalies suitable for use as roosts) were located, documented, and photographed. Most of the woodland habitat within the environmental survey area was in the form of narrow, disturbed habitat along, or associated with, the abandoned Monon railroad corridor.

The objective of the candidate roost inventory was not to document every potential roost tree with a diameter at breast height (dbh) greater than 6 inches. Instead, the objective was to

identify the most probable live, damaged live, or dead snag roost trees in the woodland habitat units and evaluate their potential to serve as bat roost trees based on tree characteristics (that is, exfoliating bark, cavities, and crevices) and landscape setting (that is, nearby water resources, solar exposure, and extent of human-made intrusions in the immediate surrounding area). For each candidate roost, data were collected on the species (if determinable), diameter at breast height (in centimeters), stage of decay, and determination of likelihood for use as a bat roost.

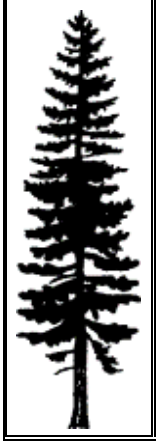
Individual tree diameters were measured using a metric diameter tape. The stage of decay classification was based on British Columbia's wildlife tree classification system (**Figure 6.2-1**). This nine-stage classification system is routinely used by USFWS for assessing the state of roost trees used by bats and is included in the USFWS Region 3 2016 v.3 data reporting form.

The roost potential likelihood was qualitatively rated using three classifications (no/low, moderate, and good) based on the Project team's direct observations and professional experience.

- Stage 3 trees with no bark, cavities, or crevices, and Stage 5 trees that were clean of bark with no cavities or crevices and trees with minor damage, very little exfoliating bark, and surrounded by dense vegetation restricting access, were assigned a roost potential rating of no/low.
- Stage 3 and 4 trees with multiple patches of exfoliating bark or notable anomalies that offer good cover with good access (that is, edge of woodland) were assigned a rating of moderate.
- Stage 4 trees with extensive exfoliating bark, optimal solar exposure, and good access were assigned a rating of good.

Based on the presence, number, quality, and landscape setting of potential roost trees identified in each woodland habitat unit, the woodland habitat unit was also assigned a rating of no potential, low potential, moderate potential, or good potential to qualitatively describe the woodland unit's potential suitability as habitat for Indiana bats and/or northern long-eared bats.

Figure 6.2-1: British Columbia's Wildlife Tree Classification System

LIVE		DEAD					DEAD FALLEN	
Decay Class								
1	2	3	4	5	6	7	8	9
					approx. 2/3 original height 	approx. 1/2 original height 	approx. 1/3 original height 	
Description								
Live/healthy; no decay; tree has valuable habitat characteristics such as large, clustered, or gnarled branches or horizontal, thickly moss-covered branches.*	**Live/unhealthy;** internal decay or growth deformities (including insect damage, broken tops); dying tree.*	**Dead;** needles or twigs may be present; roots sound.	**Dead;** no needles/twigs; 50% of branches lost; loose bark; top usually broken; roots stable.	**Dead;** most branches/bark absent; some internal decay; roots of larger trees stable.	**Dead;** no branches or bark; sapwood/ heartwood sloughing from upper bole; decay more advanced; lateral roots of larger trees softening; smaller ones unstable.	**Dead;** extensive internal decay; outer shell may be hard; lateral roots completely decomposed; hollow or nearly hollow shells.		**Debris;** downed trees or stumps.
* This classification system does not recognize root disease trees specifically. Such trees become unstable at or before death.								

Source: British Columbia Ministry of Forests (n.d.)

6.3 Woodland Characterization Survey

The objective of the woodland habitat characterization survey was to provide a general description of the more notable woodland habitats within the environmental survey area in terms of species composition and size class. To accomplish this, the Project team used a tree count inventory to survey about 20 percent or more of the woodland habitat identified in the environmental survey area. From previous experience and coordination with USFWS in conducting woodland habitat characterizations for bat habitat, the Project team considered sampling 10 percent or more of each woodland habitat area potentially affected to provide suitable data regarding species composition, size classes, and snag density for habitat characterization. Woodland characterization was not conducted for the numerous narrow, linear tree row features along the old, abandoned Monon railroad tracks and the current Monon Trail.

For survey plots F1 and F2 north of 173rd Street, a linear tract of woodland habitat parallel to the proposed alignment was marked in the field, and all trees with a diameter at breast height equal to or greater than 6 inches from the western woodland edge to the eastern property

boundary were included in the inventory tally. For survey plot F3, trees were identified in an irregularly shaped polygon, and the boundary was generally delineated using a handheld global positioning system (GPS) device. Data collected for each inventoried tree included the species name, diameter at breast height (in centimeters), and stage of decay. The stage of decay classification was based on British Columbia's wildlife tree classification system (**Figure 6.2-1**).

7 Phase 1 Bat Habitat Assessment Results

Under the No Build Alternative, no adverse permanent or temporary impacts on the Indiana bat and northern long-eared bat as a result of the Project.The following sections summarize the summer habitat potential for the Indiana bat and northern long-eared bat within the FEIS preferred alternative environmental survey area. From the field investigation, no potential winter habitat (that is, caves or mines) were observed in the Project Area or immediate vicinity. Any resident Indiana bats or northern long-eared bats that might occur in the summer are likely to migrate away from the Project Area for winter hibernation.

7.1 Phase 1 Habitat Assessment for Indiana Bat and Northern Long-eared Bat

The Project team conducted the Phase 1 bat habitat assessment of 13 woodland habitat units identified within the environmental survey area on April 28; May 1, 2, 3, 9, and 10; and June 19, 2017. **Appendix B** includes maps of the woodland habitat units and candidate roost trees. Indiana Bat Habitat Assessment Data Sheets for these evaluated habitats are included in **Appendix C**. **Appendix D** contains a data table for the individual candidate roosts, compiled by woodland habitat unit identifier (ID). **Appendix E** contains a summary table of the 13 woodland habitat units, including the dominant tree composition, candidate roost summary, woodland habitat unit roost potential rating, and area of woodland habitat unit within the environmental survey area and the Project footprint. **Appendix F** includes representative photographs of the woodland habitat units.

The 13 woodland habitat units identified totaled about 23.27 acres within the environmental suvey area. Within this area, 50 candidate trees were evaluated for their potential to serve as roosts for Indiana bats or northern long-eared bats. Forty-five of these trees were considered to have no/low potential because they lacked suitable tree characteristics and/or exhibited poor surrounding environmental conditions. The remaining five candidate trees were rated as having moderate potential based on the presence of notable exfoliating bark or tree damage conducive to providing shelter for bats.

Bat habitat unit B01 is a 1.83-acre tree-lined ditch area within the environmental survey area immediately west of the CSX railroad track (milepost [MP] 61.40 to MP 61.54). It consists of an east-west ditch and north-south ditch component bordering an agricultural field located between two subdivision developments. Dominant trees included silver maple (*Acer saccharinum*), black willow (*Salix nigra*), eastern cottonwood, and boxelder (*Acer negundo*). Only one willow with no/low roost potential was documented. This area is not considered to be suitable Indiana bat and/or northern long-eared bat habitat because of its environmental setting, isolation from water resources, and lack of connectivity with more-suitable habitat.

Bat habitat unit B02 is a 1.35-acre tract of planted and volunteer trees east of the CSX railroad track and west of Hartsfield Village (MP 61.91 to MP 62.07). Dominant trees included Norway spruce (*Picea abies*), honey locust (*Gleditsia tricanthos*), red cedar (*Juniperus virginiana*), white mulberry (*Morus alba*), eastern cottonwood, Bradford pear (*Pyrus calleryana*), and Siberian elm (*Ulmus pumila*). No potential candidate roost trees were documented from this location.

Bat habitat unit B03 is a 0.71-acre tract of disturbed trees and shrubby growth associated with the abandoned Monon railroad corridor north of 45th Street and south of the CN railroad tracks (MP 62.85 to MP 62.95). Dominant trees included eastern cottonwood and silver maple. This

area is surrounded by commercial and industrial development. Although there were a few large cottonwood trees in this tract, no potential candidate roost trees were documented.

Bat habitat unit B04 is a 0.50-acre narrow, tree-lined ditch located north of the CN railroad tracks along the eastern edge of the Lansing Country Club golf course and west of the Northern Indiana Public Service Company (NIPSCO) power substation (MP 62.98 to MP 62.22). This area had recently been heavily disturbed, including large-scale tree clearing, for an unspecified purpose. The remnant tree cover that remains along this ditch (black willow, white mulberry, and eastern cottonwood) lacked any potential candidate roost trees.

Bat habitat unit B05 is a 0.54-acre portion of a larger but isolated wooded wetland along the west side of the abandoned Monon railroad corridor and south of Fisher Street (MP 63.25 to MP 63.38). This area has high-density growth of European buckthorn (*Frangula alnus*) with some large eastern cottonwoods and willows. However, the subcanopy is considered to be too dense for bat flight, and there were no upper-canopy trees assessed to be suitable roosts.

Bat habitat unit B06 is a 2.56-acre long, narrow strip of woodland along the abandoned Monon railroad corridor between Fisher Street and Ridge Road (MP 63.41 to MP 64.08). Single-family residences and apartments are immediately to the west, and the Monon Trail and additional residences are immediately to the east. Silver maple, honey locust, Siberian elm, American elm, (*Ulmus americana*), black walnut (*Juglans nigra*), tree-of-heaven (*Ailanthus altissima*), and ash (*Fraxinus* sp.) were the common canopy and subcanopy trees. A single willow with “no/low” potential for bat roosting was documented; however, this area is not considered to be suitable Indiana bat and/or northern long-eared bat habitat because of its urban, congested environmental setting and lack of access to water and connecting flight corridors.

Bat habitat unit B07 is a 0.97-acre long, narrow strip of woodland along the abandoned Monon railroad corridor between Ridge Road and Broadmoor Avenue (MP 64.16 to MP 64.41). Single-family residences and apartments are immediately to the east, and the Monon Trail, Manor Avenue, and residences are to the immediate west. Six Stage 2 and 3 no/low-potential roost trees (cottonwood, boxelder, black walnut, and unknown) were documented in this tract. However, the area is not considered to be suitable Indiana bat and/or northern long-eared bat habitat because of its urban, congested environmental setting and lack of access to water and connecting flight corridors.

Bat habitat unit B08 is a 1.85-acre long, narrow strip of woodland along the abandoned Monon railroad corridor between Broadmoor Avenue and the Little Calumet River (MP 64.43 to MP 64.88). Throughout most of its length, residential neighborhoods are immediately adjacent to this strip; however, the east side of the northern end is exposed to an open field that is adjacent to the Little Calumet River. This area consisted mostly of sugar maple (*Acer saccharum*), tree-of-heaven, hackberry (*Celtis occidentalis*), red oak (*Quercus rubra*), burr oak (*Quercus macrocarpa*), Siberian elm, and ash. There were eight Stage 3 and 4 snags, one of which is considered to have moderate roost potential, located in or near a small wetland along the eastern side of the abandoned Monon railroad corridor. Because of the presence of a moderate potential roost and the close proximity to the Little Calumet River, which could serve as a flight and foraging corridor for Indiana and/or northern long-eared bats, this area was rated as having low bat habitat potential.

Bat habitat unit B09 is a 6.25-acre area of woodland north of I-80 that consists of a smaller 0.89-acre tract and a 5.36-acre tract separated by an unimproved access road (MP 65.06 to MP 65.30). Habitat unit B09 consists mostly of Siberian elm, eastern cottonwood, green ash (*Fraxinus pennsylvanica*), American elm, tree-of-heaven, black walnut, black willow, and silver maple, and much of the understory is dense with nonnative white mulberry and honeysuckle

bush (*Lonicera* sp.).The southern end of the larger tract supports a seasonally flooded forested wetland. Additionally, an emergent wetland dominated by common reed borders the woodland on the west. Although this woodland is mostly isolated by residential land to the east and west, as well as the Monon Trail, there is a tentative connection with the Little Calumet River to the southwest. A total of 13 potential candidate roosts were evaluated in this woodland, three of which (elm, boxelder, and tree-of-heaven) were rated as moderate potential. Although a few moderate-potential roosts were observed, this woodland is considered to have low potential for Indiana bat and/or northern long-eared bat habitat because of the dense subcanopy cover and urban landscape setting.

Bat habitat unit B10 is a narrow, 0.88-acre strip of wetland woodland east of Lyman Avenue and north of 173rd Street (MP 65.43 to MP 65.53). The immediate surrounding land use is grass-dominated green-space habitat that is periodically mowed, beyond which are high-density residential neighborhoods. This woodland is dominated by eastern cottonwood, black walnut, black willow, silver maple, green ash, and boxelder. Four Stage 2 and 3 potential roosts (green ash, boxelder, willow, and unknown) rated as low were documented for this small woodland tract. Although this represents forested wetland woodland habitat, because of the lack of moderate- or good-quality roost trees, this area is considered to have no potential for Indiana bat and/or northern long-eared bat habitat.

Bat habitat unit B11 is a 4.68-acre tract of woodland east of Lyman Avenue between 173rd Street and 169th Street (MP 65.50 to MP 65.90) just north of unit B10. The immediate surrounding land use is grass-dominated green-space habitat that is periodically mowed, beyond which are high-density residential neighborhoods. This mesic woodland with isolated wet patches is dominated by eastern cottonwood, green ash, boxelder, and tree-of-heaven. A narrow unimproved trail, which runs south to north near the western edge, could serve as a flyway. Sixteen Stage 1 through Stage 5 potential roosts (15 no/low potential, 1 moderate potential) were documented in this woodland, although additional no/low-rated trees are likely present. Despite the urban landscape setting, this woodland is considered to have low potential for Indiana bat and/or northern long-eared bat occupancy because of the number of no/low-potential roosts, the presence of a moderate-potential roost, and the fragmented connection via units B11 and B10 to the Little Calumet River.

Bat habitat unit B12 is a narrow, 0.99-acre strip of woodland between the Monon Trail and the Erie Lackawanna Trail just south of Douglas Street (MP 67.55 to MP 67.73). Surrounding land uses consist of residential and commercial property to the west along Lyman Avenue and apartments east of the Erie Lackawanna Trail. Eastern cottonwood, black walnut, Siberian elm, boxelder, white mulberry, and silver maple are the principal trees and shrubs of this area. No potential candidate roost trees were documented in this unit.

Bat habitat unit B13 is a very narrow, 0.17-acre strip of riparian cover along the north bank of the Grand Calumet River between Hohman Avenue and the Norfolk Southern (NS) Railroad tracks (MP.67.55 to MP 68.48). Surrounding land uses are a property for a large container-transport company to the north and the Northern Indiana Public Service Company utility property, which lacks trees or shrubs, to the south. Tree/shrub composition is boxelder, tree-of-heaven, and white mulberry. Storage containers are located immediately adjacent to the tree-and-shrub-covered bank to the north. The narrow band of trees along the north bank is less than 50 feet wide and does not support any potential roost trees.

Table 7.1-1 summarizes the Indiana bat and northern long-eared bat habitat suitability for the woodland habitat units identified within the environmental survey area for the Project. From this assessment, about 8.21 acres from three woodland habitat units (B03, B09, and B11) are rated as having low potential for bat roosting habitat within the Project footprint. However, because of the urban development setting of the surrounding landscape, the Project team considers these areas to be of very low quality for use by these species.

Table 7.1-1: Summary of Woodland Habitat Unit Suitability for Indiana Bat and Northern Long-eared Bat

Habitat Unit Suitability	Woodland Habitat Unit	Project Footprint			Quality of Candidate Roost Trees		
		Permanent (acres)	Temporary (acres)	Total (acres)	No/Low	Moderate	Good
No Potential	B01	1.64	0.00	6.78	1		
	B02	0.67	0.67				
	B03	0.24	0.06				
	B04	0.31	0.00				
	B05	0.01	0.07				
	B06	2.23	0.00		1		
	B07	0.71	0.00		6		
	B10	0.00	0.00		4		
	B12	0.87	0.00				
	B13	0.10	0.00				
Low Potential	B08	1.69	0.00	8.21	8	1	
	B09	4.25	0.00		10	3	
	B11	2.27	0.00		15	1	
Total		**14.99**	**0.80**	**15.79**	**45**	**5**	**0**

Source: Lochmueller Group 2017.

7.2 Woodland Characterization

Three woodland plots ranging in size from 0.30 to 1.30 acre were inventoried for all tree species with a diameter at breast height greater than or equal to 6 inches. **Appendix G** includes data regarding the counts for each species by size class and the stage-of-decay classification for each species. These woodland plots generally represent 20 percent of habitat unit H21 (forest plot F3), 43 percent of habitat unit H24 south (forest plot F2), and 26 percent of habitat unit H24north (forest plot F1) within the environmental survey area.

Note that the composition, density, and size mix of trees can vary throughout these woodland habitats; therefore, the sample data might not represent the entire woodland tract within which the inventory was conducted. Because the woodland plots vary in size, the count data were extrapolated to a density-per-acre metric for comparison. **Table 7.2-1** summarizes the data results in trees per acre.

Table 7.2-1: Summary of Woodland Characterization Plot Data

Plot ID	Number of Species	Size Class Distribution (trees per acre)				Stage of Decay (see Figure 6.2-1) (trees per acre)					
		6 to <9 Inches	9 to <18 Inches	≥18 Inches	Total	1	2	3	4	5	6
F1	10	80	81	23	184	153	12	11	3	3	2
F2	9	123	109	7	239	216	7	3	3	0	10
F3	10	53	53	7	113	97	12	2	2	0	0

Source: Lochmueller Group 2017.

In general, overall tree density for stems with a diameter at breast height greater than or equal to 6 inches ranged from 113 per acre for plot F3 (habitat unit H21) to 239 per acre for plot F2 (habitat unit H24south).

All three plots exhibited similar diversity, with 9 to 10 species with a diameter at breast height greater than 6 inches. About 87 percent of the trees were live, healthy Stage 1 individuals. Stage 2 and 3 trees made up 6 and 3 percent, respectively, with the remainder being a few Stage 4, 5, or 6 individuals.

Table 7.2-2 summarizes the most abundant and dominant canopy species in each surveyed plot. Abundant and dominant tree species were generally similar for each area surveyed, with Siberian elm, eastern cottonwood, green ash, black willow, and white mulberry collectively being the most abundant. Siberian elm and eastern cottonwood were the most pervasive of the upper-canopy species for the survey areas.

Table 7.2-2: Summary of Most Abundant and Dominant Canopy Species for Woodland Plots

Plot ID	Most Abundant Trees	Dominant Canopy Trees
F1	Siberian elm, eastern cottonwood	Eastern cottonwood, Siberian elm
F2	Eastern cottonwood, black willow, white mulberry	Eastern cottonwood
F3	Siberian elm, eastern cottonwood, green ash	Eastern cottonwood, Siberian elm

Source: Lochmueller Group 2017.

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8 Mitigation

8.1 Long-term Operating Effects

The No Build Alternative would not result in any direct impacts on the Indiana, northern long-eared bat, or woodland habitat and, therefore, would not require mitigation.

Under the FEIS Preferred Alternative only candidate roost trees showing no or low potential for bats would be cleared. To mitigate the loss of trees as a result of construction of the Project, NICTD would continue to coordinate with INDNR regarding the appropriate mitigation for tree replacement. NICTD would consult INDNR's tree replacement guidelines.

8.2 Short-term Construction Impacts

Under the No Build Alternative, no adverse permanent or temporary impacts on the Indiana bat or the northern long-eared bat would occur since the Project would not be built.

Under the FEIS Preferred Alternative, construction impacts would include removal of 15.79 acres of woodland habitat.

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9 Conclusion and Recommendation

NICTD proposes construction of a new transit rail line (West Lake) from the town of Dyer north to Hammond, Indiana, where the rail line would connect with a realigned segment of the SSL. In addition to the new rail line, stations with parking are proposed at Dyer, Munster, and two locations in Hammond, including the Hammond Gateway station and maintenance facility.

Of the 13 woodland habitat units designated in the Project Area, three units (B08, B09, and B11) are rated as having a low potential to support roosting habitat for Indiana bat and/or northern long-eared bats based on the presence of moderate-potential roost trees and relative proximity to the Little Calumet River.

- Woodland unit B08 is immediately south of the Little Calumet River.
- Woodland unit B09 is north of I-80 and the Little Calumet River where the woodland would require clearing for parking at the proposed South Hammond station.
- Woodland unit B11 is between 173rd Street and 169th Street where some tree clearing would be required for the South Hammond station.

Although bats' roosting in the dead snags in these areas is conceivable, bats of these species, if in the area, are far more likely to select roosting habitat in the higher-quality habitats outside this urban environment. The remaining woodland habitat units were considered to have no potential to support either species because of their lack of moderate- or good-quality roosts and the immediate surrounding urban landscape. In each of these locations, the woodland habitat was small, narrow strips along either the CSX railroad tracks south of the NS railroad tracks or along the abandoned Monon railroad corridor north of the CN railroad tracks and north of Fisher Street.

Three woodland plots showed that most of the trees in each plot were live, healthy Stage 1 trees with roughly 13 percent represented in early to advanced stages of decay. Tree density for stems greater than 6 inches in diameter at breast height ranged from 113 per acre to 239 per acre. The larger woodland areas within the environmental survey area between I-80 and 173rd Street and between 173rd Street and 169th Street consisted primarily of native eastern cottonwood, American elm, silver maple, green ash, black walnut, boxelder, black willow, and black cherry along with nonnative Siberian elm, tree-of-heaven, and white mulberry. In many instances throughout the FEIS Project Area, nonnative trees and forbs are prevalent.

The Project footprint would require clearing an estimated 15.79 acres of woodland habitat, about 8.21 acres of which are considered to have a low potential for roosting occupancy by Indiana bats and/or northern long-eared bats. For this reason, the Project team recommends two alternative courses of further action pending additional coordination with USFWS after it reviews this assessment.

- The first alternative would involve a follow-up Phase 3 mist netting or acoustic survey to potentially generate additional direct observation data that support a determination that Indiana bats and/or northern long-eared bats are not present in the FEIS Project Area and that tree clearing would not have an adverse effect on any such populations.
- The second alternative would be to assume bat presence in the FEIS Project Area and restrict tree clearing to late fall through winter (typically October 1 to April 1) in all woodland habitats, or at least in those identified in this report as having a low potential for bat occupancy.

This is something that would continue to be analyzed, and the approach would be determined as the NEPA process progresses. If tree clearing cannot be avoided during the summer period of potential occupancy, additional coordination with USFWS would be warranted to determine whether a bat emergence survey could be conducted on individual candidate roost trees to establish non-occupancy immediately before tree felling.

10 Preparers

Table 10.1-1 includes Lochmueller Group staff that were instrumental in the field investigations and in preparing this report. Professional résumés are provided in **Appendix H**.

Table 10.1-1: Lochmueller Group Floristic Quality Assessment Staff

Lochmueller Group Staff	Position	Contribution
Rusty Yeager	Environmental Biologist III	Field investigation and data collection Geographic information systems (GIS) analysis Report preparation
Thomas Cervone, PhD	Vice President, Environmental Practice Leader	Report preparation
Brenten Reust	Environmental Biologist I	Field investigation and data collection Report preparation
Sean Langley	Environmental Biologist I	Field investigation and data collection

Source: Lochmueller Group 2017.

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Appendix A. Correspondence with United States Fish and Wildlife Service and Indiana Department of Natural Resources

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United States Department of the Interior
Fish and Wildlife Service

Bloomington Field Office (ES)
620 South Walker Street
Bloomington, IN 47403-2121
Phone: (812) 334-4261 Fax: (812) 334-4273

November 4, 2014

NICTD
West Lake Corridor Project
33 East U.S. Highway 12
Chesterton, Indiana 46304

Dear Sir:

This is in reference to the September 30, 2014 Federal Register Notice of Intent to Prepare an Environmental Impact Statement for development of a commuter rail line within an approximate 9-mile corridor between Dyer and Hammond, with a possible extension southeast to St. John, all in Lake County, Indiana. The U.S. Fish and Wildlife Service (FWS) offers the following comments.

A coalition of the Northern Indiana Commuter Transportation District (NICTD), Town of Munster, and City of Hammond owns the abandoned right-of-way of the Monon Railroad between the 45th/Fisher Streets area in Munster and Sibley Street in Hammond and proposes using this corridor, in conjunction with the active CSX track, currently utilized by Amtrak and freight trains, south of 45th Street, as the primary route of the proposed commuter rail line. New tracks will be required beyond Sibley Street. Use of a portion of the existing South Shore Line (SSL) and Metra Electric District (MED) facilities or alternative existing rail lines between Hammond and Chicago will also be addressed. Several alternatives for a rail yard/maintenance facility will be considered, including near US 41 at St. John, near Main Street in Dyer, and at the site of the former Monon rail yard in southern Hammond.

There may be wetlands in the Fisher/45th Streets area in southern Munster because numerous other proposed developments in that area have encountered wetlands. However, we do not know what specific parcel has already been purchased by the NICTD/Munster/Hammond coalition in anticipation of a passenger station in that area, so we do not know if wetlands are involved or not. Wetland delineations will therefore be necessary in this area.

There may also be wetlands associated with the proposed crossings of the West Branch Little Calumet River, West Branch Grand Calumet River, and/or Calumet River/Calumet Sag Channel, depending upon the route chosen. The crossing of the West Branch Little Calumet will likely be at the site of the existing abandoned bridge, and a crossing of the Calumet River/Cal Sag Channel would be in the vicinity of the existing Indiana Harbor Belt (IHB) Railroad bridge in Burnham. The IHB route bisects Beaubien Woods Forest Preserve in Illinois, which contains numerous wetlands, including adjacent to the existing single railroad track; in Burnham, the IHB is also adjacent to wetlands, plus the Burnham Prairie Nature Preserve. Since entirely new tracks will be required in the downtown Hammond area to connect the old Monon right-of-way with the existing SSL tracks north of the West Branch Grand Calumet River, it is currently unknown where there may be a new crossing of the West Branch Grand Calumet.

The existing bridge over the West Branch Little Calumet River includes several piers within the river channel which are known to collect debris and contribute to flooding problems during high water events. Therefore, the DEIS needs to evaluate the impacts of leaving this bridge in place to serve the commuter line versus removing it and replacing it at the same site with a clear span bridge with no in-channel piers.

The FWS will request mitigation for wetland losses; the mitigation ratio for the loss of forested wetland is 4:1, with 2: or 3:1 for emergent and scrub-shrub wetlands. The U.S. Army Corps of Engineers, Chicago District, will have to determine whether or not a Section 404 permit would be required for the filling of wetlands due to the rail project. However, the Federal Transit Administration has an obligation to minimize the destruction, loss, or degradation of wetlands pursuant to Executive Order 11990, as amended by Executive Order 12608, concerning protection of wetlands, regardless of the need for a wetland fill permit.

Of particular concern to the FWS is the possibility of a new crossing of the West Branch Grand Calumet River in Hammond. The FWS, in conjunction with the other Natural Resources Trustees (Indiana Departments of Natural Resources and Environmental Management) has been working with the U.S. Environmental Protection Agency (EPA) to remediate the severely polluted sediments within both the West and East Branches of the Grand Calumet River in Indiana utilizing Great Lakes Legacy Act and the Great Lakes Restoration Initiative funding. This multi-year project has been proceeding along various distinct segments of the river, with the westernmost portion, Reaches 6 and 7 between Hohman Avenue and the State Line, being the last segment to be remediated within the West Branch Grand Calumet; permits have been received and work will begin shortly. The work involves dredging of some of the contaminated sediments and capping of the remaining sediments with a geosynthetic grid, organoclay, and/or granulated activiated carbon a minimum of 2 feet deep, topped with several feet of clean sand. Because of the dredging and capping, the Trustees are opposed to any construction activities that could compromise the integrity of the cap, including the placement of piers and abutments for a new railroad bridge. If it is determined by the FTA that a new bridge will be necessary to cross the West Branch Grand Calumet within Hammond, this bridge must be a clear span, with no

piers or abutments within the river channel. We are not aware of similar constraints to the construction of a new bridge over the river in Illinois, because to our knowledge the State of Illinois has not proposed to dredge and cap the river in that state.

Executive Order 13186, issued on January 10, 2001, directs each Federal agency taking actions having or likely to have a negative impact on migratory bird populations to work with the FWS to develop an agreement to conserve those birds under the Migratory Bird Treaty Act (MBTA). In addition to avoiding or minimizing impacts to migratory bird populations, agencies will be expected to take reasonable steps that include restoring and enhancing habitat and incorporating migratory bird conservation into agency planning processes whenever possible. Therefore, the DEIS you are preparing will need to address this issue. Included in the migratory bird issue is the presence of bald eagles nesting/attempting to nest within wetland and woodland habitats in the Grand Calumet/Cal-Sag Channel/Lake Calumet area in Illinois during the past 4-5 years. An adult eagle pair has attempted to nest at several locations in this area, but we do not have information about the success of the most recent nesting attempt, although the first several attempts were not successful. Bald eagles are protected by the MBTA and also by the Bald and Golden Eagle Protection Act; please refer to the National Bald Eagle Management Guidelines available on the U.S. Fish and Wildlife Service's Website.

As discussed in the Federal Transit Administration's October 1, 2014 letter to the U.S. Fish and Wildlife Service, our agency agrees to be a Participating Agency during the EIS process. Staff at our Northern Indiana Suboffice is available to attend the interagency meetings and/or field reviews and to provide early coordination comments on the proposal. Please address correspondence to Mrs. Elizabeth McCloskey, U.S. Fish and Wildlife Service, Northern Indiana Suboffice, P.O. Box 2616, Chesterton, Indiana 46304, phone (219) 983-9753, elizabeth_mccloskey@fws.gov.

ENDANGERED SPECIES

Lake County, Indiana is within the range of the Federally endangered Indiana bat (Myotis sodalis) and Karner blue butterfly (Lycaeides melissa samuelis), the proposed endangered northern long-eared bat (Myotis septentrionalis), and the threatened Pitcher's thistle (Cirsium pitcheri) and Mead's milkweed (Asclepias meadii). Cook County, Illinois is within the range of the Federally endangered piping plover (Charadrius melodus), Hine's emerald dragonfly (Somatochlora hineana), and leafy-prairie clover (Dalea foliosa), the proposed endangered northern long-eared bat, the threatened prairie bush clover (Lespedeza leptostachya), eastern prairie fringed orchid (Platanthera leucophaea), and Mead's milkweed, and the candidate eastern massasauga rattlesnake (Sistrurus catenatus) and rattlesnake-master borer moth (Papaipema eryngii). Also in Cook County there is designated Critical Habitat for the Hine's emerald dragonfly.

None of the Lake County listed species are known within the West Lake Corridor Project Study Area. Most of the Cook County listed species are also not known within the Corridor, including the Hine's emerald dragonfly and its Critical Habitat. However, we do not know the status of some of the species within the Forest Preserves, Nature Preserves, and other protected habitats within the Corridor.

We appreciate the opportunity to provide input during this environmental scoping process. If you have any questions about our comments, please contact Elizabeth McCloskey at (219) 983-9753 or elizabeth_mccloskey@fws.gov.

Sincerely yours,

Elizabeth S. McCloskey

Acting for Scott E. Pruitt
Supervisor

cc: Regional Director, FWS, Ft. Snelling, MN (HC/EC/NWI) (ER 14/0622)
USDI, Office of Environmental Policy and Compliance, Washington, DC. (PEP/NRM)
Shawn Cirton, USFWS, Chicago Field Office, Barrington, IL
Carl Wodrich, IDNR, Land Acquisition, Indianapolis, IN
Lori White, IDNR, Regional Environmental Biologist, West Lafayette, IN
Christie Stanifer, IDNR, Environmental Coordinator, Indianapolis, IN
Marty Maupin, IDEM, Office of Water Quality, Indianapolis, IN
Paul Leffler, USACE, Regulatory Branch, Chicago, IL
Kenneth Westlake, USEPA, NEPA Implementation Section, Chicago, IL

THIS IS NOT A PERMIT

State of Indiana
DEPARTMENT OF NATURAL RESOURCES
Division of Fish and Wildlife
Early Coordination/Environmental Assessment

DNR #: ER-17897 **Request Received:** October 6, 2014

Requestor:
US Department of Transportation
Mark Assam
Federal Transit Administration
200 West Adams Street, Suite 320
Chicago, IL 60606-5253

Project: West Lake Corridor Project, Lake Co., IN and Cook Co., IL EIS: new track improvements, four (4) new stations, and a maintenance facility along a 9 mile southern extension along the Northern Indiana Commuter Transportation District (NICTD) existing South Shore Line (SSL) between Dyer and Hammond, IN

County/Site info: Lake

The Indiana Department of Natural Resources has reviewed the above referenced project per your request. Our agency offers the following comments for your information and in accordance with the National Environmental Policy Act of 1969.

If our agency has regulatory jurisdiction over the project, the recommendations contained in this letter may become requirements of any permit issued. If we do not have permitting authority, all recommendations are voluntary.

Regulatory Assessment: This proposal may require the formal approval of our agency pursuant to the Flood Control Act (IC 14-28-1) for any proposal to construct, excavate, or fill in or on the floodway of a stream or other flowing waterbody which has a drainage area greater than one square mile, or the Lake Preservation Act (IC 14-26-2) for any construction that will take place at or lakeward of the legal shoreline of a public freshwater lake. Please submit more detailed plans to the Division of Water's Technical Services Section if you are unsure whether or not a permit will be required.

Natural Heritage Database: The Natural Heritage Program's data have been checked.
This project does not impact any DNR owned nature preserves. Also, no plant or animal species listed as state or federally threatened, endangered, or rare have been reported to occur within the proposed corridor. However, a historical record of the northern leopard frog (Lithobates pipiens), a state species of special concern, and a wet-mesic sand prairie "between EJE Railroad and Conrail Railroad tracks" near Dyer about 0.4 mile east of project, have been documented with 1/2 mile of the proposed corridor.

This review is based on the current proposed alignment. Once stations and maintenance sites are determined, or if the proposed alignment is changed, further review and comments may be needed.

Fish & Wildlife Comments: We do not foresee any impacts to the Northern leopard frog as a result of this project.

Avoid and minimize impacts to fish, wildlife, and botanical resources to the greatest extent possible, and compensate for impacts. The following are recommendations that address potential impacts identified in the proposed project area:

1) Stream Crossings:
Utilizing existing structures will produce fewer impacts to streams, wetlands, and surrounding habitats. If the rehabilitation of an existing structure is not feasible, consider the following:

Using a three span structure without piers within the Little Calumet River could provide benefits to the river by removing the existing structure and piers and allowing the river to flow unobstructed. Locating a new structure within the footprint of the existing structure and minimizing impacts to surrounding habitat will aid to further minimize impacts to the river, wetlands, and surrounding habitat.

For purposes of maintaining fish passage through a crossing structure, the Environmental Unit recommends bridges rather than culverts and bottomless culverts rather than box or pipe culverts. Wide culverts are better than narrow culverts, and culverts with shorter through lengths are better than culverts with longer through lengths. If box or pipe culverts are used, the bottoms should be buried a minimum of 6" (or 20% of the culvert height/pipe diameter, whichever is greater up to a maximum of 2') below the stream bed elevation to allow a natural streambed to form within or under the crossing structure. Crossings should: span the entire channel width (a minimum of 1.2 times the bankful width); maintain the natural stream substrate within the structure; have a minimum openness ratio (height x width / length) of 0.25; and have stream depth and water velocities during low-flow conditions that are approximate to those in the natural stream channel.

2) Bank Stabilization:
Establishing vegetation along the banks is critical for stabilization and erosion control. In addition to vegetation, some other form of bank stabilization may be needed. While hard armoring alone (e.g. riprap or glacial stone) may be needed in certain instances, soft armoring and bioengineering techniques should be considered first. In many instances, one or more methods are necessary to increase the likelihood of vegetation establishment. Combining vegetation with most bank stabilization methods can provide additional bank protection while not compromising the benefits to fish and wildlife. Information about bioengineering techniques can be found at http://www.in.gov/legislative/iac/20120404-IR-312120154NRA.xml.pdf. Also, the following is a USDA/NRCS document that outlines many different bioengineering techniques for streambank stabilization: http://directives.sc.egov.usda.gov/17553.wba.

The new, replacement, or rehabbed structure, and any bank stabilization under or around the structure, should not create conditions that are less favorable for wildlife passage under the structure compared to the current conditions. A level area of natural ground under the structure is ideal for wildlife passage. If hard armoring is needed, we recommend a smooth-surfaced material such as articulated concrete mats (or riprap at the toe and turf reinforcement mats above the riprap toe protection) be placed on the side-slopes instead of riprap. Such materials will not impair wildlife movement along the banks under the bridge.

Riprap must not be placed in the active thalweg channel or placed in the streambed in a manner that precludes fish or aquatic organism passage (riprap must not be placed above the existing streambed elevation). Riprap may be used only at the toe of the sideslopes up to the ordinary high water mark (OHWM). The banks above the OHWM must be restored, stabilized, and revegetated using geotextiles and a mixture of grasses, sedges, wildflowers, shrubs, and trees native to Northern Indiana and specifically for stream bank/floodway stabilization purposes as soon as possible upon completion.

3) Riparian Habitat:
We recommend a mitigation plan be developed (and submitted with the permit application, if required) if habitat impacts will occur. The DNR's Floodway Habitat Mitigation guidelines (and plant lists) can be found online at: http://www.in.gov/legislative/iac/20140806-IR-312140295NRA.xml.pdf.

Impacts to non-wetland forest over one (1) acre should be mitigated at a minimum 2:1 ratio. If less than one acre of non-wetland forest is removed in a rural setting, replacement should be at a 1:1 ratio based on area. Impacts to non-wetland forest under one (1) acre in an urban setting should be mitigated by planting five trees, at least 2 inches in diameter-at-breast height (dbh), for each tree which is removed that is 10" dbh or greater (5:1 mitigation based on the number of large trees).

Remediation efforts along the west and east branches of the Grand Calumet River under the Great Lakes Legacy Act and Great Lakes Restoration Initiative have been on-going, and the last segment of remediation work along the Grand Calumet River from Hohman Avenue to the state line will begin soon. Any work proposed within the Grand Calumet River floodway for this project should avoid impacts to any mitigation planting areas from the remediation project.

4) Wetlands:
A formal wetland delineation should be conducted in order to determine the presence of and extent of any wetland habitat within the project corridor. Impacts should be avoided and minimized to the greatest extent possible.
Due to the presence or potential presence of wetlands on site, we recommend contacting and coordinating with the Indiana Department of Environmental Management (IDEM) 401 program and also the US Army Corps of Engineers (USACE) 404 program. Impacts to wetlands should be mitigated at the appropriate ratio (see guidelines above).

5) Exposed Soils:
All exposed soil areas must be stabilized with temporary or permanent vegetation by November 1. Between November 1 and April 1, all exposed soils idle for longer than 7 days must be stabilized with erosion control blankets or with a bonded fiber matrix hydro-mulch. Sites must be protected from seasonal flooding by keeping traffic areas covered with stone and soil stockpiles seeded, stable and contained with silt fencing.

The additional measures listed below should be implemented to avoid, minimize, or compensate for impacts to fish, wildlife, and botanical resources:
1. Revegetate all bare and disturbed areas with a mixture of grasses (excluding all varieties of tall fescue), legumes, and native shrub and hardwood tree species as soon as possible upon completion.
2. Minimize and contain within the project limits inchannel disturbance and the clearing of trees and brush.
3. Do not work in the waterway from April 1 through June 30 without the prior written approval of the Division of Fish and Wildlife.
4. Do not cut any trees suitable for Indiana bat roosting (greater than 3 inches dbh, living or dead, with loose hanging bark) from April 1 through September 30.
5. Do not excavate in the low flow area except for the placement of piers, foundations, and riprap, or removal of the old structure.
6. Do not construct any temporary runarounds, causeways, or cofferdams.
7. Use minimum average 6 inch graded riprap stone extended below the normal water level to provide habitat for aquatic organisms in the voids.
8. Do not use broken concrete as riprap.
9. Minimize the movement of resuspended bottom sediment from the immediate project area.
10. Do not deposit or allow demolition materials or debris to fall or otherwise enter the waterway.
11. Appropriately designed measures for controlling erosion and sediment must be implemented to prevent sediment from entering the stream or leaving the construction site; maintain these measures until construction is complete and all disturbed areas are stabilized.
12. Seed and protect all disturbed streambanks and slopes that are 3:1 or steeper with

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State of Indiana
DEPARTMENT OF NATURAL RESOURCES
Division of Fish and Wildlife
Early Coordination/Environmental Assessment

erosion control blankets (follow manufacturer's recommendations for selection and installation); seed and apply mulch on all other disturbed areas.

Contact Staff: Christie L. Stanifer, Environ. Coordinator, Fish & Wildlife
Our agency appreciates this opportunity to be of service. Please contact the above staff member at (317) 232-4080 if we can be of further assistance.

Date: November 7, 2014

Christie L. Stanifer
Environ. Coordinator
Division of Fish and Wildlife

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State of Indiana
DEPARTMENT OF NATURAL RESOURCES
Division of Fish and Wildlife
Early Coordination/Environmental Assessment

DNR #: ER-17897-1 **Request Received:** December 14, 2016

Requestor: Northern Indiana Commuter Transportation District
Nicole Barker
33 East US Highway 12
Chesterton, IN 46304-3521

Project: West Lake Corridor Project, Lake Co., IN and Cook Co., IL DEIS: new track improvements, four (4) new stations, and a maintenance facility along a 9 mile southern extension along the Northern Indiana Commuter Transportation District (NICTD) existing South Shore Line (SSL) between Dyer and Hammond, IN

County/Site info: Lake

The Indiana Department of Natural Resources has reviewed the above referenced project per your request. Our agency offers the following comments for your information and in accordance with the National Environmental Policy Act of 1969.

If our agency has regulatory jurisdiction over the project, the recommendations contained in this letter may become requirements of any permit issued. If we do not have permitting authority, all recommendations are voluntary.

Fish & Wildlife Comments: All of the recommendations in our previous letter dated November 7, 2014, still apply; however, we offer the following additional comments:

The alternatives that were evaluated had varying levels of environmental impact. Of the proposals that were evaluated, the selected proposal seems to be the alternative that will minimize impacts to fish, wildlife, and botanical resources, while still achieving the stated goals of the project.

Contact Staff: Christie L. Stanifer, Environ. Coordinator, Fish & Wildlife
Our agency appreciates this opportunity to be of service. Please contact the above staff member at (317) 232-4080 if we can be of further assistance.

Christie L. Stanifer **Date:** February 3, 2017
Environ. Coordinator
Division of Fish and Wildlife

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Appendix B. Exhibit 1

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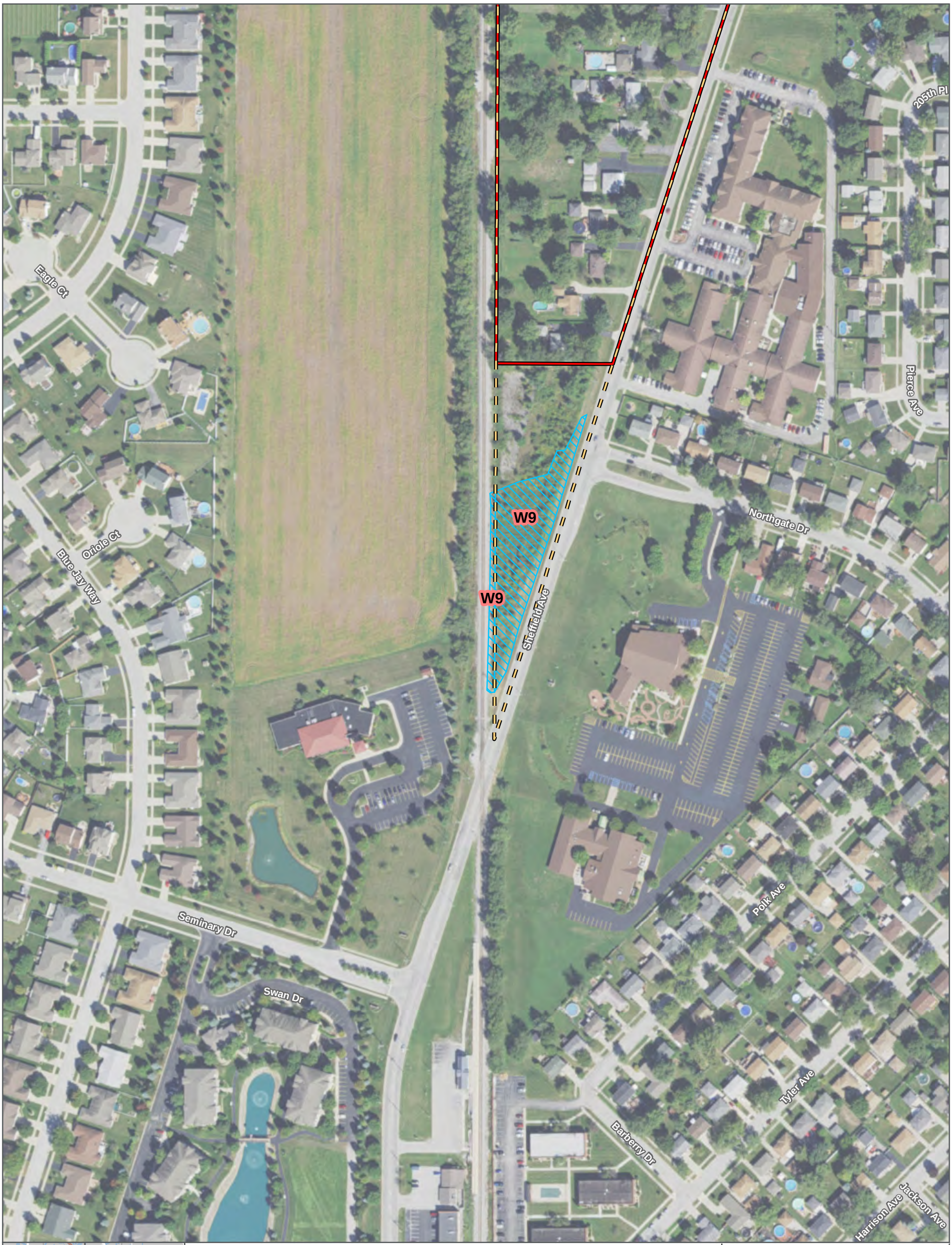
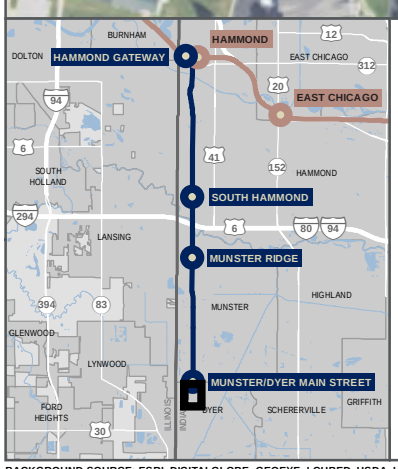




- Existing Station
- Proposed Station
- Existing South Shore Line
- FEIS Preferred Alternative
- Milepost
- Milepost Stationing
- Environmental Survey Area
- Project Footprint
- Delineated Wetlands
- Woodland Survey Area

Bat Roost Habitat Potential

- Low Potential
- No Potential

Candidate Bat Roost Rating Classification Range

- Good
- Moderate
- None/Low

H## = bat habitat unit ID

F## = woodland habitat plot ID

SEPTEMBER 8, 2017

EXHIBIT 1: BAT HABITAT ASSESSMENT AND CANDIDATE ROOST EVALUATION LOCATION MAP

0 200
FEET

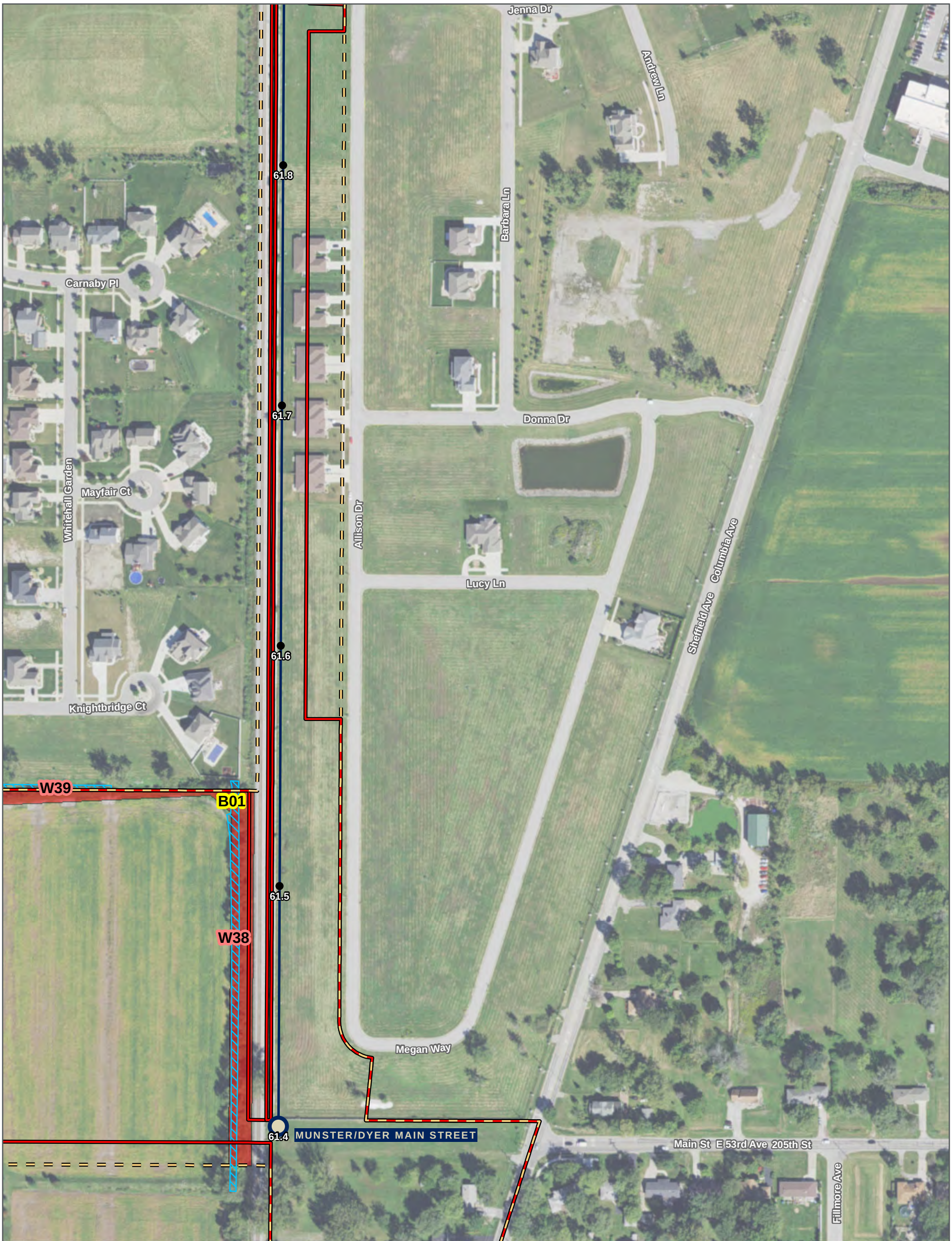
WEST LAKE CORRIDOR

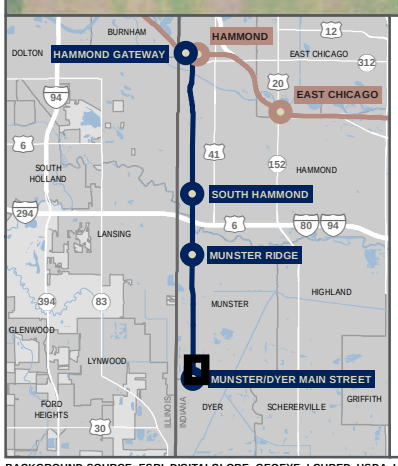
SHEET 1 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service





- Existing Station
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- Milepost Stationing
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- Project Footprint
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- Woodland Survey Area

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SEPTEMBER 8, 2017

EXHIBIT 1: BAT HABITAT ASSESSMENT AND CANDIDATE ROOST EVALUATION LOCATION MAP

N

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FEET

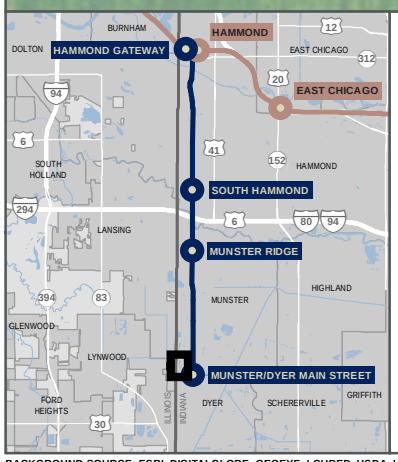
WEST LAKE CORRIDOR

SHEET 2 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service



- Existing Station
- Proposed Station
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- Milepost
- Milepost Stationing
- Environmental Survey Area
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Bat Roost Habitat Potential

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- No Potential

Candidate Bat Roost Rating Classification Range

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- Moderate
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SEPTEMBER 8, 2017

EXHIBIT 1: BAT HABITAT ASSESSMENT AND CANDIDATE ROOST EVALUATION LOCATION MAP

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FEET

WEST LAKE CORRIDOR

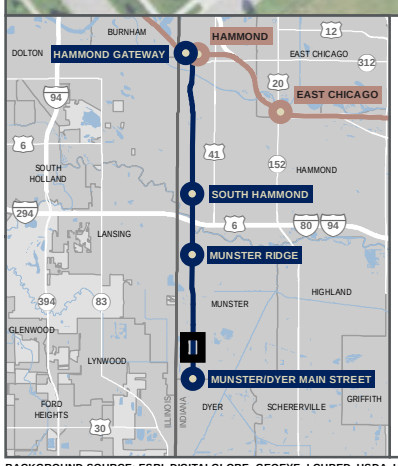
SHEET 3 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service

Glastonbury St
Whitehall Garden
Milford Haven Way
Leicester Dr
St Ives Ct
Margo Ln
Salisbury Dr
Lands End
Norwich Ct
Cornwall Cir
Norwich Dr
Exeter Rd
Indiana Pkwy
Progress Ave
Otis Bowen Dr
Jenna Dr
62.3
62.2
62.1
62
61.9
W12
B02
W11R
W11L



Existing Station
Proposed Station
Existing South Shore Line
FEIS Preferred Alternative
Milepost
Milepost Stationing
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Delineated Wetlands
Woodland Survey Area

Bat Roost Habitat Potential

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Candidate Bat Roost Rating Classification Range

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SEPTEMBER 8, 2017

EXHIBIT 1: BAT HABITAT ASSESSMENT AND CANDIDATE ROOST EVALUATION LOCATION MAP

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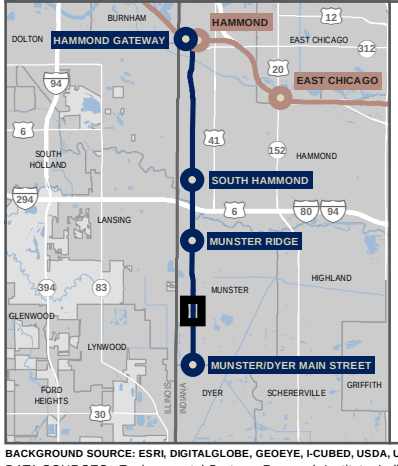
0 200
FEET

WEST LAKE CORRIDOR

SHEET 4 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service



- Existing Station
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Bat Roost Habitat Potential

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Candidate Bat Roost Rating Classification Range

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SEPTEMBER 8, 2017

EXHIBIT 1: BAT HABITAT ASSESSMENT AND CANDIDATE ROOST EVALUATION LOCATION MAP

N

0 200
FEET

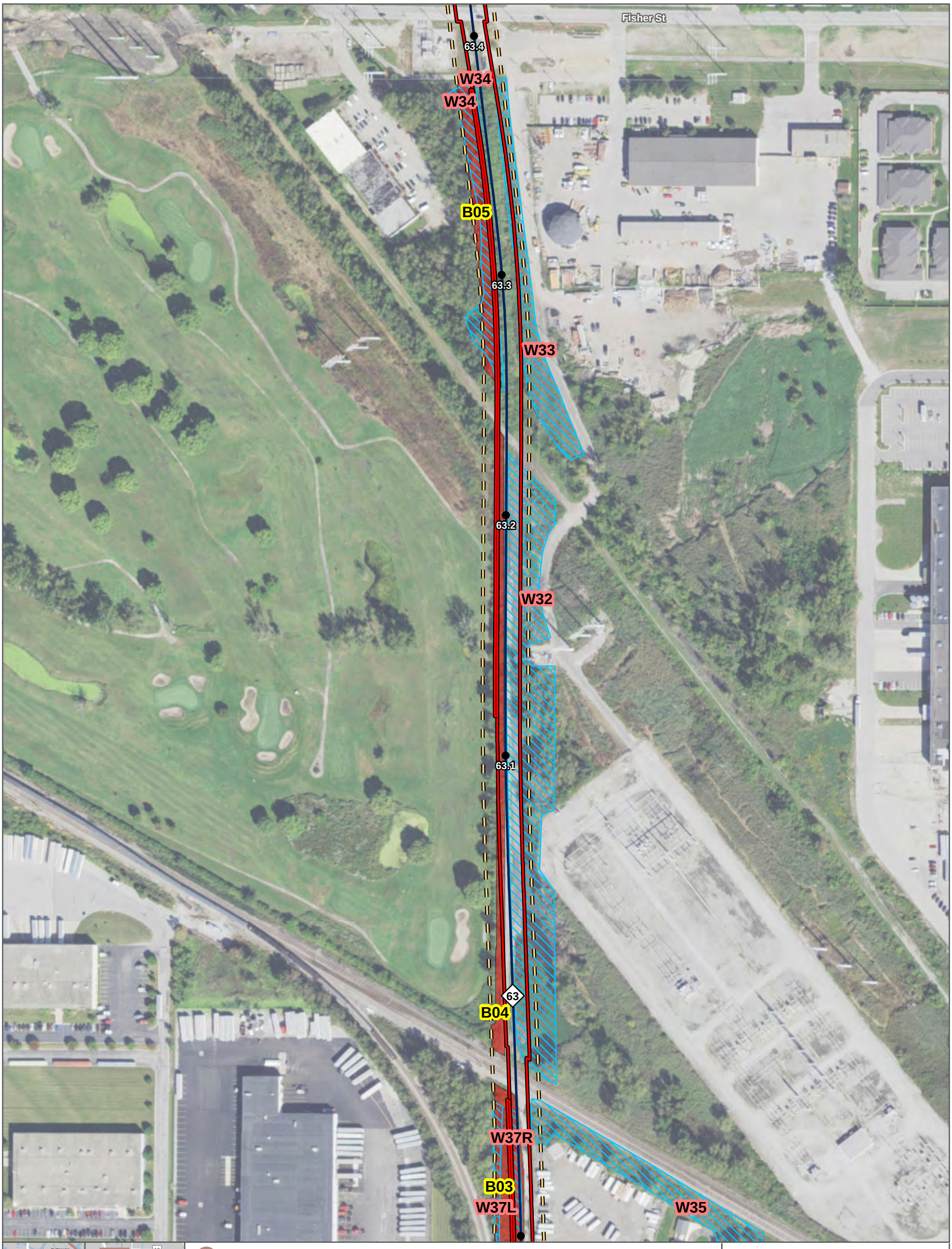
WEST LAKE CORRIDOR

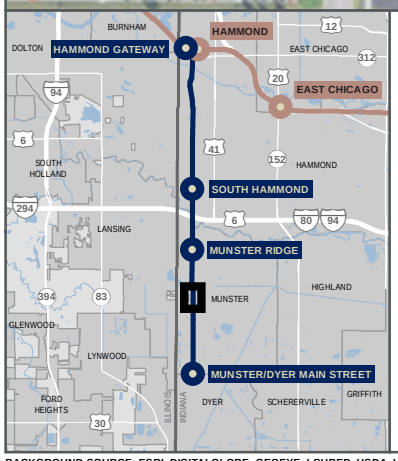
SHEET 5 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service





Existing Station

Proposed Station

Existing South Shore Line

FEIS Preferred Alternative

Milepost

Milepost Stationing

Environmental Survey Area

Project Footprint

Delineated Wetlands

Woodland Survey Area

Bat Roost Habitat Potential

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Candidate Bat Roost Rating Classification Range

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Moderate

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SEPTEMBER 8, 2017

EXHIBIT 1: BAT HABITAT ASSESSMENT AND CANDIDATE ROOST EVALUATION LOCATION MAP

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FEET

WEST LAKE CORRIDOR

SHEET 6 OF 18

Data for Reference Only

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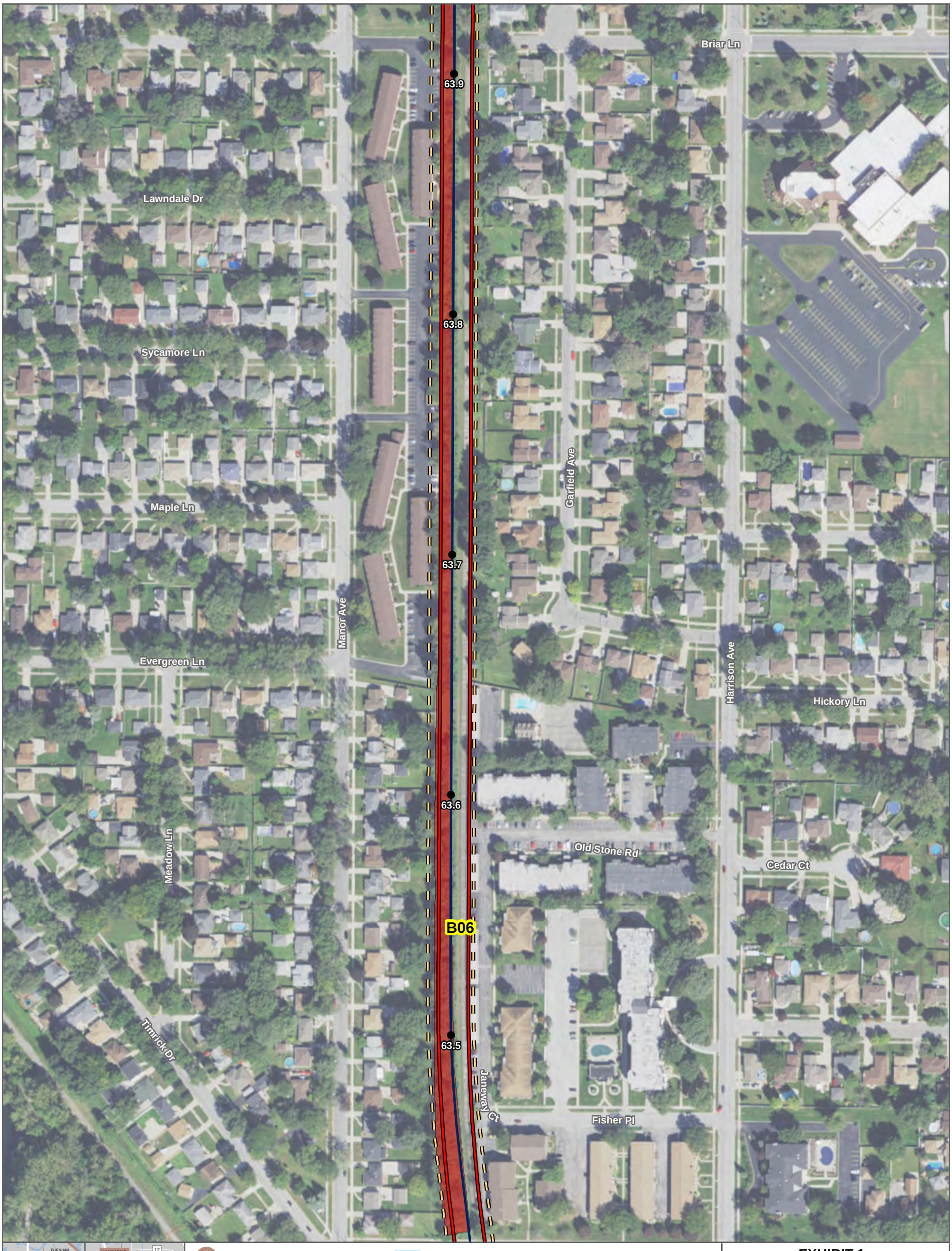

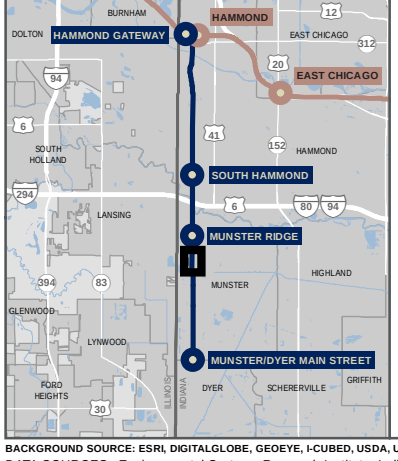

Existing Station
Proposed Station
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FEIS Preferred Alternative
Milepost
Milepost Stationing
Environmental Survey Area
Project Footprint

Delineated Wetlands
Woodland Survey Area

Bat Roost Habitat Potential

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Candidate Bat Roost Rating Classification Range

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H## = bat habitat unit ID
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SEPTEMBER 8, 2017

EXHIBIT 1: BAT HABITAT ASSESSMENT AND CANDIDATE ROOST EVALUATION LOCATION MAP

N

0 200
FEET

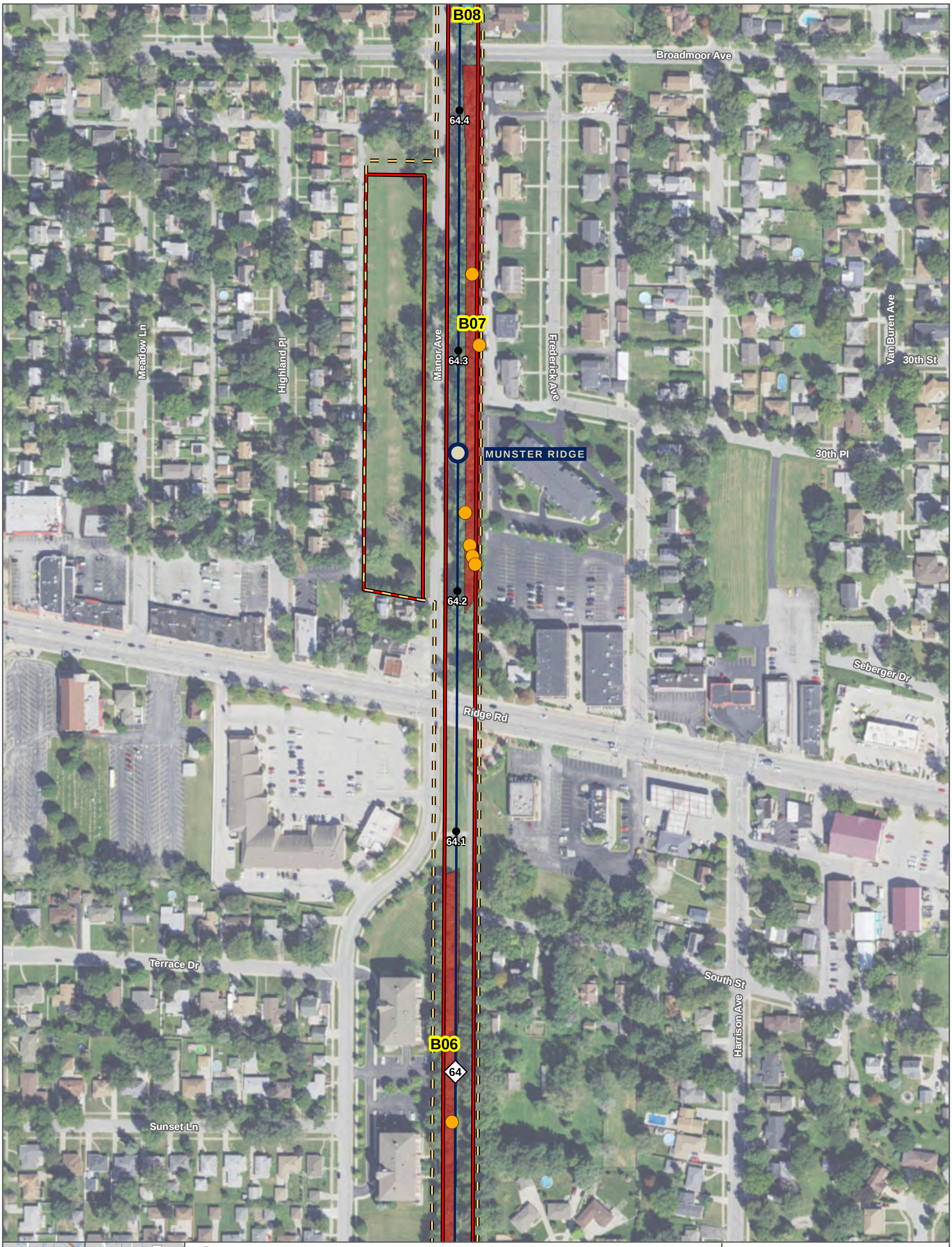
WEST LAKE CORRIDOR

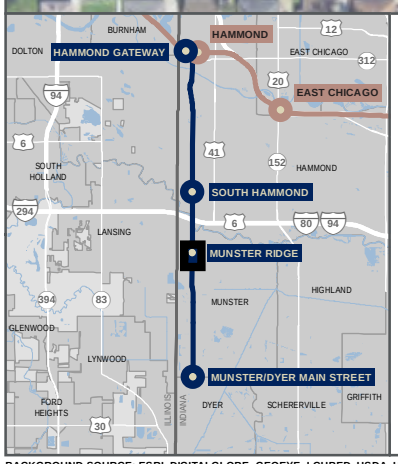
SHEET 7 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service





Existing Station
Proposed Station
Existing South Shore Line
FEIS Preferred Alternative
Milepost
Milepost Stationing
Environmental Survey Area
Project Footprint

Delineated Wetlands
Woodland Survey Area

Bat Roost Habitat Potential

Low Potential
No Potential

Candidate Bat Roost Rating Classification Range

Good
Moderate
None/Low

H## = bat habitat unit ID
F## = woodland habitat plot ID

SEPTEMBER 8, 2017

EXHIBIT 1: BAT HABITAT ASSESSMENT AND CANDIDATE ROOST EVALUATION LOCATION MAP

N

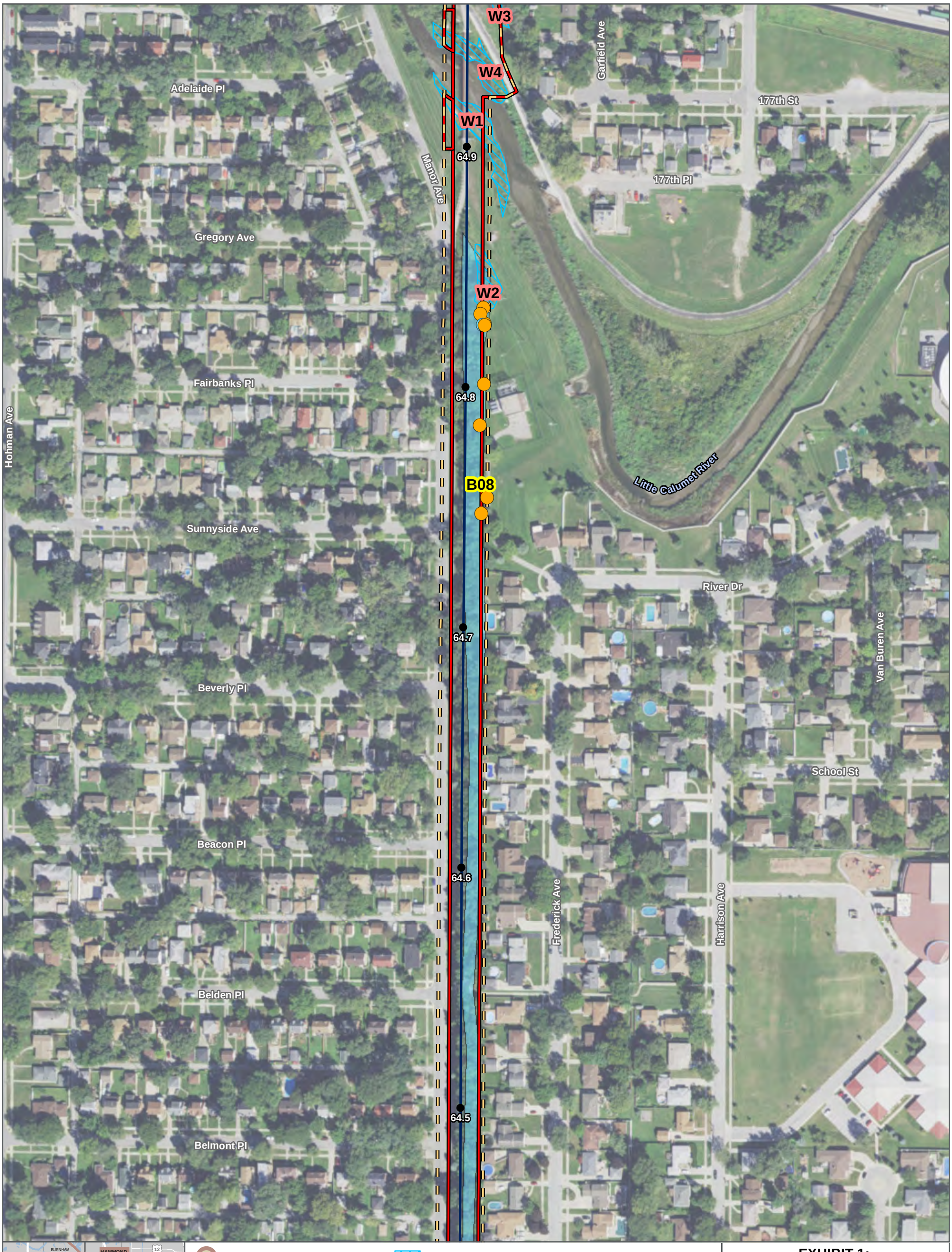
0 200
FEET

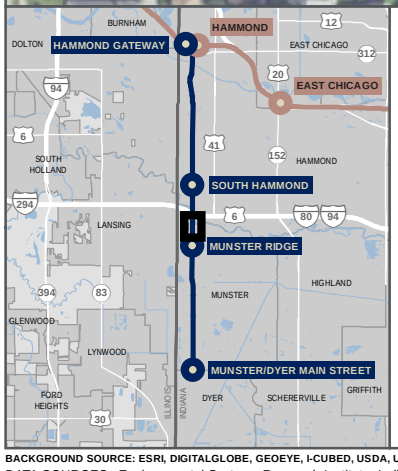
WEST LAKE CORRIDOR

SHEET 8 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service





Existing Station
Proposed Station
Existing South Shore Line
FEIS Preferred Alternative
Milepost
Milepost Stationing
Environmental Survey Area
Project Footprint

Delineated Wetlands
Woodland Survey Area

Bat Roost Habitat Potential

Low Potential
No Potential

Candidate Bat Roost Rating Classification Range

Good
Moderate
None/Low

H## = bat habitat unit ID
F## = woodland habitat plot ID

SEPTEMBER 8, 2017

EXHIBIT 1: BAT HABITAT ASSESSMENT AND CANDIDATE ROOST EVALUATION LOCATION MAP

0 200
FEET

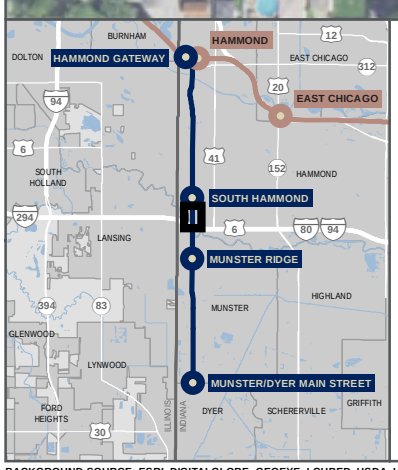
WEST LAKE CORRIDOR

SHEET 9 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service

W8
B10
173rd St
65.4
173rd Pl
S Harrison Ave
65.3
Hohman Ave
174th St
E 174th St
S Meadow Lane Ave
Meadow Lane Ave
Park Pl
174th Pl
E 174th Pl
Harrison Ave
Van Buren Ave
Bat habitat unit B09 contains
7 additional none/low potential roosts
identified that lack positional data
W7
Southmoor Rd
E Southmoor Rd
65.2
B09
F03
175th St
Little Calumet River
Lyman Ave
B09
65.1
W5
W6
176th Ct
E 176th Ct
176th St
80
94
6
Kinsley Pl
65
Hollywood Ave
Manor Ave
W3



Existing Station
Proposed Station
Existing South Shore Line
FEIS Preferred Alternative
Milepost
Milepost Stationing
Environmental Survey Area
Project Footprint

Delineated Wetlands
Woodland Survey Area

Bat Roost Habitat Potential

Low Potential
No Potential

Candidate Bat Roost Rating Classification Range

Good
Moderate
None/Low

H## = bat habitat unit ID
F## = woodland habitat plot ID

SEPTEMBER 8, 2017

EXHIBIT 1:
BAT HABITAT ASSESSMENT AND CANDIDATE ROOST EVALUATION LOCATION MAP

N

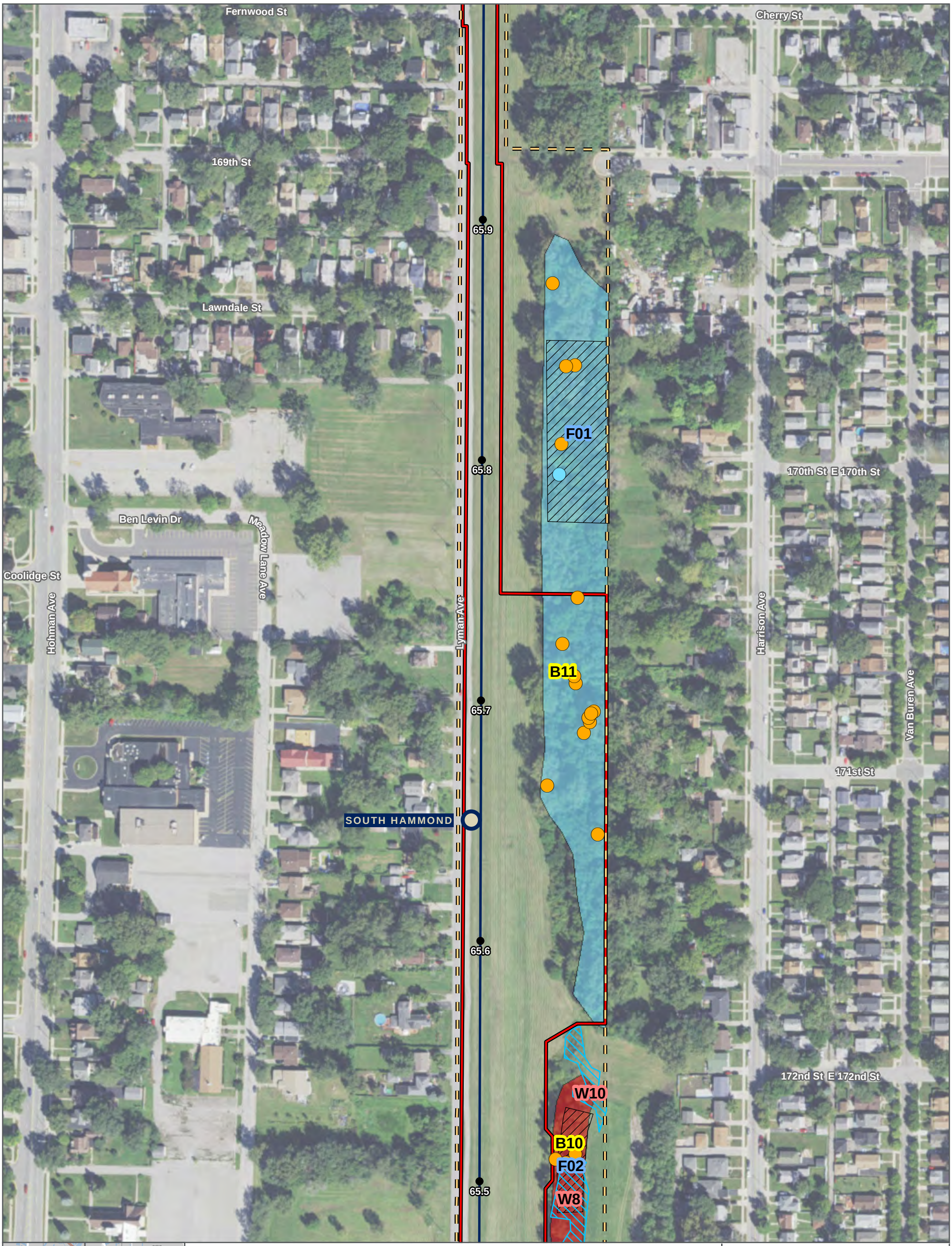
0 200
FEET

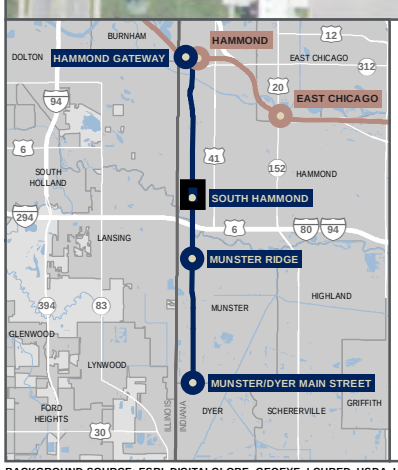
WEST LAKE CORRIDOR

SHEET 10 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY
DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service





- Existing Station
- Proposed Station
- Existing South Shore Line
- FEIS Preferred Alternative
- Milepost
- Milepost Stationing
- Environmental Survey Area
- Project Footprint
- Delineated Wetlands
- Woodland Survey Area

Bat Roost Habitat Potential

- Low Potential
- No Potential

Candidate Bat Roost Rating Classification Range

- Good
- Moderate
- None/Low

H## = bat habitat unit ID

F## = woodland habitat plot ID

SEPTEMBER 8, 2017

EXHIBIT 1: BAT HABITAT ASSESSMENT AND CANDIDATE ROOST EVALUATION LOCATION MAP

0 200
FEET

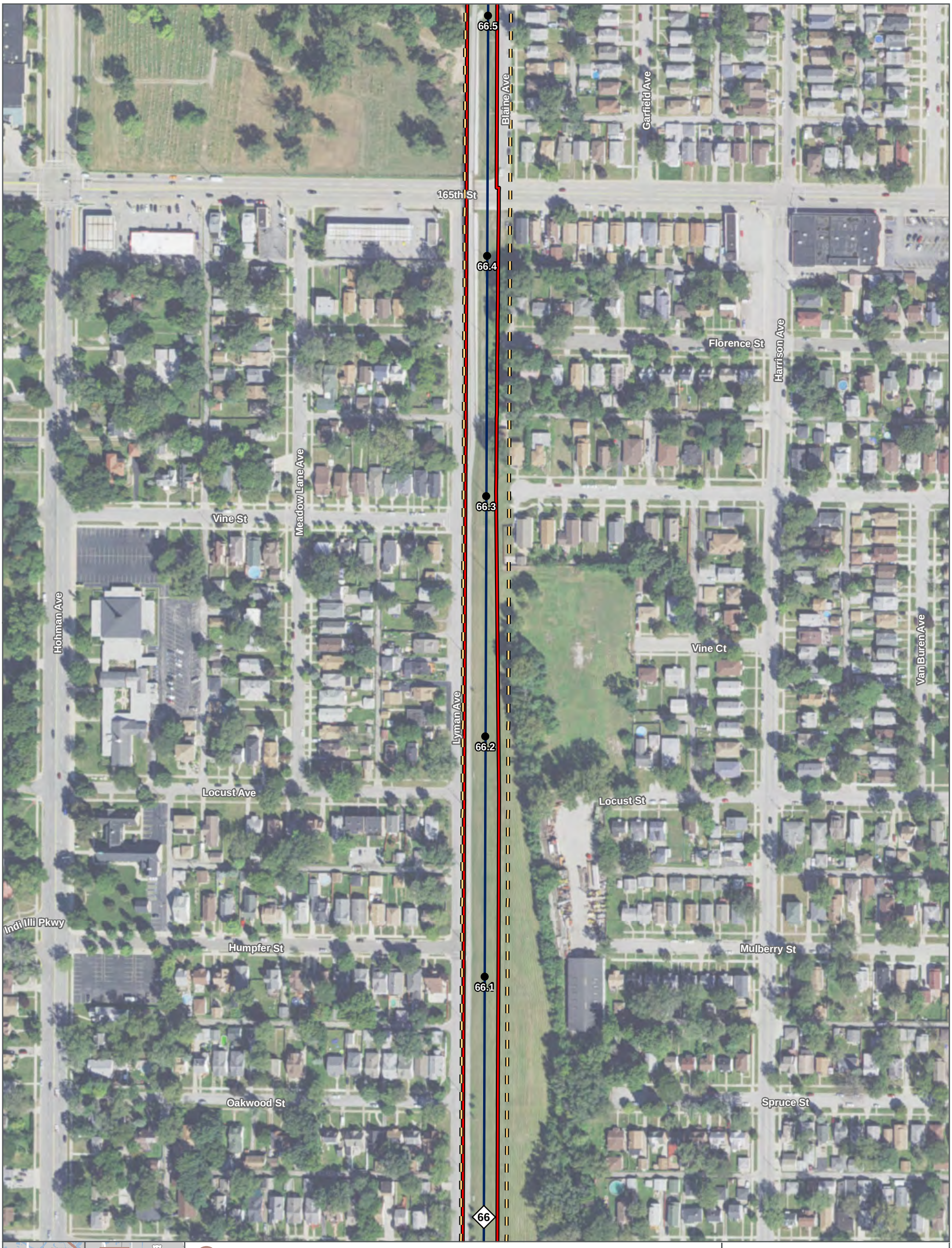
WEST LAKE CORRIDOR

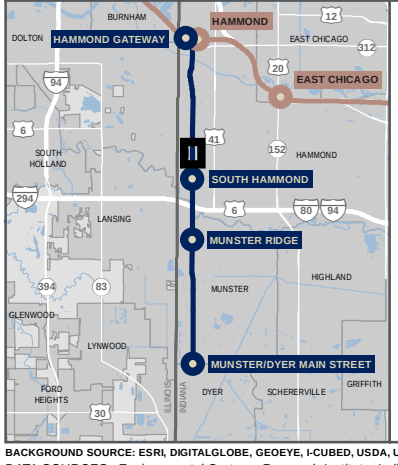
SHEET 11 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service





- Existing Station
- Proposed Station
- Existing South Shore Line
- FEIS Preferred Alternative
- Milepost
- Milepost Stationing
- Environmental Survey Area
- Project Footprint
- Delineated Wetlands
- Woodland Survey Area

Bat Roost Habitat Potential

- Low Potential
- No Potential

Candidate Bat Roost Rating Classification Range

- Good
- Moderate
- None/Low

H## = bat habitat unit ID

F## = woodland habitat plot ID

SEPTEMBER 8, 2017

EXHIBIT 1: BAT HABITAT ASSESSMENT AND CANDIDATE ROOST EVALUATION LOCATION MAP

N

0 200

FEET

WEST LAKE CORRIDOR

SHEET 12 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

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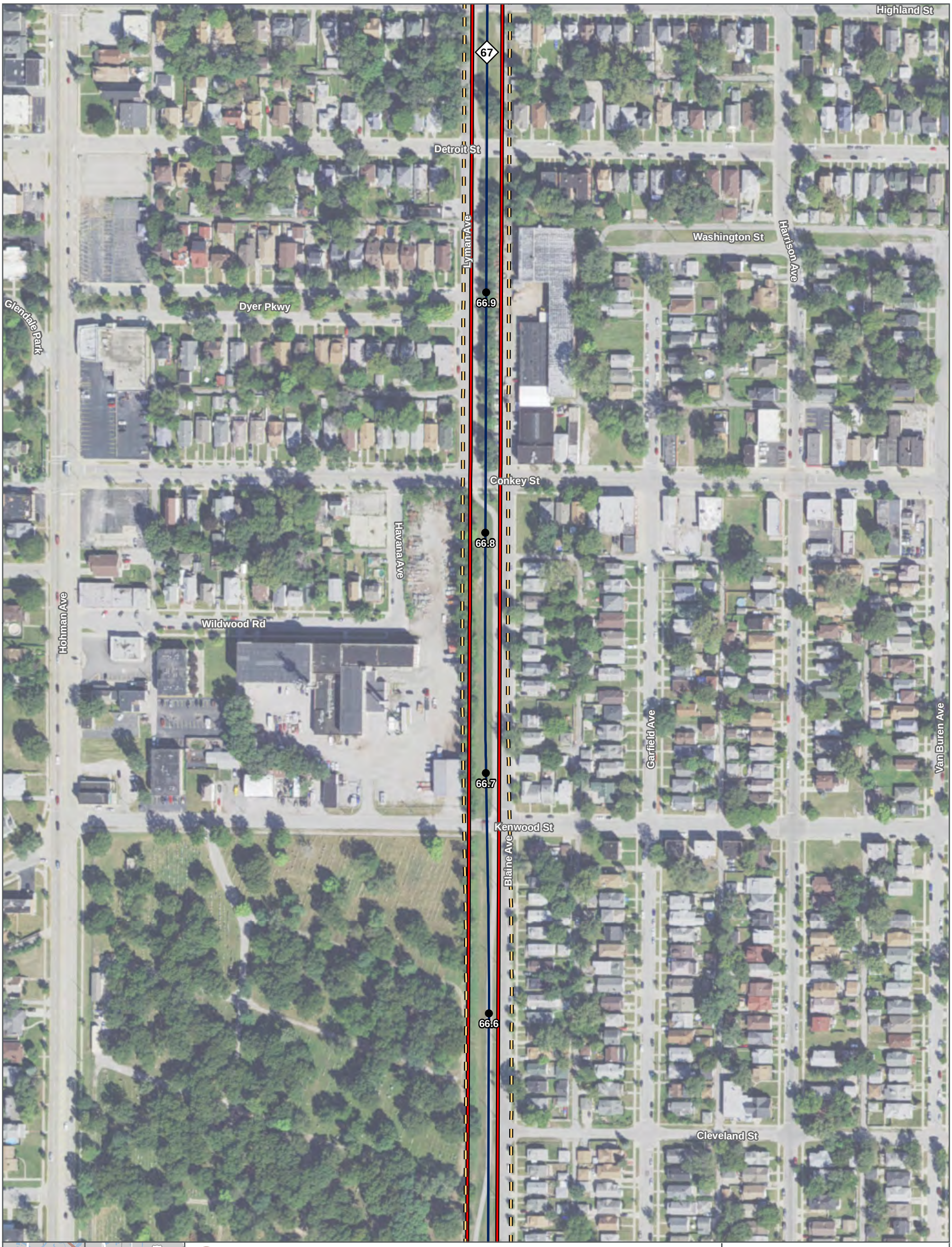
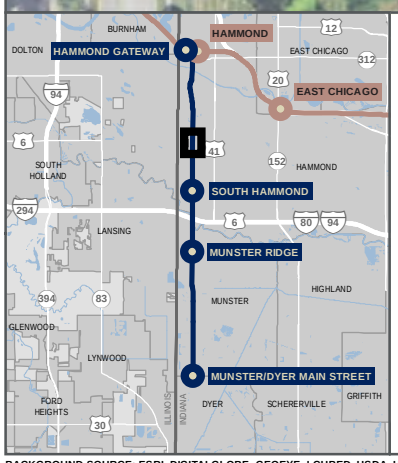




Existing Station
Proposed Station
Existing South Shore Line
FEIS Preferred Alternative
Milepost
Milepost Stationing
Environmental Survey Area
Project Footprint

Delineated Wetlands
Woodland Survey Area

Bat Roost Habitat Potential

Low Potential
No Potential

Candidate Bat Roost Rating Classification Range

Good
Moderate
None/Low

H## = bat habitat unit ID
F## = woodland habitat plot ID

SEPTEMBER 8, 2017

EXHIBIT 1: BAT HABITAT ASSESSMENT AND CANDIDATE ROOST EVALUATION LOCATION MAP

N

0 200
FEET

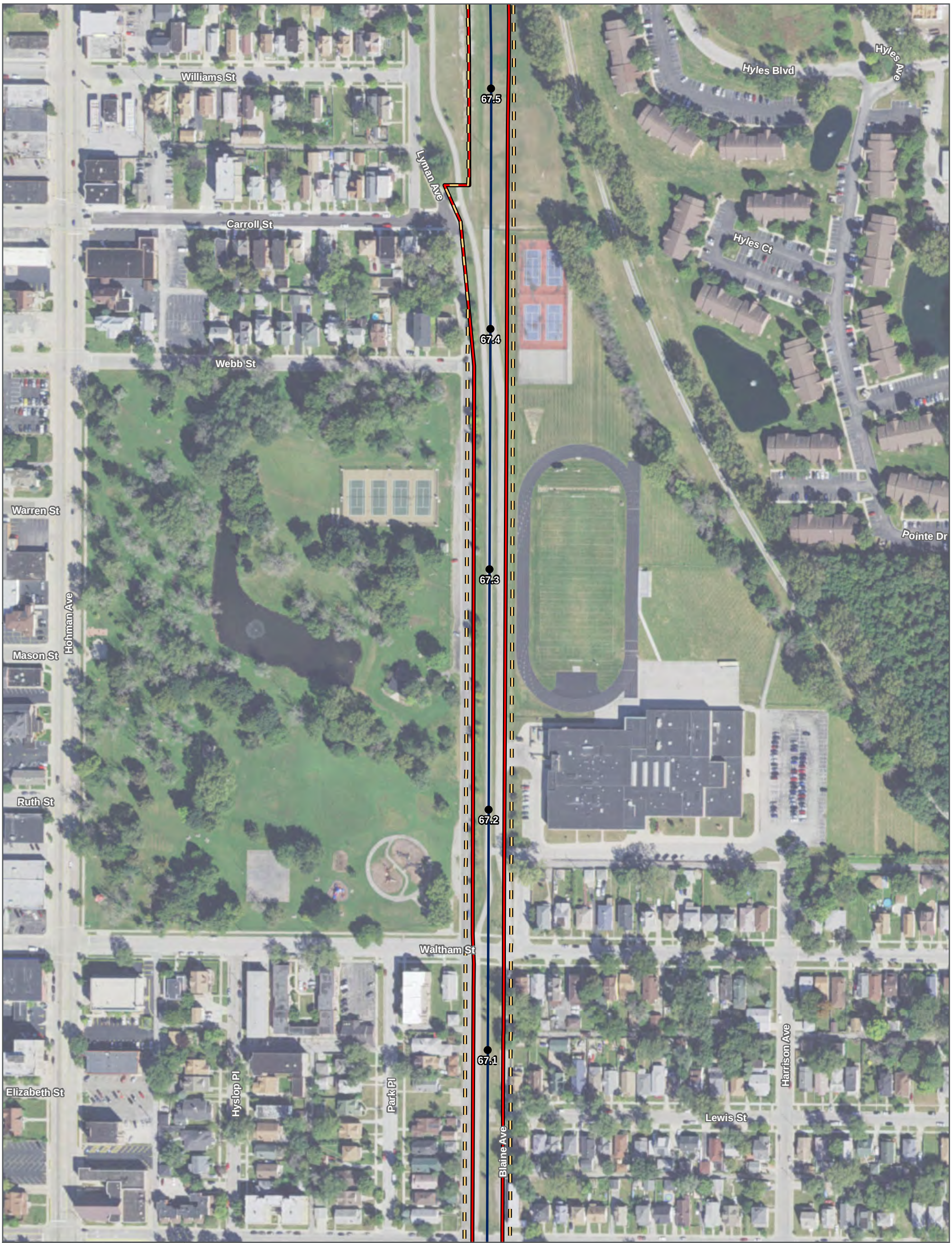
WEST LAKE CORRIDOR

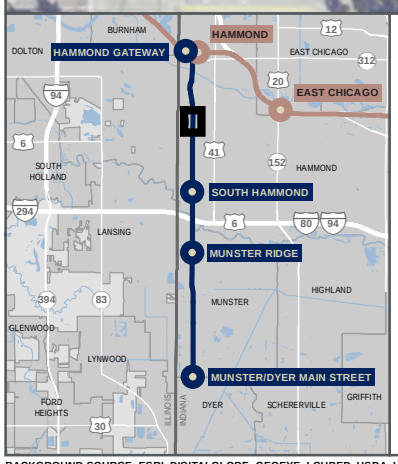
SHEET 13 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service





- Existing Station
- Proposed Station
- Existing South Shore Line
- FEIS Preferred Alternative
- Milepost
- Milepost Stationing
- Environmental Survey Area
- Project Footprint
- Delineated Wetlands
- Woodland Survey Area

Bat Roost Habitat Potential

- Low Potential
- No Potential

Candidate Bat Roost Rating Classification Range

- Good
- Moderate
- None/Low

H## = bat habitat unit ID

F## = woodland habitat plot ID

SEPTEMBER 8, 2017

EXHIBIT 1: BAT HABITAT ASSESSMENT AND CANDIDATE ROOST EVALUATION LOCATION MAP

0 200
FEET

SHEET 14 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

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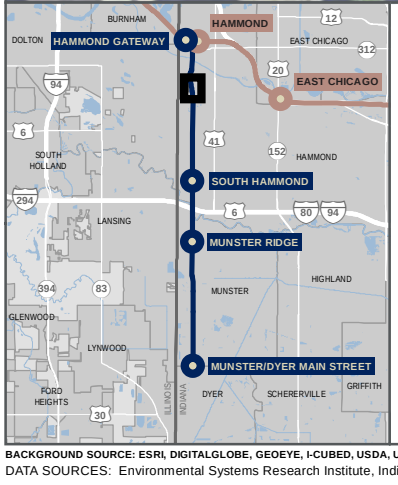

- Existing Station
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- FEIS Preferred Alternative
- Milepost
- Milepost Stationing
- Environmental Survey Area
- Project Footprint
- Delineated Wetlands
- Woodland Survey Area

Bat Roost Habitat Potential

- Low Potential
- No Potential

Candidate Bat Roost Rating Classification Range

- Good
- Moderate
- None/Low

H## = bat habitat unit ID

F## = woodland habitat plot ID

SEPTEMBER 8, 2017

EXHIBIT 1: BAT HABITAT ASSESSMENT AND CANDIDATE ROOST EVALUATION LOCATION MAP

0 200
FEET

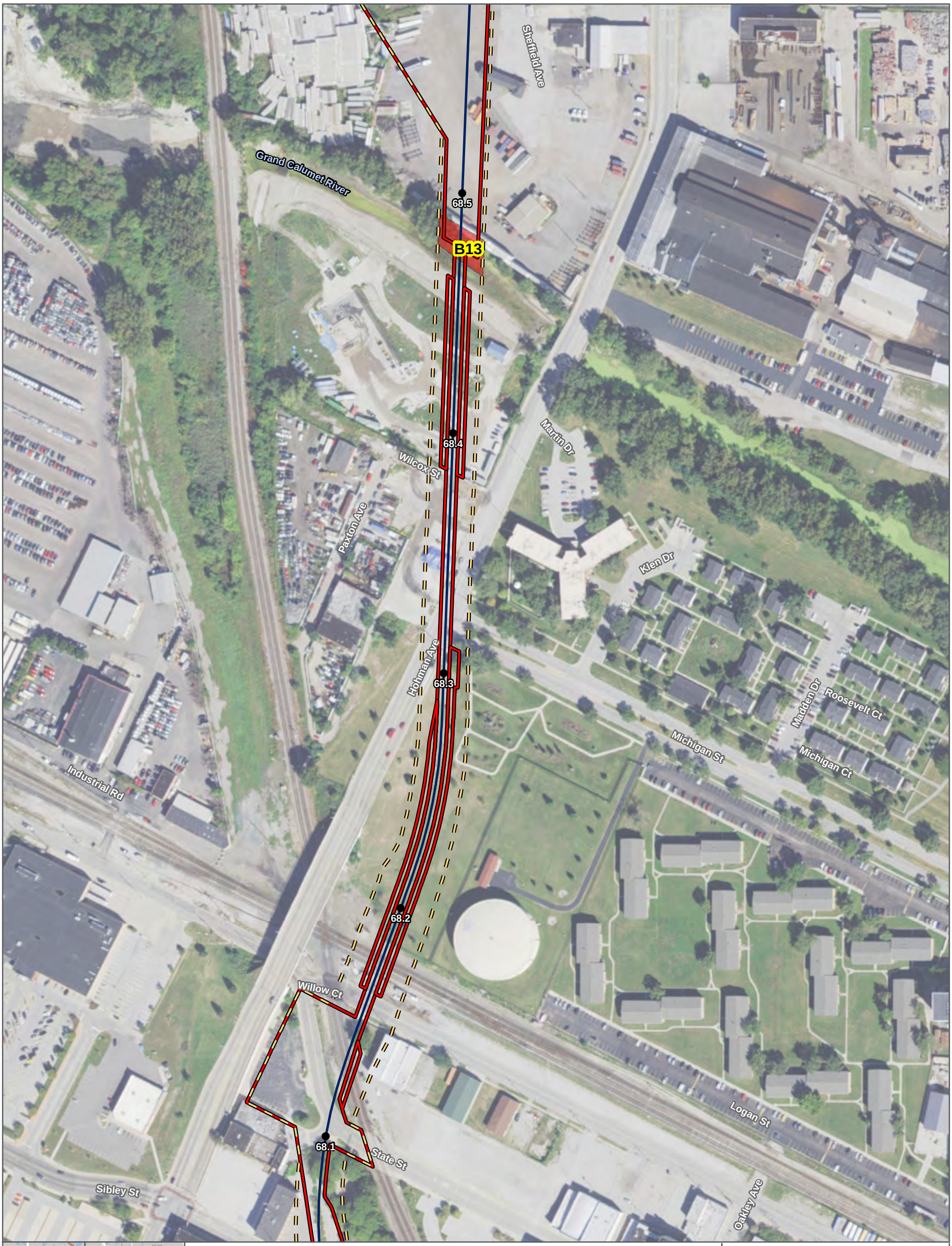
WEST LAKE CORRIDOR

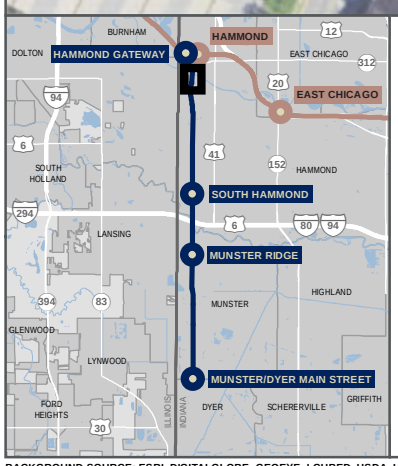
SHEET 15 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service





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- Proposed Station
- Existing South Shore Line
- FEIS Preferred Alternative
- Milepost
- Milepost Stationing
- Environmental Survey Area
- Project Footprint
- Delineated Wetlands
- Woodland Survey Area

Bat Roost Habitat Potential

- Low Potential
- No Potential

Candidate Bat Roost Rating Classification Range

- Good
- Moderate
- None/Low

H## = bat habitat unit ID

F## = woodland habitat plot ID

SEPTEMBER 8, 2017

EXHIBIT 1: BAT HABITAT ASSESSMENT AND CANDIDATE ROOST EVALUATION LOCATION MAP

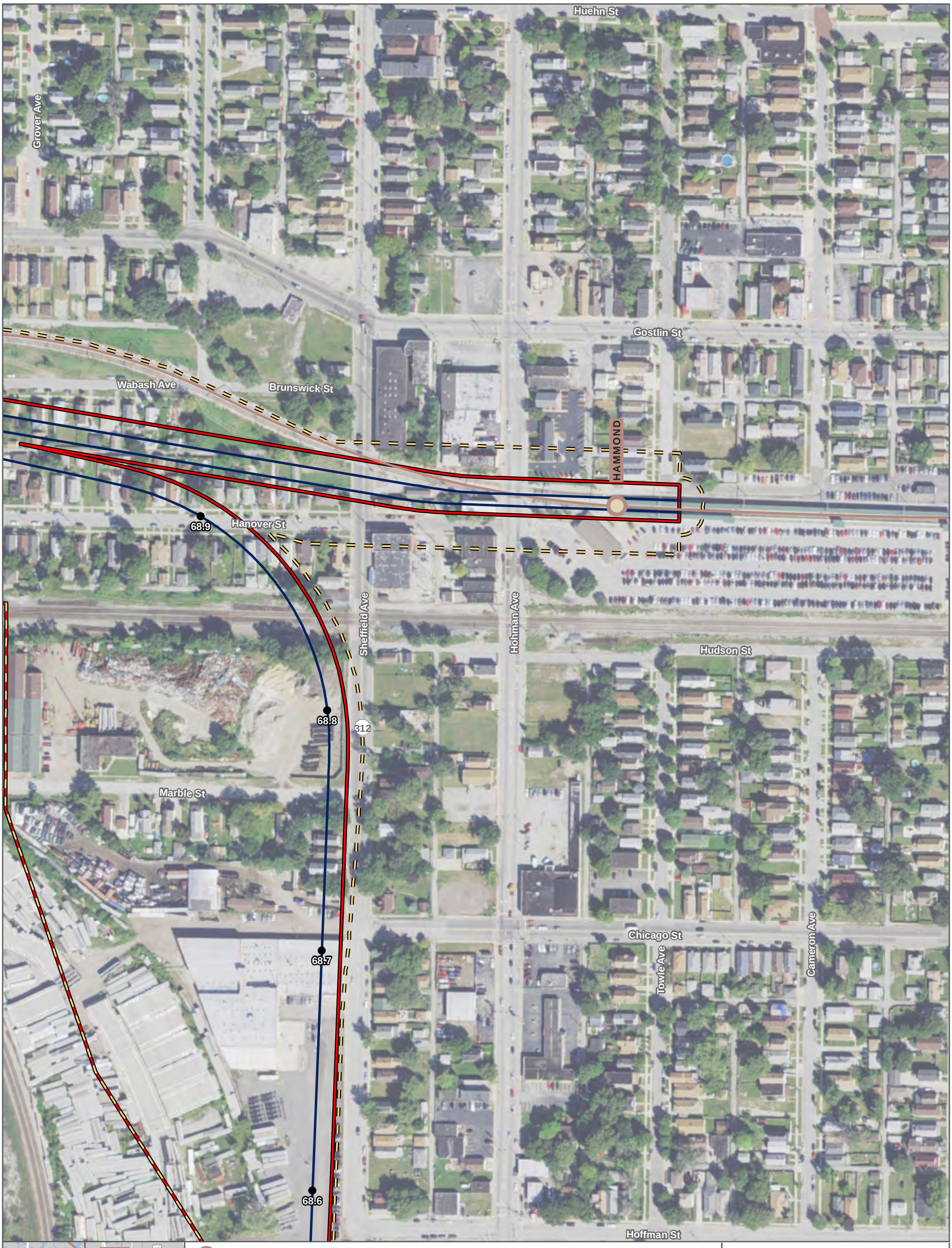
0 200
FEET

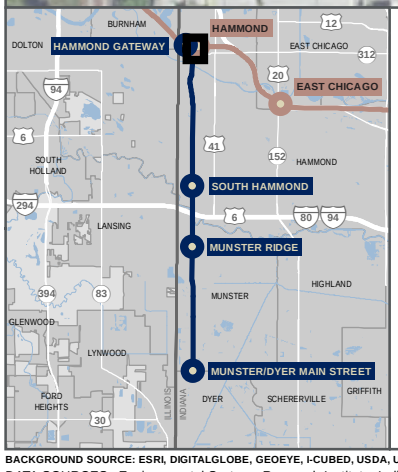
SHEET 16 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service





- Existing Station
- Proposed Station
- Existing South Shore Line
- FEIS Preferred Alternative
- Milepost
- Milepost Stationing
- Environmental Survey Area
- Project Footprint
- Delineated Wetlands
- Woodland Survey Area

Bat Roost Habitat Potential

- Low Potential
- No Potential

Candidate Bat Roost Rating Classification Range

- Good
- Moderate
- None/Low

H## = bat habitat unit ID

F## = woodland habitat plot ID

SEPTEMBER 8, 2017

EXHIBIT 1: BAT HABITAT ASSESSMENT AND CANDIDATE ROOST EVALUATION LOCATION MAP

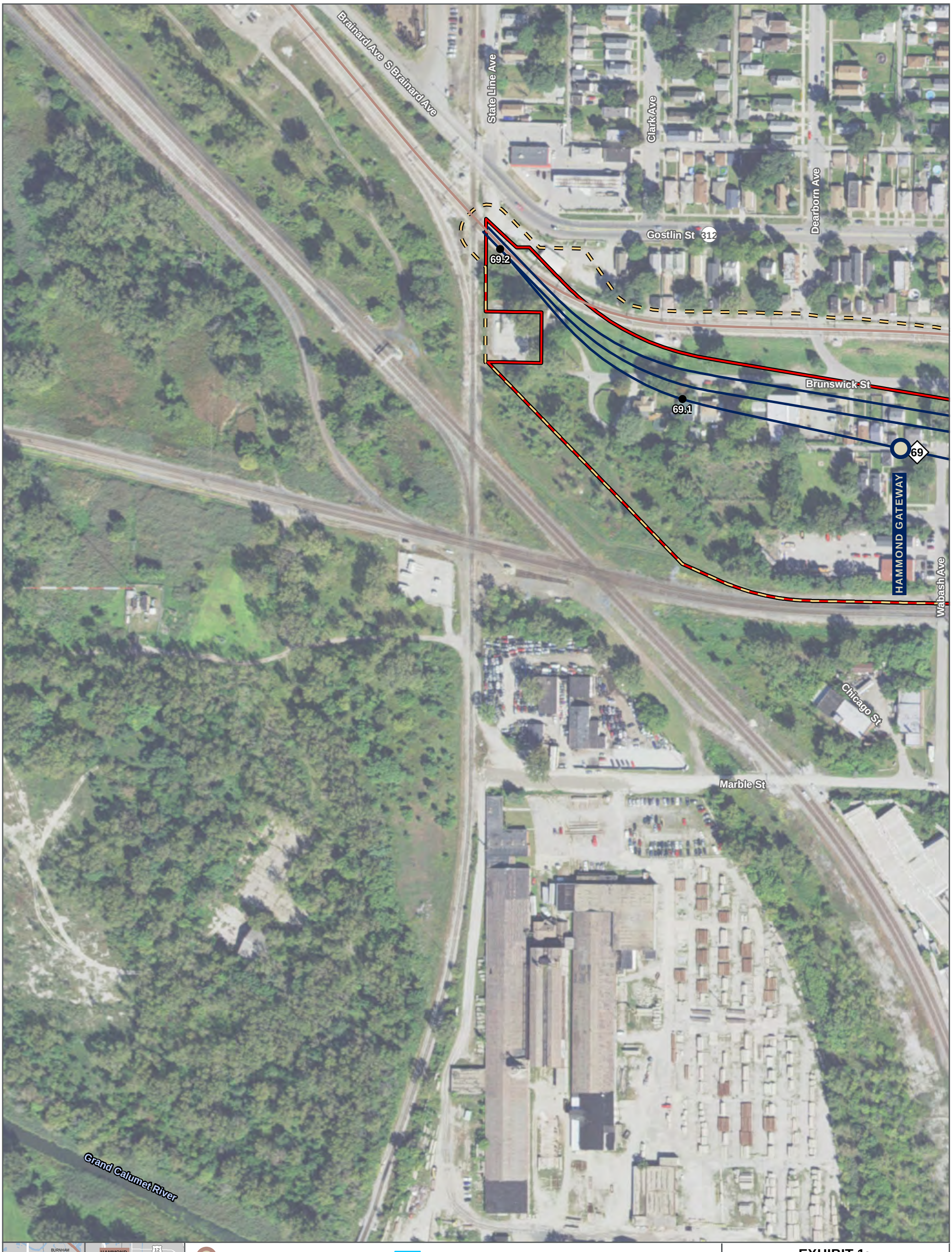
0 200
FEET

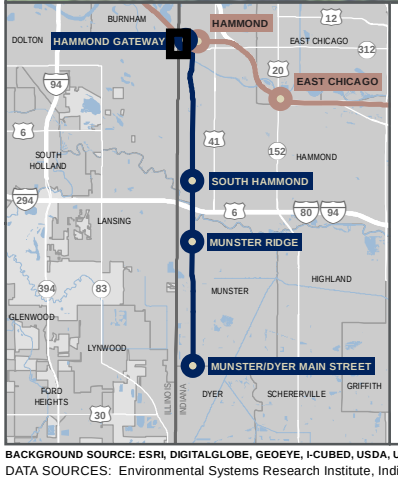
SHEET 17 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service





- Existing Station
- Proposed Station
- Existing South Shore Line
- FEIS Preferred Alternative
- Milepost
- Milepost Stationing
- Environmental Survey Area
- Project Footprint
- Delineated Wetlands
- Woodland Survey Area

Bat Roost Habitat Potential

- Low Potential
- No Potential

Candidate Bat Roost Rating Classification Range

- Good
- Moderate
- None/Low

H## = bat habitat unit ID

F## = woodland habitat plot ID

SEPTEMBER 8, 2017

EXHIBIT 1: BAT HABITAT ASSESSMENT AND CANDIDATE ROOST EVALUATION LOCATION MAP

0 200
FEET

WEST LAKE CORRIDOR

SHEET 18 OF 18

Data for Reference Only

BACKGROUND SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

DATA SOURCES: Environmental Systems Research Institute, Indiana Department of Environmental Management, National Resource Commission, Northern Indiana Commuter Transportation District, U.S. Geological Survey, U.S. Department of the Interior, U.S. Fish & Wildlife Service

Appendix C. Phase 1 Summer Habitat Assessment Worksheets and Candidate Roost Tree Photographs

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PHASE 1 SUMMER HABITAT ASSESSMENTS

INDIANA BAT HABITAT ASSESSMENT DATASHEET

Project Name: NICTD West Lake Project	Date: 6/24/2017
Township/Range/Section: T35N R10W Sec 1 T36N R10W Sec 1,12,13,24,25,36 T37N R10W Sec 25,36	
Lat Long/UTM/Zone: UTM western termini: 456781E,4596349N,16S UTM eastern termini: 456257E,4609126N,16S	Surveyor: R. Yeager

Brief Project Description

Construct a new railroad line from Dyer, through Munster and into Hammond, Indiana where this commuter line will connect in with a realigned section of the South Shore Line. The project involves construction of four new stations and a maintenance facility at Hammond.

Project Area

Project	Total Acres	Forest Acres		Open Acres
	170.6. ac. within proposed construction footprint	23.1 ac. within proposed construction footprint		147.5 ac. within proposed construction footprint is in the form of residential, commercial, and industrial property, urban green space, abandoned railroad, scattered wetlands, and miscellaneous urban landscapes.
Proposed Tree Removal (ac)	Completely cleared	Partially cleared (will leave trees)	Preserve acres-no clearing	
	approx.. 23.1 ac.	0.0 ac.	0.0 ac.	

Brief Project Description

Pre-Project	**Post-Project**
Project area is exclusively urban/suburban through Dyer, Muster and Hammond, Indiana. The proposed railroad will follow along the existing CSX in the southern part of the project area at Dyer and then follow along the abandoned Monon railroad corridor through Munster and up into Hammond. These areas are all highly developed.	Completed project would include a new railroad line from Dyer to Hammond with addition of four new stations and a maintenance facility at Hammond. Impacts are largely confined to urban landscape habitat and residential/commercial properties.

Brief Project Description

Flight corridors to other forested areas?
The NICTD railroad and the parallel NIPSCO utility right-of-way serve as the principal flight corridor within the project area through the Indiana Dunes National Lakeshore and Indiana Dunes State Park. These two public lands constitute the largest tracts of forest land in the area. Small stream channels and utility clearings within the woods south of the NICTD tracks may serve as minor flight corridors.

Describe Adjacent Properties (e.g. forested, grassland, commercial or residential development, water sources)
The majority of the project area consists of highly developed commercial/industrial land with high density residential neighborhoods. Forestland is fragmented, small in size and typically linear strips along the old Monon railroad line. Grassland is limited to urban recreational corridors along the Monon Trail, maintained areas that are periodically mowed. Water resources are limited to the Grand Calumet River and Little Calumet River and a scattered collection of small, disturbed forested and emergent wetlands in the southern half of the project area.

Proximity to Public Land

What is the distance (mi.) from the project area to forested public lands (e.g., national or state forests, national or state parks, conservation areas, wildlife management areas)?
The project area is adjacent to urban recreation parks and trails.

PHASE 1 SUMMER HABITAT ASSESSMENTS

Use additional sheets to assess discrete habitat types at multiple sites in a project area
Include a map depicting locations of sample sites if assessing discrete habitats at multiple sites in a project area
A single sheet can be used for multiple sample sites if habitat is the same

Sample Site Description

Sample Site No.(s): B01
South terminus – MP 61.54 ditches on west side of CSX railroad
5/9/2017

Water Resources at Sample Site

Stream Type (# and length)	Ephemeral	Intermittent	Perennial	Describe existing condition of water sources: Deep ditch wetland habitat than parallels existing CSX railroad tracks to the east and borders agricultural field to the west.
	None	None	None	
Pools/Ponds (# and size)	None	Open and accessible to bats?		
		NA		
Wetlands (approx. ac.)	Permanent	Seasonal		
	0.85	None		

Forest Resources at Sample Site

Closure/Density	Canopy (>50')	Midstory (20-50')	Understory (<20')	1=1-10%, 2=11-20%, 3=21-40%, 4=41-60% 5=61-80%, 6=81-100%
	3	3	2	
Dominant Species of Mature Trees	silver maple, black willow, eastern cottonwood, and boxelder			
% Trees w/ Exfoliating Bark	0	0	0	
Size Composition of Live Trees (%)	Small (3-8 in)	Med (9-15 in)	Large (>15 in)	
	60	39	1	
No. of Suitable Snags	0	0	0	

Standing dead trees with exfoliating bark, cracks, crevices, or hollows.
Snags without these characteristics area not considered suitable.

IS THE HABITAT SUITABLE FOR INDIANA BATS? No

Additional Comments:
Wooded habitat consists of narrow tree lines on both sides of deep channel ditch. Offers no attractive roost habitat. Wooded channel is generally isolated and does not provide a travel corridor between potential roost habitats in the immediate landscape vicinity.

Attach aerial photo or project site with all forested areas labeled and a general description of the habitat

Photographic Documentation: habitat shots at edge and interior from multiple locations; Understory/midstory/canopy; examples of potential suitable snags and live trees; water sources

Roost B01-1: *Salix sp*., Stage 4/5, 20cm dbh, low roost potential (5/9/2017)

PHASE 1 SUMMER HABITAT ASSESSMENTS

Use additional sheets to assess discrete habitat types at multiple sites in a project area
Include a map depicting locations of sample sites if assessing discrete habitats at multiple sites in a project area
A single sheet can be used for multiple sample sites if habitat is the same

Sample Site Description

Sample Site No.(s): B02
MP 61.91 - MP 62.07 along CSX railroad north of Jenna Drive
5/9/2017

Water Resources at Sample Site

Stream Type (# and length)	Ephemeral	Intermittent	Perennial	Describe existing condition of water sources: Nearest water resources are linear ditch long west side of CSX railroad tracks and large *Phragmites* based wetland less than 0.1 mile to the north.
	None	None	None	
Pools/Ponds (# and size)	None	Open and accessible to bats?		
		NA		
Wetlands (approx. ac.)	Permanent	Seasonal		
	None	None		

Forest Resources at Sample Site

Closure/Density	Canopy (>50')	Midstory (20-50')	Understory (<20')	1=1-10%, 2=11-20%, 3=21-40%, 4=41-60% 5=61-80%, 6=81-100%
	1	3	4	
Dominant Species of Mature Trees	Norway spruce, honey locust, red cedar, white mulberry, eastern cottonwood, Bradford pear, Siberian elm			
% Trees w/ Exfoliating Bark	0	0	0	
Size Composition of Live Trees (%)	Small (3-8 in)	Med (9-15 in)	Large (>15 in)	
	80	19	1	
No. of Suitable Snags	0	0	0	

Standing dead trees with exfoliating bark, cracks, crevices, or hollows.
Snags without these characteristics area not considered suitable.

IS THE HABITAT SUITABLE FOR INDIANA BATS? No

Additional Comments:
Planted and volunteer (native and nonnative) woody species on a linear earthen mound along the east side of CSX railroad tracks adjacent to undeveloped property potentially targeted for residential development.

Attach aerial photo or project site with all forested areas labeled and a general description of the habitat

Photographic Documentation: habitat shots at edge and interior from multiple locations; Understory/midstory/canopy; examples of potential suitable snags and live trees; water sources

PHASE 1 SUMMER HABITAT ASSESSMENTS

Use additional sheets to assess discrete habitat types at multiple sites in a project area
Include a map depicting locations of sample sites if assessing discrete habitats at multiple sites in a project area
A single sheet can be used for multiple sample sites if habitat is the same

Sample Site Description

Sample Site No.(s): B03
MP 62.85 – MP 62.95 North of 45th Street west of abandoned Monon railroad
5/9/2017

Water Resources at Sample Site

Stream Type (# and length)	Ephemeral	Intermittent	Perennial	Describe existing condition of water sources: Limited to minor wetland ditches along both sides of the abandoned railroad track, but larger wetland area present north of the active railroad tracks.
	None	None	None	
Pools/Ponds (# and size)	None	Open and accessible to bats?		
		NA		
Wetlands (approx. ac.)	Permanent	Seasonal		
	None	<0.5		

Forest Resources at Sample Site

Closure/Density	Canopy (>50')	Midstory (20-50')	Understory (<20')	1=1-10%, 2=11-20%, 3=21-40%, 4=41-60% 5=61-80%, 6=81-100%
	3	2	2	
Dominant Species of Mature Trees	eastern cottonwood, silver maple			
% Trees w/ Exfoliating Bark	0	0	0	
Size Composition of Live Trees (%)	Small (3-8 in)	Med (9-15 in)	Large (>15 in)	
	10	90	0	
No. of Suitable Snags	0	0	0	

Standing dead trees with exfoliating bark, cracks, crevices, or hollows.
Snags without these characteristics area not considered suitable.

IS THE HABITAT SUITABLE FOR INDIANA BATS? No

Additional Comments:
No candidate roosts evaluated. Surrounded by commercial/industrial development.

Attach aerial photo or project site with all forested areas labeled and a general description of the habitat

Photographic Documentation: habitat shots at edge and interior from multiple locations;
Understory/midstory/canopy; examples of potential suitable snags and live trees; water sources

PHASE 1 SUMMER HABITAT ASSESSMENTS

Use additional sheets to assess discrete habitat types at multiple sites in a project area
Include a map depicting locations of sample sites if assessing discrete habitats at multiple sites in a project area
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Sample Site Description

Sample Site No.(s): B04
MP 62.98-MP 63.22 north of railroad west of substation
5/9/2017

Water Resources at Sample Site

Stream Type (# and length)	Ephemeral	Intermittent	Perennial	Describe existing condition of water sources: Recently cleared wooded wetland now with mostly common reed.
	None	None	None	
Pools/Ponds (# and size)	None	Open and accessible to bats?		
		NA		
Wetlands (approx. ac.)	Permanent	Seasonal		
	None	>1		

Forest Resources at Sample Site

Closure/Density	Canopy (>50')	Midstory (20-50')	Understory (<20')	1=1-10%, 2=11-20%, 3=21-40%, 4=41-60% 5=61-80%, 6=81-100%
	0	0	0	
Dominant Species of Mature Trees	black willow, white mulberry, eastern cottonwood			
% Trees w/ Exfoliating Bark	0	0	0	
Size Composition of Live Trees (%)	Small (3-8 in)	Med (9-15 in)	Large (>15 in)	
	80	20	0	
No. of Suitable Snags	0	0	0	

Standing dead trees with exfoliating bark, cracks, crevices, or hollows.
Snags without these characteristics area not considered suitable.

IS THE HABITAT SUITABLE FOR INDIANA BATS? No

Additional Comments:
No candidate roosts evaluated along this narrow wooded ditch line between abandoned railroad tracks and golf course.

Attach aerial photo or project site with all forested areas labeled and a general description of the habitat

Photographic Documentation: habitat shots at edge and interior from multiple locations; Understory/midstory/canopy; examples of potential suitable snags and live trees; water sources

PHASE 1 SUMMER HABITAT ASSESSMENTS

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Sample Site Description

Sample Site No.(s): B05
MP 63.25 – MP 63.38 west of abandoned Monon railroad south of Fisher Street
5/10/2017

Water Resources at Sample Site

Stream Type (# and length)	Ephemeral	Intermittent	Perennial	Describe existing condition of water sources: Varying width wooded wetland along west side of abandoned railroad tracks.
	None	None	None	
Pools/Ponds (# and size)	None	Open and accessible to bats?		
		NA		
Wetlands (approx. ac.)	Permanent	Seasonal		
	>0.5	None		

Forest Resources at Sample Site

Closure/Density	Canopy (>50')	Midstory (20-50')	Understory (<20')	1=1-10%, 2=11-20%, 3=21-40%, 4=41-60% 5=61-80%, 6=81-100%
	4	4	6	
Dominant Species of Mature Trees	eastern cottonwood, black willow, buckthorn			
% Trees w/ Exfoliating Bark	0	0	0	
Size Composition of Live Trees (%)	Small (3-8 in)	Med (9-15 in)	Large (>15 in)	
	80	19	1	
No. of Suitable Snags	0	0	0	

Standing dead trees with exfoliating bark, cracks, crevices, or hollows.
Snags without these characteristics area not considered suitable.

IS THE HABITAT SUITABLE FOR INDIANA BATS? No

Additional Comments:
No suitable roost trees and subcanopy displays notable clutter.

Attach aerial photo or project site with all forested areas labeled and a general description of the habitat

Photographic Documentation: habitat shots at edge and interior from multiple locations;
Understory/midstory/canopy; examples of potential suitable snags and live trees; water sources

PHASE 1 SUMMER HABITAT ASSESSMENTS

Use additional sheets to assess discrete habitat types at multiple sites in a project area
Include a map depicting locations of sample sites if assessing discrete habitats at multiple sites in a project area
A single sheet can be used for multiple sample sites if habitat is the same

Sample Site Description

Sample Site No.(s): B06
MP 63.41 – MP 64.08 abandoned Monon railroad between Fisher Street and Ridge Road
6/19/2017

Water Resources at Sample Site

Stream Type (# and length)	Ephemeral	Intermittent	Perennial	Describe existing condition of water sources: Ditch along west side of abandoned tracks only wet for short periods after rain.
	None	None	None	
Pools/Ponds (# and size)	None	Open and accessible to bats?		
		NA		
Wetlands (approx. ac.)	Permanent	Seasonal		
	None	None		

Forest Resources at Sample Site

Closure/Density	Canopy (>50')	Midstory (20-50')	Understory (<20')	1=1-10%, 2=11-20%, 3=21-40%, 4=41-60% 5=61-80%, 6=81-100%
	3	5	6	
Dominant Species of Mature Trees	silver maple, honey locust, willow, Siberian elm, American elm, black walnut, tree-of-heaven, ash			
% Trees w/ Exfoliating Bark	1	0	0	
Size Composition of Live Trees (%)	Small (3-8 in)	Med (9-15 in)	Large (>15 in)	
	74	25	1	
No. of Suitable Snags	0	0	1	

Standing dead trees with exfoliating bark, cracks, crevices, or hollows.
Snags without these characteristics area not considered suitable.

IS THE HABITAT SUITABLE FOR INDIANA BATS? No

Additional Comments:
Environmental landscape setting in high density residential land use, lack of water resources and limit roost opportunities is not conducive to Indiana bat and northern long-eared bat habitation.

Attach aerial photo or project site with all forested areas labeled and a general description of the habitat

Photographic Documentation: habitat shots at edge and interior from multiple locations;
Understory/midstory/canopy; examples of potential suitable snags and live trees; water sources

Roost B06-1: *Salix sp*., Stage 2, 94, 71, 63cm dbh, low roost potential (6/19/2017)

PHASE 1 SUMMER HABITAT ASSESSMENTS

Use additional sheets to assess discrete habitat types at multiple sites in a project area
Include a map depicting locations of sample sites if assessing discrete habitats at multiple sites in a project area
A single sheet can be used for multiple sample sites if habitat is the same

Sample Site Description

Sample Site No.(s): B07

MP 64.16 – MP 64.41 abandoned Monon railroad between Ridge Road and Broadmoor Street
5/10/2017

Water Resources at Sample Site

Stream Type (# and length)	Ephemeral	Intermittent	Perennial	Describe existing condition of water sources: No water resources in vicinity
	None	None	None	
Pools/Ponds (# and size)	None	Open and accessible to bats?		
		NA		
Wetlands (approx. ac.)	Permanent	Seasonal		
	None	None		

Forest Resources at Sample Site

Closure/Density	Canopy (>50')	Midstory (20-50')	Understory (<20')	1=1-10%, 2=11-20%, 3=21-40%, 4=41-60% 5=61-80%, 6=81-100%
	4	5	4	
Dominant Species of Mature Trees	black walnut, cottonwood, boxelder, black locust, Siberian elm			
% Trees w/ Exfoliating Bark	0	1	1	
Size Composition of Live Trees (%)	Small (3-8 in)	Med (9-15 in)	Large (>15 in)	
	70	28	2	
No. of Suitable Snags	0	0	0	

Standing dead trees with exfoliating bark, cracks, crevices, or hollows.
Snags without these characteristics area not considered suitable.

IS THE HABITAT SUITABLE FOR INDIANA BATS? No

Additional Comments:
Exclusively urban residential setting.

Attach aerial photo or project site with all forested areas labeled and a general description of the habitat

Photographic Documentation: habitat shots at edge and interior from multiple locations;
Understory/midstory/canopy; examples of potential suitable snags and live trees; water sources

Roost B07-1: *Ulmus pumila*, Stage 3, 20cm dbh, low roost potential (5/3/2017)

Roost B07-2: *Robinia pseudoacacia*, Stage 3, 20cm dbh, low roost potential (5/3/2017)

Roost B07-3: unknown snag, Stage 3/4, 35cm dbh, low roost potential (5/3/2017)

Roost B07-4: *Populus deltoides*, Stage 2/3, 66cm dbh, low roost potential (5/3/2017)

Roost B07-5: unknown snag, Stage 3, 15cm dbh, low roost potential (5/3/2017)

Roost B07-6: *Acer negundo*, Stage 3, 23cm dbh, low roost potential (5/3/2017)

PHASE 1 SUMMER HABITAT ASSESSMENTS

Use additional sheets to assess discrete habitat types at multiple sites in a project area
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A single sheet can be used for multiple sample sites if habitat is the same

Sample Site Description

Sample Site No.(s): B08

MP 64.43 – MP 64.88 abandoned Monon railroad between Broadmoor Street and Gregory Street
5/3/2017

Water Resources at Sample Site

Stream Type (# and length)	Ephemeral	Intermittent	Perennial	Describe existing condition of water sources: Small ditch wetland along abandoned railroad. Little Calumet River with limited riparian cover to the east.
	None	None	None	
Pools/Ponds (# and size)	None	Open and accessible to bats?		
		NA		
Wetlands (approx. ac.)	Permanent	Seasonal		
	None	0.1		

Forest Resources at Sample Site

Closure/Density	Canopy (>50')	Midstory (20-50')	Understory (<20')	1=1-10%, 2=11-20%, 3=21-40%, 4=41-60% 5=61-80%, 6=81-100%
	4	5	5	
Dominant Species of Mature Trees	sugar maple, tree-of-heaven, hackberry, red oak, Siberian elm, green ash, bur oak,			
% Trees w/ Exfoliating Bark	0	1	1	
Size Composition of Live Trees (%)	Small (3-8 in)	Med (9-15 in)	Large (>15 in)	
	70	29	1	
No. of Suitable Snags	0	1	0	

Standing dead trees with exfoliating bark, cracks, crevices, or hollows.
Snags without these characteristics area not considered suitable.

IS THE HABITAT SUITABLE FOR INDIANA BATS? Yes, but low suitability

Additional Comments:
Small cluster of stage 3 snags in wetland at north end of woodland strip is considered to have potential for roost, but very low, due to its proximity to Little Calumet River.

Attach aerial photo or project site with all forested areas labeled and a general description of the habitat

Photographic Documentation: habitat shots at edge and interior from multiple locations; Understory/midstory/canopy; examples of potential suitable snags and live trees; water sources

Roost B08-1: *Acer negundo*, Stage 4, 27cm dbh, low roost potential (5/3/2017)

Roost B08-2: *Acer negundo*, Stage 3/4, 21 & 25cm dbh, low roost potential (5/3/2017)

Roost B08-3: *Acer negundo*, Stage 3, 21cm dbh, low roost potential (5/3/2017)

Roost B08-4: *Acer negundo*, Stage 4, 23cm dbh, low roost potential (5/3/2017)

Roost B08-5: unknown snag, Stage 3/4, 45cm dbh, moderate roost potential (5/3/2017)

Roost B08-6: *Ulmus americana*, Stage 3/4, 21cm dbh, low roost potential (5/3/2017)

Roost B08-7: *Ulmus americana*, Stage 3/4, 21cm dbh, low roost potential (5/3/2017)

Roost B08-8: unknown snag, Stage 3, 34cm dbh, low roost potential (5/3/2017)

Roost B08-9: *Ulmus americana*, Stage 3, 23cm dbh, low roost potential (5/3/2017)

PHASE 1 SUMMER HABITAT ASSESSMENTS

Use additional sheets to assess discrete habitat types at multiple sites in a project area
Include a map depicting locations of sample sites if assessing discrete habitats at multiple sites in a project area
A single sheet can be used for multiple sample sites if habitat is the same

Sample Site Description

Sample Site No.(s): B09
MP 65.06 – MP 65.30 east of Lyman Avenue between I-80 and 174th Street
5/2/2017 & 6/19/2017

Water Resources at Sample Site

Stream Type (# and length)	Ephemeral	Intermittent	Perennial	Describe existing condition of water sources: Shallow wetland along west side of woods. Little Calumet River to the west within 50 meters of woods and to the south of I-80.
	None	None	None	
Pools/Ponds (# and size)	None	Open and accessible to bats?		
		NA		
Wetlands (approx. ac.)	Permanent	Seasonal		
	None	<0.5		

Forest Resources at Sample Site

Closure/Density	Canopy (>50')	Midstory (20-50')	Understory (<20')	1=1-10%, 2=11-20%, 3=21-40%, 4=41-60% 5=61-80%, 6=81-100%
	5	5	6	
Dominant Species of Mature Trees	Siberian elm, eastern cottonwood, green ash, American elm, tree-of-heaven, black walnut, black willow, silver maple			
% Trees w/ Exfoliating Bark	10	5	5	
Size Composition of Live Trees (%)	Small (3-8 in)	Med (9-15 in)	Large (>15 in)	
	50	30	20	
No. of Suitable Snags	0	3	0	

Standing dead trees with exfoliating bark, cracks, crevices, or hollows.
Snags without these characteristics area not considered suitable.

IS THE HABITAT SUITABLE FOR INDIANA BATS? No

Additional Comments:
Despite the presence of a few low quality candidate roost trees, the urban environmental setting, poor connection to water resources, and subcanopy clutter do not provide suitable habitat for the Indiana bat and/or the northern long-eared bat.

Attach aerial photo or project site with all forested areas labeled and a general description of the habitat

Photographic Documentation: habitat shots at edge and interior from multiple locations; Understory/midstory/canopy; examples of potential suitable snags and live trees; water sources

Roost B09-2: *Ulmus sp*., Stage 4, 29 dbh, moderate roost potential (6/19/2017)

Roost B09-4: *Ailanthus altissima*, Stage 3, 25cm dbh, moderate roost potential (6/19/2017)

Roost B09-8: *Acer negundo*, Stage 3, 25cm dbh, moderate roost potential (6/19/2017)

Roost B09-9: *Ulmus sp*., Stage 3, 21cm dbh, low roost potential (6/19/2017)

Roost B09-12: *Ailanthus altissima*, Stage 3, 11cm dbh, low roost potential (5/2/2017)

Roost B09-13: *Ailanthus altissima*, Stage 3, 9cm dbh, low roost potential (5/2/2017)

PHASE 1 SUMMER HABITAT ASSESSMENTS

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Include a map depicting locations of sample sites if assessing discrete habitats at multiple sites in a project area
A single sheet can be used for multiple sample sites if habitat is the same

Sample Site Description

Sample Site No.(s): B10
MP 65.43 – MP 65.53 between 173rd Street and 169th Street
5/1/2017

Water Resources at Sample Site

Stream Type (# and length)	Ephemeral	Intermittent	Perennial	Describe existing condition of water sources: Two small isolated seasonal wetlands within woods.
	None	None	None	
Pools/Ponds (# and size)	None	Open and accessible to bats?		
		NA		
Wetlands (approx. ac.)	Permanent	Seasonal		
	None	0.5		

Forest Resources at Sample Site

Closure/Density	Canopy (>50')	Midstory (20-50')	Understory (<20')	1=1-10%, 2=11-20%, 3=21-40%, 4=41-60% 5=61-80%, 6=81-100%
	3	4	3	
Dominant Species of Mature Trees	eastern cottonwood, black walnut, willow, silver maple, green ash, boxelder			
% Trees w/ Exfoliating Bark	0	1	0	
Size Composition of Live Trees (%)	Small (3-8 in)	Med (9-15 in)	Large (>15 in)	
	60	40	0	
No. of Suitable Snags	0	0	0	

Standing dead trees with exfoliating bark, cracks, crevices, or hollows.
Snags without these characteristics area not considered suitable.

IS THE HABITAT SUITABLE FOR INDIANA BATS? No

Additional Comments:
A few stage 2 and 3 snags were present, but none offered suitable roosting potential. Woodland area is isolated in an urban setting.

Attach aerial photo or project site with all forested areas labeled and a general description of the habitat

Photographic Documentation: habitat shots at edge and interior from multiple locations; Understory/midstory/canopy; examples of potential suitable snags and live trees; water sources

Roost B10-1: unknown snag, Stage 3, 17cm dbh, low roost potential (5/1/2017)

Roost B10-2: *Fraxinus pennsylvanica*, Stage 3, 15cm dbh, low roost potential (5/1/2017)

Roost B10-3: *Salix sp*., Stage 3, 27cm dbh, low roost potential (5/1/2017)

Roost B10-4: *Acer negundo*, Stage 3, 23cm dbh, low roost potential (5/1/2017)

PHASE 1 SUMMER HABITAT ASSESSMENTS

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Sample Site Description

Sample Site No.(s): B11
MP 65.56 – MP 65.90 between 173rd Street and 169th Street
5/1/2017

Water Resources at Sample Site

Stream Type (# and length)	Ephemeral	Intermittent	Perennial	Describe existing condition of water sources:
	None	None	None	
Pools/Ponds (# and size)	None	Open and accessible to bats?		
		NA		
Wetlands (approx. ac.)	Permanent	Seasonal		
	None	None		

Forest Resources at Sample Site

Closure/Density	Canopy (>50')	Midstory (20-50')	Understory (<20')
	5	3	2
Dominant Species of Mature Trees	eastern cottonwood, green ash, boxelder, tree-of-heaven		
% Trees w/ Exfoliating Bark	1	1	0
Size Composition of Live Trees (%)	Small (3-8 in)	Med (9-15 in)	Large (>15 in)
	60	35	5
No. of Suitable Snags	0	0	1

Standing dead trees with exfoliating bark, cracks, crevices, or hollows.
Snags without these characteristics area not considered suitable.

IS THE HABITAT SUITABLE FOR INDIANA BATS? No

Additional Comments:
16 potential candidate stage 1 through stage 5 snags evaluated, but only one considered to have moderate potential for roost. Landscape setting is generally not suited for Indiana bat occupancy.

Attach aerial photo or project site with all forested areas labeled and a general description of the habitat

Photographic Documentation: habitat shots at edge and interior from multiple locations; Understory/midstory/canopy; examples of potential suitable snags and live trees; water sources

Roost B11-1: *Fraxinus pennsylvanica*, Stage 1, 37cm dbh, low roost potential (5/1/2017)

Roost B11-2: unknown snag, Stage 5, 31cm dbh, low roost potential (5/1/2017)

Roost B11-3: *Ulmus americana*, Stage 3, 23cm dbh, low roost potential (5/1/2017)

Roost B11-4: *Ailanthus altissima*, Stage 3/5, 23cm dbh, low roost potential (5/1/2017)

Roost B11-5: *Ailanthus altissima*, Stage 3/5, 16cm dbh, low roost potential (5/1/2017)

Roost B11-6: *Ailanthus altissima*, Stage 3, 19cm dbh, low roost potential (5/1/2017)

Roost B11-7: *Ailanthus altissima*, Stage 3/5, 22cm dbh, low roost potential (5/1/2017)

Roost B11-8: *Acer negundo*, Stage 3/4, 37cm dbh, low roost potential (5/1/2017)

Roost B11-9: *Populus deltoides*, Stage 5, 50cm dbh, low roost potential (5/1/2017)

Roost B11-10: *Acer negundo*, Stage 4, 27cm dbh, low roost potential (5/1/2017)

Roost B11-11: *Acer negundo*, Stage 3/4, 25cm dbh, low roost potential (5/1/2017)

Roost B11-12: *Ulmus americana*, Stage 3, 64cm dbh, moderate roost potential (5/1/2017)

Roost B11-13: *Acer negundo*, Stage 3, 80cm dbh, low roost potential (5/1/2017)

Roost B11-14: *Populus deltoides*, Stage 3, 70cm dbh, low roost potential (5/1/2017)

Roost B11-15: *Populus deltoides*, Stage 3, 44cm dbh, low roost potential (5/1/2017)

Roost B11-16: *Populus deltoides*, Stage 2, 42cm dbh, low roost potential (5/1/2017)

PHASE 1 SUMMER HABITAT ASSESSMENTS

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A single sheet can be used for multiple sample sites if habitat is the same

Sample Site Description

Sample Site No.(s): B12
MP 67.55 – MP 67.73 between Doty Street and Douglas Street
4/28/2017

Water Resources at Sample Site

Stream Type (# and length)	Ephemeral	Intermittent	Perennial	Describe existing condition of water sources:
	None	None	None	
Pools/Ponds (# and size)	None	Open and accessible to bats?		
		NA		
Wetlands (approx. ac.)	Permanent	Seasonal		
	None	None		

Forest Resources at Sample Site

Closure/Density	Canopy (>50')	Midstory (20-50')	Understory (<20')	1=1-10%, 2=11-20%, 3=21-40%, 4=41-60% 5=61-80%, 6=81-100%
	4	3	2	
Dominant Species of Mature Trees	eastern cottonwood, black walnut, Siberian elm, boxelder, white mulberry, silver maple			
% Trees w/ Exfoliating Bark	0	0	0	
Size Composition of Live Trees (%)	Small (3-8 in)	Med (9-15 in)	Large (>15 in)	
	70	30	0	
No. of Suitable Snags	0	0	0	

Standing dead trees with exfoliating bark, cracks, crevices, or hollows.
Snags without these characteristics area not considered suitable.

IS THE HABITAT SUITABLE FOR INDIANA BATS? No

Additional Comments:
No candidate roost trees evaluated. Landscape setting is entirely urban with no connectivity to water resources.

Attach aerial photo or project site with all forested areas labeled and a general description of the habitat

Photographic Documentation: habitat shots at edge and interior from multiple locations; Understory/midstory/canopy; examples of potential suitable snags and live trees; water sources

PHASE 1 SUMMER HABITAT ASSESSMENTS

Use additional sheets to assess discrete habitat types at multiple sites in a project area
Include a map depicting locations of sample sites if assessing discrete habitats at multiple sites in a project area
A single sheet can be used for multiple sample sites if habitat is the same

Sample Site Description

Sample Site No.(s): B13
MP 68.47 – MP 68.48 north side of Grand Calumet River west of Hohman Avenue
5/2/2017

Water Resources at Sample Site

Stream Type (# and length)	Ephemeral	Intermittent	Perennial	Describe existing condition of water sources: Immediately adjacent to Grand Calumet River approximately 40 feet in width.
	None	None	120 ft	
Pools/Ponds (# and size)	None	Open and accessible to bats?		
		NA		
Wetlands (approx. ac.)	Permanent	Seasonal		
	None	None		

Forest Resources at Sample Site

Closure/Density	Canopy (>50')	Midstory (20-50')	Understory (<20')	1=1-10%, 2=11-20%, 3=21-40%, 4=41-60% 5=61-80%, 6=81-100%
	0	1	4	
Dominant Species of Mature Trees	boxelder, tree-of-heaven, white mulberry			
% Trees w/ Exfoliating Bark	0	0	0	
Size Composition of Live Trees (%)	Small (3-8 in)	Med (9-15 in)	Large (>15 in)	
	80	20	0	
No. of Suitable Snags	0	0	0	

Standing dead trees with exfoliating bark, cracks, crevices, or hollows.
Snags without these characteristics area not considered suitable.

IS THE HABITAT SUITABLE FOR INDIANA BATS? No

Additional Comments:
No candidate roost trees evaluated. Landscape setting is narrow riparian edge along north side of Grand Calumet River in highly developed urban area of Hammond.

Attach aerial photo or project site with all forested areas labeled and a general description of the habitat

Photographic Documentation: habitat shots at edge and interior from multiple locations; Understory/midstory/canopy; examples of potential suitable snags and live trees; water sources

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Appendix D. Woodland Habitat Candidate Bat Roost Tree Evaluation

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Appendix D NICTD West Lake Woodland Habitat Candidate Bat Roost Tree Evaluation

Habitat Unit ID	Roost ID	Number of Trees	Species	dbh (cm)	Stage of Decay	Roost Potential	Comments
B01	B03-1	1	*Salix sp.*	20	4/5	none/low	
B02	No candidate bat roost trees evaluated						
B03	No candidate bat roost trees evaluated						
B04	No candidate bat roost trees evaluated						
B05	No candidate bat roost trees evaluated						
B06	B06-1	3	*Salix sp.*	94,71,63	2	none/low	multi-trunk
B07	B07-1	1	*Ulmus pumila*	20	3	none/low	
	B07-2	1	*Robinia pseudoacacia*	20	3	none/low	
	B07-3	1	*unknown*	35	3/4	none/low	
	B07-4	1	*Populus deltoides*	66	2/3	none/low	
	B07-5	1	*unknown*	15	3	none/low	
	B07-6	1	*Acer negundo*	23	3	none/low	
B08	B08-01	1	*Acer negundo*	27	4	none/low	
	B08-02	2	*Acer negundo*	21,25	3/4	none/low	multi-trunk
	B08-03	1	*Acer negundo*	21	3	none/low	
	B08-04	1	*Acer negundo*	23	4	none/low	
	B08-05	1	*unknown*	45	3/4	moderate	
	B08-06	1	*Ulmus americana*	34	3/4	none/low	
	B08-07	1	*Ulmus americana*	21	3/4	none/low	
	B08-08	1	*unknown*	34	3	none/low	
	B08-09	1	*Ulmus americana*	23	3	none/low	
B09	B09-01	2	*unknown*	38,43	5	none/low	multi-trunk; no photo
	B09-02	1	*Ulmus sp.*	29	4	moderate	
	B09-03	1	*Fraxinus sp.*	37	3	none/low	no photo
	B09-04	1	*Ailanthus altissima*	25	3	moderate	
	B09-05	1	*Acer negundo*	12	3	none/low	no photo
	B09-06	1	*Acer negundo*	17	3	none/low	no photo
	B09-07	1	*Acer negundo*	9	3	none/low	no photo
	B09-08	1	*Acer negundo*	25	3	moderate	
	B09-09	1	*Ulmus sp.*	21	3	none/low	

Appendix D NICTD West Lake Woodland Habitat Candidate Bat Roost Tree Evaluation

Habitat Unit ID	Roost ID	Number of Trees	Species	dbh (cm)	Stage of Decay	Roost Potential	Comments
	B09-10	1	*Populus deltoides*	86	2	none/low	no photo
	B09-11	1	*Fraxinus sp.*	34	3	none/low	no photo
	B09-12	1	*Ailanthus altissima*	11	3	none/low	
	B09-13	1	*Ailanthus altissima*	9	3	none/low	
B10	B10-01	1	*unknown*	17	3	none/low	
	B10-02	1	*Fraxinus pennsylvanica*	15	2	none/low	
	B10-03	1	*Salix sp.*	27	3	none/low	
	B10-04	1	*Acer negundo*	23	3	none/low	
B11	B11-01	1	*Fraxinus pennsylvanica*	37	1	none/low	
	B11-02	1	*Unknown*	31	5	none/low	
	B11-03	1	*Ulmus americana*	23	3	none/low	
	B11-04	1	*Ailanthus altissima*	23	3/5	none/low	
	B11-05	1	*Ailanthus altissima*	16	3/5	none/low	
	B11-06	1	*Ailanthus altissima*	19	3	none/low	
	B11-07	1	*Ailanthus altissima*	22	3/5	none/low	
	B11-08	1	*Acer negundo*	37	3/4	none/low	
	B11-09	1	*Populus deltoides*	50	5	none/low	
	B11-10	1	*Acer negundo*	27	4	none/low	
	B11-11	1	*Acer negundo*	25	3/4	none/low	
	B11-12	1	*Ulmus americana*	64	3	moderate	
	B11-13	1	*Acer negundo*	80	3	none/low	
	B11-14	1	*Populus deltoides*	70	3	none/low	
	B11-15	1	*Populus deltoides*	44	3	none/low	
	B11-16	1	*Populus deltoides*	42	2	none/low	
B12	No candidate bat roost trees evaluated						
B13	No candidate bat roost trees evaluated						

Appendix E. Summary of Woodland Habitat Unit Evaluation for Bat Roosting

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Appendix E Summary of NICTD West Lake Woodland Habitat Unit Evaluation for Bat Roosting

Habitat Unit ID	Stationing Limits	Environmental Survey Area (acres)	Project Footprint Area (acres)	Dominant Composition	Candidate Roosts Evaluated			Roost Habitat Potential
					Low Roost Potential	Moderate Roost Potential	Good Roost Potential	
B01	south-61.54 Ditches west of CSX railroad	1.83	1.64	silver maple, black willow, eastern cottonwood, and boxelder	1			None
B02	61.91-62.07 Along CSX north of Jenna Drive	1.35	1.35	Norway spruce, honey locust, red cedar, white mulberry, eastern cottonwood, Bradford pear, Siberian elm				None
B03	62.85-62.95 North of 45th Street west of abandoned Monon railroad	0.71	0.30	eastern cottonwood, silver maple				None
B04	62.98-63.22 North of railroad west of substation	0.50	0.31	Black willow, white mulberry, eastern cottonwood				None
B05	63.25-63.38 West of abandoned Monon railroad south of Fisher Street	0.54	0.08	eastern cottonwood, black willow, buckthorn				None
B06	63.41-64.08 Abandoned Monon railroad between Fisher Street and Ridge Road	2.56	2.23	silver maple, honey locust, willow, Siberian elm, American elm, black walnut, tree-of-heaven, ash	1			None
B07	64.16-64.41 Abandoned Monon railroad between Ridge Road and Broadmoor Street	0.97	0.71	black walnut, cottonwood, boxelder, black locust, Siberian elm	6			None
B08	64.43-64.88 Abandoned Monon railroad between Broadmoor Street and Gregory Street	1.85	1.69	sugar maple, tree-of-heaven, hackberry, red oak, Siberian elm, green ash, bur oak,	8	1		Low
B09	65.06-65.30 East of Lyman Avenue between I-80 and 174th Street	6.25	4.25	Siberian elm, eastern cottonwood, green ash, American elm, tree-of-heaven, black walnut, black willow, silver maple	10	3		Low
B10	65.43-65.53 Between 173rd Street and 169th Street	0.88	0.00	eastern cottonwood, black walnut, willow, silver maple, green ash, boxelder	4			None
B11	65.56-65.90 Between 173rd Street and 169th Street	4.68	2.27	eastern cottonwood, green ash, boxelder, tree-of-heaven	15	1		Low
B12	67.55-67.73 Between Doty Street and Douglas Street	0.99	0.87	eastern cottonwood, black walnut, Siberian elm, boxelder, white mulberry, silver maple				None
B13	68.47-68.48 North bank of Grand Calumet River	0.17	0.10	boxelder, tree-of-heaven, white mulberry				None
Total		23.28	15.79		45	5	0	

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Appendix F. Project Photographs

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Woodland Unit B01 (5/9/2017)

Woodland Unit B02 (5/9/2017)

Woodland Unit B03 (5/9/2017)

Woodland Unit B04 – left side of photograph (5/4/2017)

Woodland Unit B05 (5/9/2017)

Woodland Unit B06 (5/3/2017)

Woodland Unit B07 (5/3/2017)

Woodland Unit B08 (5/3/2017)

Woodland Unit B09 (6/19/2017)

Woodland Unit B10 (5/1/2017)

Woodland Unit B11 (5/1/2017)

Woodland Unit B12 (4/28/2017)

Woodland Unit B13 (5/2/2017)

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Appendix G. Forest Plot Inventory Worksheets

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NICTD West Lake Project Forest Plot Inventory Worksheet

Forest Plot #F1			Date/Time: May 10, 2017 8:30 AM						
Stationing: MP 65.77 – MP 65.85			Location: south of 169th Street						
Plot Area: 1.2429 acre			Sub-Canopy Density: Moderate						
Species	Diameter breast height (dbh)			Stage of Decay					
	15 to <23cm 6 to <9 in.	23 to <45cm 9 to <18 in.	≥45cm ≥18 in.	1	2	3	4	5	6
Acer negundo	23	13	1	21	6	7	1	1	1
Acer saccharinum	7	1	1	9	0	0	0	0	0
Ailanthus altissima	11	8	0	18	0	0	0	0	1
Fraxinius pennsylvanica	5	7	0	8	1	3	0	0	0
Juglans nigra	4	8	1	13	0	0	0	0	0
Morus alba	25	7	0	31	0	0	1	0	0
Populus deltoides	2	19	20	38	2	1	0	0	0
Prunus serotina	0	1	0	1	0	0	0	0	0
Ulmus americana	5	9	2	12	2	0	2	0	0
Ulmus pumila	15	26	4	39	4	2	0	0	0
Unknown	2	2	0	0	0	0	0	3	1
Total	99	101	29	190	15	13	4	4	3
	229								
Density (#/acre)	80	81	23	153	12	11	3	3	2
	184								

Facing south from north end of plot

Facing north from south end of plot

Species	Common name	dbh (cm)	Stage of Decay
Acer negundo	box elder	15	1
Acer negundo	box elder	16	3
Acer negundo	box elder	17	1
Acer negundo	box elder	17	1
Acer negundo	box elder	17	1
Acer negundo	box elder	17	2
Acer negundo	box elder	17	3
Acer negundo	box elder	18	1
Acer negundo	box elder	18	1
Acer negundo	box elder	19	1
Acer negundo	box elder	19	1
Acer negundo	box elder	19	3
Acer negundo	box elder	19	3
Acer negundo	box elder	19	6
Acer negundo	box elder	20	1
Acer negundo	box elder	20	1
Acer negundo	box elder	20	3
Acer negundo	box elder	20	3
Acer negundo	box elder	21	1
Acer negundo	box elder	21	1
Acer negundo	box elder	22	1
Acer negundo	box elder	22	1
Acer negundo	box elder	22	1
Acer negundo	box elder	23	1
Acer negundo	box elder	23	1
Acer negundo	box elder	24	1
Acer negundo	box elder	24	2
Acer negundo	box elder	26	2
Acer negundo	box elder	27	1
Acer negundo	box elder	27	4
Acer negundo	box elder	28	5
Acer negundo	box elder	29	1
Acer negundo	box elder	31	2
Acer negundo	box elder	32	2
Acer negundo	box elder	33	2
Acer negundo	box elder	36	1
Acer negundo	box elder	78	3
Acer saccharinum	silver maple	15	1
Acer saccharinum	silver maple	16	1
Acer saccharinum	silver maple	16	1
Acer saccharinum	silver maple	17	1
Acer saccharinum	silver maple	18	1
Acer saccharinum	silver maple	19	1
Acer saccharinum	silver maple	21	1
Acer saccharinum	silver maple	36	1
Acer saccharinum	silver maple	48	1
Ailanthus altissima	tree-of-heaven	15	1
Ailanthus altissima	tree-of-heaven	16	6
Ailanthus altissima	tree-of-heaven	17	1
Ailanthus altissima	tree-of-heaven	17	1
Ailanthus altissima	tree-of-heaven	17	1
Ailanthus altissima	tree-of-heaven	17	1

Species	Common name	dbh (cm)	Stage of Decay
Ailanthus altissima	tree-of-heaven	20	1
Ailanthus altissima	tree-of-heaven	20	1
Ailanthus altissima	tree-of-heaven	21	1
Ailanthus altissima	tree-of-heaven	21	1
Ailanthus altissima	tree-of-heaven	22	1
Ailanthus altissima	tree-of-heaven	24	1
Ailanthus altissima	tree-of-heaven	25	1
Ailanthus altissima	tree-of-heaven	28	1
Ailanthus altissima	tree-of-heaven	28	1
Ailanthus altissima	tree-of-heaven	33	1
Ailanthus altissima	tree-of-heaven	34	1
Ailanthus altissima	tree-of-heaven	38	1
Ailanthus altissima	tree-of-heaven	42	1
Fraxinus pennsylvanica	green ash	16	3
Fraxinus pennsylvanica	green ash	17	1
Fraxinus pennsylvanica	green ash	18	1
Fraxinus pennsylvanica	green ash	18	3
Fraxinus pennsylvanica	green ash	21	1
Fraxinus pennsylvanica	green ash	24	3
Fraxinus pennsylvanica	green ash	25	1
Fraxinus pennsylvanica	green ash	26	1
Fraxinus pennsylvanica	green ash	27	2
Fraxinus pennsylvanica	green ash	29	1
Fraxinus pennsylvanica	green ash	30	1
Fraxinus pennsylvanica	green ash	36	1
Juglans nigra	black walnut	19	1
Juglans nigra	black walnut	19	1
Juglans nigra	black walnut	21	1
Juglans nigra	black walnut	22	1
Juglans nigra	black walnut	23	1
Juglans nigra	black walnut	23	1
Juglans nigra	black walnut	26	1
Juglans nigra	black walnut	26	1
Juglans nigra	black walnut	31	1
Juglans nigra	black walnut	31	1
Juglans nigra	black walnut	35	1
Juglans nigra	black walnut	38	1
Juglans nigra	black walnut	46	1
Morus alba	white mulberry	15	1
Morus alba	white mulberry	15	1
Morus alba	white mulberry	15	1
Morus alba	white mulberry	15	1
Morus alba	white mulberry	15	1
Morus alba	white mulberry	16	1
Morus alba	white mulberry	16	1
Morus alba	white mulberry	16	1
Morus alba	white mulberry	17	1
Morus alba	white mulberry	17	1
Morus alba	white mulberry	17	1
Morus alba	white mulberry	17	1
Morus alba	white mulberry	18	1
Morus alba	white mulberry	18	1

Species	Common name	dbh (cm)	Stage of Decay
Morus alba	white mulberry	18	1
Morus alba	white mulberry	18	1
Morus alba	white mulberry	20	1
Morus alba	white mulberry	21	1
Morus alba	white mulberry	21	1
Morus alba	white mulberry	21	1
Morus alba	white mulberry	21	4
Morus alba	white mulberry	22	1
Morus alba	white mulberry	22	1
Morus alba	white mulberry	22	1
Morus alba	white mulberry	22	1
Morus alba	white mulberry	23	1
Morus alba	white mulberry	23	1
Morus alba	white mulberry	24	1
Morus alba	white mulberry	26	1
Morus alba	white mulberry	27	1
Morus alba	white mulberry	30	1
Morus alba	white mulberry	39	1
Populus deltoides	eastern cottonwood	21	1
Populus deltoides	eastern cottonwood	21	1
Populus deltoides	eastern cottonwood	23	1
Populus deltoides	eastern cottonwood	27	1
Populus deltoides	eastern cottonwood	27	1
Populus deltoides	eastern cottonwood	28	2
Populus deltoides	eastern cottonwood	29	1
Populus deltoides	eastern cottonwood	32	1
Populus deltoides	eastern cottonwood	33	1
Populus deltoides	eastern cottonwood	34	1
Populus deltoides	eastern cottonwood	37	1
Populus deltoides	eastern cottonwood	37	1
Populus deltoides	eastern cottonwood	38	1
Populus deltoides	eastern cottonwood	38	1
Populus deltoides	eastern cottonwood	39	1
Populus deltoides	eastern cottonwood	39	1
Populus deltoides	eastern cottonwood	40	1
Populus deltoides	eastern cottonwood	41	1
Populus deltoides	eastern cottonwood	42	1
Populus deltoides	eastern cottonwood	44	1
Populus deltoides	eastern cottonwood	44	1
Populus deltoides	eastern cottonwood	47	1
Populus deltoides	eastern cottonwood	48	2
Populus deltoides	eastern cottonwood	52	1
Populus deltoides	eastern cottonwood	54	1
Populus deltoides	eastern cottonwood	54	1
Populus deltoides	eastern cottonwood	57	1
Populus deltoides	eastern cottonwood	58	1
Populus deltoides	eastern cottonwood	60	1
Populus deltoides	eastern cottonwood	62	1
Populus deltoides	eastern cottonwood	68	1
Populus deltoides	eastern cottonwood	68	1
Populus deltoides	eastern cottonwood	68	1
Populus deltoides	eastern cottonwood	70	3

Species	Common name	dbh (cm)	Stage of Decay
Populus deltoides	eastern cottonwood	74	1
Populus deltoides	eastern cottonwood	75	1
Populus deltoides	eastern cottonwood	76	1
Populus deltoides	eastern cottonwood	78	1
Populus deltoides	eastern cottonwood	80	1
Populus deltoides	eastern cottonwood	80	1
Populus deltoides	eastern cottonwood	82	1
Prunus serotina	black cherry	31	1
Ulmus americana	American elm	17	1
Ulmus americana	American elm	17	1
Ulmus americana	American elm	18	1
Ulmus americana	American elm	18	1
Ulmus americana	American elm	20	1
Ulmus americana	American elm	24	1
Ulmus americana	American elm	24	1
Ulmus americana	American elm	27	1
Ulmus americana	American elm	28	4
Ulmus americana	American elm	31	1
Ulmus americana	American elm	31	2
Ulmus americana	American elm	34	1
Ulmus americana	American elm	40	1
Ulmus americana	American elm	42	2
Ulmus americana	American elm	49	1
Ulmus americana	American elm	63	4
Ulmus pumila	Siberian elm	15	1
Ulmus pumila	Siberian elm	15	1
Ulmus pumila	Siberian elm	16	1
Ulmus pumila	Siberian elm	17	1
Ulmus pumila	Siberian elm	18	1
Ulmus pumila	Siberian elm	18	1
Ulmus pumila	Siberian elm	19	1
Ulmus pumila	Siberian elm	19	1
Ulmus pumila	Siberian elm	20	1
Ulmus pumila	Siberian elm	20	2
Ulmus pumila	Siberian elm	21	1
Ulmus pumila	Siberian elm	21	1
Ulmus pumila	Siberian elm	21	1
Ulmus pumila	Siberian elm	22	1
Ulmus pumila	Siberian elm	22	2
Ulmus pumila	Siberian elm	23	1
Ulmus pumila	Siberian elm	24	1
Ulmus pumila	Siberian elm	25	1
Ulmus pumila	Siberian elm	25	1
Ulmus pumila	Siberian elm	26	1
Ulmus pumila	Siberian elm	27	1
Ulmus pumila	Siberian elm	28	1
Ulmus pumila	Siberian elm	29	1
Ulmus pumila	Siberian elm	29	1
Ulmus pumila	Siberian elm	29	1
Ulmus pumila	Siberian elm	29	1
Ulmus pumila	Siberian elm	29	1
Ulmus pumila	Siberian elm	30	1

Species	Common name	dbh (cm)	Stage of Decay
Ulmus pumila	Siberian elm	31	1
Ulmus pumila	Siberian elm	31	1
Ulmus pumila	Siberian elm	31	3
Ulmus pumila	Siberian elm	32	1
Ulmus pumila	Siberian elm	32	1
Ulmus pumila	Siberian elm	37	1
Ulmus pumila	Siberian elm	38	1
Ulmus pumila	Siberian elm	38	1
Ulmus pumila	Siberian elm	38	1
Ulmus pumila	Siberian elm	39	1
Ulmus pumila	Siberian elm	40	1
Ulmus pumila	Siberian elm	41	1
Ulmus pumila	Siberian elm	43	2
Ulmus pumila	Siberian elm	45	1
Ulmus pumila	Siberian elm	48	1
Ulmus pumila	Siberian elm	58	3
Ulmus pumila	Siberian elm	63	2
Unknown		18	5
Unknown		22	5
Unknown		26	6
Unknown		28	5

NICTD West Lake Project Forest Plot Inventory Worksheet

Forest Plot #F2			Date/Time: May 10, 2017 12:00 PM						
Stationing: MP 65.49 – MP 65.53			Location: north of 173rd Street						
Plot Area: 0.3008 acre			Sub-Canopy Density: open and moderate						
Species	Diameter breast height (dbh)			Stage of Decay					
	15 to <23cm 6 to <9 in.	23 to <45cm 9 to <18 in.	≥45cm ≥18 in.	1	2	3	4	5	6
Acer negundo	1	5	0	6	0	0	0	0	0
Acer saccharinum	5	0	0	5	0	0	0	0	0
Ailanthus altissima	1	0	0	0	0	1	0	0	0
Catalpa speciosa	4	0	0	4	0	0	0	0	0
Fraxinus pennsylvanica	2	0	0	2	0	0	0	0	0
Juglans nigra	8	1	0	8	0	0	0	0	1
Morus alba	7	3	0	10	0	0	0	0	0
Populus deltoides	6	11	2	18	0	0	0	0	1
Salix nigra	1	11	0	8	2	0	1	0	1
Ulmus pumila	2	2	0	4	0	0	0	0	0
Total	37	33	2	65	2	1	1	0	3
	72								
Density (#/acre)	123	109	7	216	7	3	3	0	10
	239								

Facing east from north end of plot

Facing north from south end of plot

Species	Common name	dbh (cm)	Stage of Decay
Acer negundo	box elder	21	1
Acer negundo	box elder	23	1
Acer negundo	box elder	24	1
Acer negundo	box elder	27	1
Acer negundo	box elder	27	1
Acer negundo	box elder	35	1
Acer saccharinum	silver maple	15	1
Acer saccharinum	silver maple	15	1
Acer saccharinum	silver maple	16	1
Acer saccharinum	silver maple	18	1
Acer saccharinum	silver maple	22	1
Ailanthus altissima	tree-of-heaven	18	3
Catalpa speciosa	catalpa	16	1
Catalpa speciosa	catalpa	16	1
Catalpa speciosa	catalpa	17	1
Catalpa speciosa	catalpa	20	1
Fraxinus pennsylvanica	green ash	16	1
Fraxinus pennsylvanica	green ash	16	1
Juglans nigra	black walnut	15	1
Juglans nigra	black walnut	15	1
Juglans nigra	black walnut	16	1
Juglans nigra	black walnut	17	6
Juglans nigra	black walnut	18	1
Juglans nigra	black walnut	18	1
Juglans nigra	black walnut	18	1
Juglans nigra	black walnut	18	1
Juglans nigra	black walnut	25	1
Morus alba	white mulberry	16	1
Morus alba	white mulberry	17	1
Morus alba	white mulberry	19	1
Morus alba	white mulberry	20	1
Morus alba	white mulberry	20	1
Morus alba	white mulberry	21	1
Morus alba	white mulberry	21	1
Morus alba	white mulberry	26	1
Morus alba	white mulberry	27	1
Morus alba	white mulberry	30	1
Populus deltoides	eastern cottonwood	16	1
Populus deltoides	eastern cottonwood	17	1
Populus deltoides	eastern cottonwood	17	1
Populus deltoides	eastern cottonwood	18	6
Populus deltoides	eastern cottonwood	20	1
Populus deltoides	eastern cottonwood	22	1
Populus deltoides	eastern cottonwood	25	1
Populus deltoides	eastern cottonwood	26	1
Populus deltoides	eastern cottonwood	28	1
Populus deltoides	eastern cottonwood	28	1
Populus deltoides	eastern cottonwood	28	1
Populus deltoides	eastern cottonwood	30	1
Populus deltoides	eastern cottonwood	31	1
Populus deltoides	eastern cottonwood	32	1
Populus deltoides	eastern cottonwood	34	1

Species	Common name	dbh (cm)	Stage of Decay
Populus deltoides	eastern cottonwood	39	1
Populus deltoides	eastern cottonwood	41	1
Populus deltoides	eastern cottonwood	45	1
Populus deltoides	eastern cottonwood	47	1
Salix nigra	black willow	18	6
Salix nigra	black willow	23	1
Salix nigra	black willow	26	1
Salix nigra	black willow	26	1
Salix nigra	black willow	27	2
Salix nigra	black willow	27	2
Salix nigra	black willow	28	4
Salix nigra	black willow	32	1
Salix nigra	black willow	33	1
Salix nigra	black willow	40	1
Salix nigra	black willow	41	1
Salix nigra	black willow	42	1
Ulmus pumila	Siberian elm	17	1
Ulmus pumila	Siberian elm	23	1
Ulmus pumila	Siberian elm	27	1
Ulmus pumila	Siberian elm	30	1

NICTD West Lake Project Forest Plot Inventory Worksheet

Forest Plot #F3			Date/Time: June 19, 2017 1:00 PM						
Stationing: MP 65.10 – MP 65.29			Location: north of I-80						
Plot Area: 1.2956 acre			Sub-Canopy Density: closed						
Species	Diameter breast height (dbh)			Stage of Decay					
	15 to <23cm 6 to <9 in.	23 to <45cm 9 to <18 in.	≥45cm ≥18 in.	1	2	3	4	5	6
Acer negundo	4	0	0	2	0	1	1	0	0
Acer saccharinum	1	2	0	3	0	0	0	0	0
Ailanthus altissima	1	1	0	2	0	0	0	0	0
Fraxinus pennsylvanica	10	13	0	12	9	2	0	0	0
Juglans nigra	1	4	0	5	0	0	0	0	0
Morus alba	4	0	0	4	0	0	0	0	0
Populus deltoides	13	26	8	46	1	0	0	0	0
Salix nigra	2	0	0	2	0	0	0	0	0
Ulmus americana	5	2	0	6	1	0	0	0	0
Ulmus pumila	26	21	1	44	3	0	1	0	0
Unknown	2	0	0	0	1	0	1	0	0
Total	69	69	9	126	15	3	3	0	0
	147								
Density (#/acre)	53	53	7	97	12	2	2	0	0
	113								

Facing north from southern portion of woods

Facing south from northern portion of woods

Species	Common name	dbh (cm)	Stage of Decay
Acer negundo	boxelder	19	3
Acer negundo	boxelder	21	1
Acer negundo	boxelder	22	4
Acer negundo	boxelder	22	1
Acer saccharinum	silver maple	22	1
Acer saccharinum	silver maple	23	1
Acer saccharinum	silver maple	24	1
Ailanthus altissima	tree-of-heaven	19	1
Ailanthus altissima	tree-of-heaven	24	1
Fraxinus pennsylvanica	green ash	15	1
Fraxinus pennsylvanica	green ash	18	2
Fraxinus pennsylvanica	green ash	18	1
Fraxinus pennsylvanica	green ash	19	2
Fraxinus pennsylvanica	green ash	19	1
Fraxinus pennsylvanica	green ash	19	1
Fraxinus pennsylvanica	green ash	19	1
Fraxinus pennsylvanica	green ash	20	1
Fraxinus pennsylvanica	green ash	20	2
Fraxinus pennsylvanica	green ash	21	1
Fraxinus pennsylvanica	green ash	25	1
Fraxinus pennsylvanica	green ash	27	2
Fraxinus pennsylvanica	green ash	27	2
Fraxinus pennsylvanica	green ash	28	1
Fraxinus pennsylvanica	green ash	28	2
Fraxinus pennsylvanica	green ash	30	2
Fraxinus pennsylvanica	green ash	33	1
Fraxinus pennsylvanica	green ash	33	2
Fraxinus pennsylvanica	green ash	33	1
Fraxinus pennsylvanica	green ash	34	3
Fraxinus pennsylvanica	green ash	35	1
Fraxinus pennsylvanica	green ash	37	2
Fraxinus pennsylvanica	green ash	39	3
Juglans nigra	black walnut	20	1
Juglans nigra	black walnut	23	1
Juglans nigra	black walnut	23	1
Juglans nigra	black walnut	25	1
Juglans nigra	black walnut	25	1
Morus alba	white mulberry	17	1
Morus alba	white mulberry	17	1
Morus alba	white mulberry	19	1
Morus alba	white mulberry	21	1
Populus deltoides	eastern cottonwood	16	1
Populus deltoides	eastern cottonwood	17	1
Populus deltoides	eastern cottonwood	17	1
Populus deltoides	eastern cottonwood	17	1
Populus deltoides	eastern cottonwood	17	1
Populus deltoides	eastern cottonwood	18	1
Populus deltoides	eastern cottonwood	18	1
Populus deltoides	eastern cottonwood	19	1
Populus deltoides	eastern cottonwood	19	1
Populus deltoides	eastern cottonwood	20	1
Populus deltoides	eastern cottonwood	20	1

Species	Common name	dbh (cm)	Stage of Decay
Populus deltoides	eastern cottonwood	20	1
Populus deltoides	eastern cottonwood	22	1
Populus deltoides	eastern cottonwood	23	1
Populus deltoides	eastern cottonwood	23	1
Populus deltoides	eastern cottonwood	24	1
Populus deltoides	eastern cottonwood	24	1
Populus deltoides	eastern cottonwood	25	1
Populus deltoides	eastern cottonwood	25	1
Populus deltoides	eastern cottonwood	26	1
Populus deltoides	eastern cottonwood	26	1
Populus deltoides	eastern cottonwood	26	1
Populus deltoides	eastern cottonwood	26	1
Populus deltoides	eastern cottonwood	27	1
Populus deltoides	eastern cottonwood	29	1
Populus deltoides	eastern cottonwood	29	1
Populus deltoides	eastern cottonwood	30	1
Populus deltoides	eastern cottonwood	32	1
Populus deltoides	eastern cottonwood	33	1
Populus deltoides	eastern cottonwood	33	1
Populus deltoides	eastern cottonwood	33	1
Populus deltoides	eastern cottonwood	34	1
Populus deltoides	eastern cottonwood	34	1
Populus deltoides	eastern cottonwood	35	1
Populus deltoides	eastern cottonwood	37	1
Populus deltoides	eastern cottonwood	39	1
Populus deltoides	eastern cottonwood	40	1
Populus deltoides	eastern cottonwood	41	1
Populus deltoides	eastern cottonwood	42	1
Populus deltoides	eastern cottonwood	46	1
Populus deltoides	eastern cottonwood	47	1
Populus deltoides	eastern cottonwood	48	1
Populus deltoides	eastern cottonwood	50	1
Populus deltoides	eastern cottonwood	86	2
Populus deltoides	eastern cottonwood	110	1
Populus deltoides	eastern cottonwood	135	1
Populus deltoides	eastern cottonwood	159	1
Salix nigra	black willow	17	1
Salix nigra	black willow	19	1
Ulmus americana	American elm	15	3
Ulmus americana	American elm	18	1
Ulmus americana	American elm	22	1
Ulmus americana	American elm	22	1
Ulmus americana	American elm	22	1
Ulmus americana	American elm	25	1
Ulmus americana	American elm	39	1
Ulmus pumila	Siberian elm	15	1
Ulmus pumila	Siberian elm	16	1
Ulmus pumila	Siberian elm	16	1
Ulmus pumila	Siberian elm	16	1
Ulmus pumila	Siberian elm	16	1
Ulmus pumila	Siberian elm	16	1
Ulmus pumila	Siberian elm	17	1

Species	Common name	dbh (cm)	Stage of Decay
Ulmus pumila	Siberian elm	17	1
Ulmus pumila	Siberian elm	17	1
Ulmus pumila	Siberian elm	17	1
Ulmus pumila	Siberian elm	17	1
Ulmus pumila	Siberian elm	17	1
Ulmus pumila	Siberian elm	18	1
Ulmus pumila	Siberian elm	18	1
Ulmus pumila	Siberian elm	18	4
Ulmus pumila	Siberian elm	18	1
Ulmus pumila	Siberian elm	19	1
Ulmus pumila	Siberian elm	19	1
Ulmus pumila	Siberian elm	20	2
Ulmus pumila	Siberian elm	20	1
Ulmus pumila	Siberian elm	20	1
Ulmus pumila	Siberian elm	21	2
Ulmus pumila	Siberian elm	21	1
Ulmus pumila	Siberian elm	22	1
Ulmus pumila	Siberian elm	22	1
Ulmus pumila	Siberian elm	22	1
Ulmus pumila	Siberian elm	24	1
Ulmus pumila	Siberian elm	25	1
Ulmus pumila	Siberian elm	25	1
Ulmus pumila	Siberian elm	25	2
Ulmus pumila	Siberian elm	25	1
Ulmus pumila	Siberian elm	25	1
Ulmus pumila	Siberian elm	25	1
Ulmus pumila	Siberian elm	26	1
Ulmus pumila	Siberian elm	26	1
Ulmus pumila	Siberian elm	29	1
Ulmus pumila	Siberian elm	29	1
Ulmus pumila	Siberian elm	29	1
Ulmus pumila	Siberian elm	30	1
Ulmus pumila	Siberian elm	31	1
Ulmus pumila	Siberian elm	31	1
Ulmus pumila	Siberian elm	33	1
Ulmus pumila	Siberian elm	39	1
Ulmus pumila	Siberian elm	40	1
Ulmus pumila	Siberian elm	41	1
Ulmus pumila	Siberian elm	42	1
Ulmus pumila	Siberian elm	42	1
Ulmus pumila	Siberian elm	47	1
Unknown		18	2
Unknown		21	4

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Appendix H. Lochmueller Group Staff Résumés

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Rusty Yeager

Senior Field Biologist – Senior Associate

Rusty is an expert Environmental Biologist and author of several articles for scientific journals. His work includes EAs, EISs, field studies in aquatic and terrestrial ecosystems, and floral/faunal investigations. In addition he is a noise and farmland specialist. He has completed numerous wetland delineations for state, county and local government entities in accordance with the USACE Wetland Delineation Manual Technical Report Y-87-1.

Rusty also acts as an Environmental Permit Manager for Kentucky. In this role he coordinates and monitors environmental permitting for all Lochmueller Group projects in Kentucky, serving as central point of contact for reviewing agencies. Rusty previously worked as Assistant Laboratory Manager for Toxicology and Pathology Services, Inc., where his responsibilities included maintenance, handling, and treatment of a variety of mammalian laboratory animals ranging from mice to two species of primates. As Study Manager, he provided oversight and execution of study events, administration of test materials via various routes, maintenance of study data, and monitoring of the study population for toxicological effects, all in accordance with strict USDA and FDA guidelines. Other duties included performing necropsy prosections at study termination, and personnel management.

As a Biologist Aide with the Indiana Department of Natural Resources Fisheries Biologist Aide at the Sugar Ridge (formerly Patoka) Fish & Wildlife Area, he assisted the property's Fisheries Biologist in conducting fish population estimates (growth analysis), limnology tests (dissolved oxygen, thermocline, etc.), creel surveys, and in implementing aquatic weed control measures. Emphasis was placed on the management of reclaimed coal stripper pits for the purpose of recreational sport fishing. Additional lake studies included Hoosier National Forest Lake, Scales Lake, Garvin Park Lake, as well as several other Southwestern Indiana lakes.

REPRESENTATIVE PROJECT EXPERIENCE

National Environmental Protection Act Training for INDOT – Class Leader responsible for presenting at INDOT's 5-day seminar to engineering consultants and others covering the basics of NEPA regulations. Responsible for developing subject materials and presenting on several topics: 1) noise impacts; and 2) farmland impacts. 2011

Electrofishing for Coal Mine Permit, Noble County, Ohio for Central Ohio Coal Company – Subconsultant responsible for performing electro-shocking for fish sampling on two streams.

Tier 2 EIS, I-69, Evansville to Indianapolis, for INDOT – As a Senior Biologist for this effort comprising six EISs, conducted numerous quantitative and qualitative aquatic and terrestrial samples (e.g., stream assessments such as QHEI and HHEI, wetland assessments (such as INWRAP) and mist netted for the bats (especially the Indiana bat) throughout the 142-mile corridor, largely on new terrain. He was also responsible for the review of biological survey reports and interpretation of ecological data as it applies to various species and their habitats; management and coordination of farmland impact evaluations; oversight of noise analysis modeling; identification of assessment methods; oversight and review of wetland delineation and identification; and ecological assessments for all six EISs. He developed and conducted training programs for all consultants involved in water resources evaluations, as well as review agencies involved to ensure consistent application of assessment methods and inclusion of agency considerations. To date RODs have been received on Sections 1- 5. As a result, he is now heavily involved in supervising and conducting radio-telemetry and pre- and post-construction monitoring for the Indiana bat in Sections 1, 2, and 3. 2004–Present

On-Call Environmental Services for INDOT, Crawfordsville District – Contract Manager responsible for assigning and overseeing work orders including development of CEs and supplemental documentation, natural resource assessments (streams and wetlands), Section 106 issues, Section 4(f), Section 6(f) issues, coordinating with agencies, and preliminary permitting activities.

WITH THE FIRM
Since 1992

YEARS OF EXPERIENCE
27

EDUCATION
BS, Biology, University of Southern Indiana, Evansville, Indiana, 1987

REGISTRATION
Scientific Purpose:

Indiana

CERTIFICATION
Indiana Scientific Purposes License (1992 to Present)

Kentucky Scientific Wildlife Collecting Permit (1994-2009)

Georgia Scientific Collecting Permit (2013)

USFWS Region 3 Indiana/Gray Bat Federal Fish & Wildlife Permit TE06845A-1 (2010 to Present)

USFWS Region 4 Indiana/Gray Bat Federal Fish & Wildlife Permit (2013)

OSHA Confined Space Entry

INDUSTRY ASSOCIATION
Indiana Academy of Science

Kentucky Academy of Science

Society of Wetland Scientists

Midwest Bat Working Group

- **CE, US 136 Partial 3-R, Waynetown for INDOT, Crawfordsville District** – Project Manager for environmental services related to pavement rehabilitation and sidewalks that included historic structure evaluation and documentation of potential impacts for application of the Section 106 Minor Projects Programmatic Agreement. Potential hazardous materials issues were also addressed due to USTs. (DES 0501067)
- **CE, US 52 Pavement Replacement for INDOT, Crawfordsville District** – Project Manager responsible for completing field reconnaissance and environmental coordination, including Section 106 Minor Projects Programmatic Agreement analysis and hazardous materials coordination relative to USTs and an active rail yard. Public lands were also reviewed for potential Section 4(f) applicability. (DES 0100699)
- **CE, SR 267 Reconstruction, Brownsburg for INDOT, Crawfordsville District** – Project Manager responsible for field reconnaissance and environmental coordination including Section 4(f) applicability review for Arbuckle Acres Park and for initial coordination with park staff regarding mitigation concerns. Section 106 coordination with INDOT Central Office that has included Section 106 analysis for multiple National Register Properties adjacent to the project. A stream assessment was also completed. (DES 9608920)

On-Call Wetland Services for INDOT, Central Office – Contract Manager responsible for assigning, overseeing, and/or managing more than 25 work orders statewide from 2008 to present. Projects assigned include:

- **Auburn Rest Area (I-69) Wetland Mitigation Design Re-Evaluation for INDOT, Central Office** – Project Manager for wetland mitigation site re-evaluation and design modification prior to letting. Site designs included excavation and planting plans and specifications. 2009-11
- **SR 62, Nord Wetland Site, Warrick County for INDOT, Central Office** – Project Manager for 5th year wetland monitoring and delineation of a 45-acre mitigation site. Assessment of vegetation, hydrology and soil conditions concluded that site was meeting the required performance standards. 2009
- **SR 3, Lemon Wetland Mitigation Bank Site, Noble County for INDOT, Central Office** – Project Manager for wetland delineation and Floristic Quality Assessment of constructed wetland site proposed for use as a wetland mitigation bank by INDOT mitigation credits. 2009
- **SR 66, Big Creek Wetland Remediation Design for INDOT, Vincennes District** – Project Manager for assessment of existing wetland conditions and design of remediation action to increase the size of the wetland to meet the target mitigation criteria required under the Section 401 and 404 permits issued for the Big Creek overflow bridge construction. 2010
- **SR 237, Anderson River Bank Stabilization & Enhancement Remedial Action Plan, Perry & Spencer Counties for INDOT, Central Office** – Project Manager for coordination of activities required to prepare remediation plans to correct erosion problems on a stream mitigation site that does not currently meet performance standards. Activities include review of corrective action plans and unique special provisions developed by another consultant, coordination with state and federal permitting agencies, coordination with easement property owners and preparation of all documentation required by contracts to let the project. 2009-present
- **SR 237 Anderson River Bank Stabilization & Enhancement 4th Year Stream Mitigation Monitoring for INDOT, Central Office** – Project Manager overseeing and reviewing 4th year monitoring report prepared by others. 2010
- **SR 246 Fish Creek Tributary Relocation, Owen County for INDOT, Central Office** – Project Manager responsible for managing construction oversight performed by others for the relocation of 287 feet of stream channel, plus 300 feet of channel from a roadside drainage facility. Activities also included post construction evaluation of vegetation survival and recommendation for corrective action needed for the eroding roadside stream that developed immediately after construction. 2010 to present
- **SR 25 (Hoosier Heartland Highway) Improvements Wetland & Stream Mitigation, Tippecanoe & Carroll Counties for INDOT, Central Office** – Project Manager providing resource assessment and mitigation planning for bioengineering the bank stabilization effort and used natural channel design restoration techniques to relocate two Robinson Branch tributary streams. Included overall evaluation of the water resources identified to be impacted by this project, and completed habitat assessments for coordination with the permitting agencies and benchmarking for the ultimate mitigation success criteria. The water resources assessments completed for the project included Qualitative Habitat Evaluation Index (QHEI) for larger streams, Primary

Headwater Habitat Evaluation Index (HHEI) for small tributaries (<1 mi.^{2} drainage area), and Indiana Wetland Rapid Assessment Protocol (INWRAP) for all wetlands. The Stream and Wetland Mitigation and Monitoring Plan included wetland restoration and enhancement, stream restoration, riparian enhancement and major bank stabilization elements. The wetland mitigation included extensive enhancement of degraded fens at Prophetstown State Park as well as tile drain elimination to restore hydrology to a previously drained area within the Wabash River floodplain area. During construction of the mitigation projects, on-call consultation has been provided to INDOT and the contractor concerning the proper construction of the mitigation facilities. 2010 to present

- **SR 3, Freeman Farm Wetland Mitigation Site, Noble County, Indiana for INDOT, Central Office** – Project Manager and Field Investigator for wetland delineation, wetland determination documentation and Floristic Quality Assessment of constructed wetland site proposed for use as a wetland mitigation bank by INDOT mitigation credits. 2010-11
- **SR 44, Flatrock River Wetland Mitigation 5th Year Monitoring, Rush County for INDOT, Central Office** – Project Manager for 5th year wetland monitoring and delineation, Floristic Quality Assessment, and coordination with IDEM and USACE on approval of the site and release from future monitoring. 2010-11
- **I-74, Batesville Wetland Mitigation 5th Year Monitoring, Ripley County for INDOT, Central Office** – Project Manager for 5th year wetland monitoring and delineation, Floristic Quality Assessment, and coordination with IDEM and USACE on approval of this 6-acre site and release from future monitoring 2010-11
- **US 24 Wolfe Mitigation Bank Site, Miami County for INDOT, Central Office** – Project Manager providing oversight of herbicide treatments performed by others to control invasive species and meet performance standards required for IDEM and USACE acceptance as a mitigation bank. 2010
- **US 24 Sperry Wetland, Miami County for INDOT, Central Office** – Project Manager providing oversight of herbicide treatments performed by others to control invasive species and meet performance standards required for IDEM Section 401 and USACE Section 404 permit requirements. 2010
- **SR 145, Hurricane Creek Wetland Mitigation 2nd Year Monitoring, Perry County for INDOT, Central Office** – Project Manager for 2nd year wetland monitoring and Floristic Quality Assessment of this 2.5-acre site. Monitoring identified the need for continued invasive species control and recommended additional remediation plantings to correct high tree mortality and greater than acceptable open water habitat coverage. 2010
- **SR 641, Terre Haute Stream Mitigation 1st Monitoring, Vigo County for INDOT, Central Office** – Project Manager for 1st year monitoring evaluation of stream channel construction, wet meadow development and planted riparian zone development adjacent to Little Honey Creek. Provided oversight of stream channel monitoring by others and conducted Floristic Quality Assessment study for the stream channels, wet meadows and riparian habitats. 2010
- **SR 641, Terre Haute Wetland Mitigation Site, Vigo County for INDOT, Central Office** – Project Manager for 3rd year monitoring of a 149 acre mitigation site that included 90 acres of plantings. 2010
- **Statewide Monitoring Well Installation, Gibson, Miami, St. Joseph & Noble Counties for INDOT, Central Office** – Involved purchase of material and installation of six groundwater monitoring wells at four wetland. Water level data loggers were also deployed at each well. Data from the loggers was downloaded and analyzed to assess hydrology conditions for each site. 2010-11
- **SR145, Hurricane Creek Wetland, Perry County for INDOT, Central Office** – Project Manager oversight of herbicide treatments performed by others to control invasive species that had become established and exceed the success criteria performance standards in the Section 401 and 404 permits. 2010
- **US 231, Chrisney Lake Wetland Remediation, Spencer County, for INDOT, Vincennes Office** – Project Manager providing remediation plan consultation and remediation construction oversight. Heavy rain events in September 2009 resulted in notable sediment transport from the US231 construction site and deposition into a stream and wetland associated with Chrisney Lake. The extent of the sediment deposition was delineated and coordination with INDOT, the contractor, IDEM, USACE, and local officials was conducted to determine the appropriate measures to mitigate for the discharge. Prepared remediation plan with multiple options and provided oversight during the remediation which involved mechanical removal of the material with light machinery. 2009-11

- **SR 66, After-the-Fact Mitigation Design, Warrick County, for INDOT, Vincennes Office** – Project Manager responsible for all activities related to securing a suitable wetland mitigation site impacts to approximately 2 acres of forest and emergent wetlands associated with improvements to SR 66 east of Newburgh. Activities include identification and alternatives analysis for multiple potential sites, delineation of existing wetlands, coordination with IDEM and USACE on site selection, property owner coordination, NEPA documentation, mitigation design, bid package preparation, Construction in Floodway permit, if applicable, and acquisition or conservation easement acquisition. 2010 to 2015
- **SR 641, Terre Haute Stream Mitigation 2nd through 5th Year Monitoring, Vigo County for INDOT, Central Office** – Project Manager for continued monitoring of stream channel construction, wet meadow development and planted riparian zone development adjacent to Little Honey Creek. Provided oversight of stream channel monitoring and herbicide treatments performed by others and conducted Floristic Quality Assessment study for the stream channels, wet meadows and riparian habitats. 2011-15
- **SR 641, Terre Haute Wetland Mitigation Site, Vigo County for INDOT, Central Office** – Project Manager for 4th and 5th year monitoring of a 149 acre mitigation site that included 90 acres of plantings. As a result of the delineation of existing wetlands conducted in 2011, additional monitoring has been suspended since the site does not appear to meet the acreage requirements for the multiple phases of the SR 641 project. 2011.
- **SR 145, Hurricane Creek Wetland Mitigation 3rd through 5th Year Monitoring, Perry County for INDOT, Central Office** – Project Manager for continued wetland monitoring and Floristic Quality Assessment of this 2.5-acre site. In 2011 this included oversight of multiple herbicide treatments performed by others and coordination on remediation plantings of trees and herbaceous plugs performed by others. 2011 to 2013
- **US 24 Wolfe Wetland Mitigation Bank, Miami County for INDOT, for Central Office** – Project Manager and Field Investigator responsible for wetland delineation/documentation and assessment of tree/shrub survival success and invasive species cover for this proposed INDOT mitigation bank. Provided oversight for multiple herbicide treatments performed by others and assessment of effectiveness. 2011
- **US 24 Sperry Wetland, Miami County, for INDOT, Central Office** – Project Manager and Field Investigator responsible for delineation of developing forest habitat and assessment of invasive species cover for this proposed INDOT mitigation bank. Provided oversight for multiple herbicide treatments performed by others, as well as. 2011
- **US 24 Bonar Wetland, Cass County, for INDOT, Central Office** – Project Manager and field investigator responsible for assessment of invasive species cover and delineation of invasive species problem areas for this mitigation site. Provided oversight and assessed effectiveness of multiple herbicide treatments performed by others. 2011

US 68/KY 80 Trail, Land Between the Lakes (LBL) for Kentucky Transportation Cabinet (KYTC) – Conducted field reconnaissance for a proposed bike/pedestrian trail to be constructed through the LBL National Recreation Area. Associated with proposed highway improvements, this trail traverses LBL from east to west, crossing the Cumberland River/Tennessee River watershed divide including some rugged terrain. Provided cycling input on the potential route and potential combinations/variations on trail designs ranging from AASHTO standards to USDA National Forest Service trail standards, to address the terrain issues. 2008

I-65 to US 31W Connector Study, Bowling Green for KYTC – Senior Field Biologist responsible for research and conducting field studies, preparing ecological baseline study, and EIS chapters for a connector roadway between I-65 and US 31W. The study area was within a well-developed karst plain comprised of sinkholes and caves. Completed a Biological Assessment, conducted Section 7 consultation, and assisted with public involvement. Specific field tasks included an inventory of flora (including specific searches for the federally-listed Eggert's sunflower), small mammal trapping (237 trap-nights in multiple habitat types), and wetland delineations. Also included fall harp trapping at two cave entrances and summer mist netting at two potential maternity roosting sites, to survey for gray bats and/or Indiana bats, to facilitate a Biological Assessment. The survey resulted in the capture of three male gray bats, red bats, and eastern pipistrelles. Major considerations included sinkholes, caves, groundwater quality, the Mammoth Cave Shrimp, and historic resources. A Secondary and Cumulative Impact Analysis was also completed. 2008

EIS, I-69, Evansville, Indiana to Henderson, Kentucky for INDOT & KYTC – Senior Field Biologist responsible for an Ecological Assessment baseline study and assisted in completing the EIS. Provided input on possible mitigation efforts to address bike/pedestrian impacts, including the potential for a dedicated bike/pedestrian facility on the proposed Ohio River crossing bridge, which would provide connectivity between Kentucky's Audubon State Park and Indiana's Angel Mounds State Historic Site and their

respective trail systems. Also completed a review of potential bike/pedestrian impacts, including coordination with the public and local cycling groups on existing and proposed bike routes associated with dedicated bike/pedestrian facilities and other transportation facilities as well. This portion of the highway would begin in Indiana at Green River Road and continues south across the Ohio River and its floodplain, then connecting to the Pennyrile Parkway south of Henderson, Kentucky. The EIS was performed to identify the purpose and need for the project; conduct an alternative's analysis; identify environmental consequences; and propose mitigation measures. Major considerations were the Indiana bat (mist netting showed a pregnant female); wetlands; a bridge crossing; the proposed Green River National Wildlife Refuge; Green River State Forest; Henderson Landfill; bald eagle and blue heron rookeries; and an historic home razed during this project. 2005

Tier 1 EIS, I-69, Evansville to Indianapolis for INDOT – Noise Impact Specialist and Senior Biologist responsible for field surveys for homes and businesses in five final routes; research and writing the farmland impacts and noise analysis sections of the Draft EIS; and assisting in planning a highly successful 2-day tour for environmental review agencies. As part of this study, he managed and conducted extensive quantitative and qualitative ecological sampling for plants and animals for agency review, i.e., 250 plant species from 70 families were identified: no Threatened, Endangered and Sensitive plant species were observed. Biological assessments were completed for numerous mammal, reptile, amphibian, fish, mussel, and bird species. In addition, questionnaires on location, hydrology, soils, vegetation, and animals were completed for over 230 wetland and riparian habitats. His responsibilities included interpretation of ecological data collected and managing all studies on species and their habitats to completion. A ROD was received on March 24, 2004 and, in 2005, the EIS was recognized by the National Cooperative Highway Research Program study as one of the Top 10 NEPA documents in the nation and cited as an example of "best practice." 2004

EIS, US 31 Plymouth to South Bend, St. Joseph & Marshall Counties for INDOT – Senior Field Biologist responsible for coordinating field work, sampling perennial stream sites, and identifications and calculations of IBI and diversity indices for this segment of the US 31 study area, approximately 20 miles long by 10 miles wide, running from the southern terminus at US 30, near Plymouth, to the northern terminus at US 20 near South Bend, which resulted in a Record of Decision in 2006. He also conducted bat surveys in conjunction with another firm. Similarly, he coordinated with the NRCS on farmed wetlands and helped address the project's many other ecological considerations with agencies and others. The project was applauded for locating the roadway following sustainability concepts. 2004

EA, Bert T. Combs Mountain Parkway (KY 114) Reconstruction & Widening, Salyersville to Prestonsburg for KYTC – Senior Field Biologist responsible for study to evaluate upgrading existing KY 114 for approximately 21 miles. Major considerations included wetlands, forests, Middle Creek National Battlefield, stream crossings and water quality, residential and commercial relocations, and a 4(f) issue on a "death house." Unique to this project was a Community Impact Assessment and the development of Kentucky's first Public Involvement Plan and Public Involvement Action Plan which included four Community Impact Assessment Meetings. FONSI received March 4, 2003

KY 7 Reconstruction, KY 706 to Carter County Line, Elliott County for KYTC – Senior Field Biologist responsible for noise analysis at eight locations and evaluation of abatement feasibility along the proposed reconstruction of KY 7 from north of KY 706 to the Carter County Line. 2003

Noise Analysis Baseline Studies for KYTC – This contract involved noise analysis to determine highway-generated noise impacts according to FHWA guidelines. Included ambient field measurements and employed the STAMINA/OPTIMA 2.0 model to predict and compare design year highway noise levels at several rural and urban sites for multiple alternates. Each study also discussed the reasonableness and feasibility of potential noise abatement measures when the FHWA criteria for impacts had been met. Projects included:

- KY 114 from Salyersville to near Prestonsburg, Magoffin & Floyd Counties, 2003
- US 460, Menifee County, 2002
- KY 519 at Morehead, Rowan County, 1999

I-65 Noise Barrier Analysis, West 62nd Street to Springs Road for INDOT – Project Manager responsible for highway noise impacts and to evaluate the potential to abate any such highway noise impacts. 2002

I-465 Noise Barrier Analysis, Pendleton Pike to I-69 Interchange for INDOT – Project Manager for a noise impact analysis and abatement barrier evaluation along I-465 on the east side of Indianapolis between Pendleton Pike and Fall Creek. This interstate is heavily traveled and has many high density neighborhoods (single- and multi-family) and businesses along its course. Four noise

barrier segments were recommended totaling 2.6 miles at an estimated cost of $3.9 million that would benefit an estimated 173 residences. 2002

I-69 Noise Barrier Evaluation, Abiote Center Road to Covington Road for INDOT – Project Manager responsible for assessment of effectiveness of existing barrier walls along the east and west side of I-69 at Fort Wayne. TNM 2.5 models were created to replicate the existing barriers, roadways and receptors in the area and evaluate the predicted insertion loss expected to occur in the design year. The analysis concluded that a portion of the barrier was too low to provide a minimum 5dBA insertion loss for a small group of residences west of the interstate and provided a recommendation to raise the barrier height by as much as 5 feet to increase the effectiveness of the structure. 2010

Northfield Drive Highway Noise Analysis, Hendricks County, for Town of Brownsburg – Project Manager responsible for collecting ambient noise level data and TNM 2.5 assessment of predicted noise levels associated with proposed road reconstruction and design year traffic forecast in accordance with INDOT Traffic Noise Analysis Procedure. Analysis concluded that no highway noise impacts are anticipated within this mixed residential/commercial land use suburban area of Brownsburg. No abatement measures were required to be evaluation. 2011

Georgetown Road Highway Noise Analysis, Marion County, for City of Indianapolis – Project Manager responsible for collecting ambient noise level data oversight on TNM 2.5 assessment of predicted noise levels associated with reconstruction of Georgetown Road from 56th Street to 62nd Street in an area of high density residential (single family residence subdivisions and three apartment complexes) and commercial use. Analysis concluded that that a limited number of impacts were anticipated for the proposed reconstruction in the design year, but that abatement in the form of barrier wall construction was not feasible since the City of Indianapolis does not restrict access control along this portion of Georgetown Road. 2011

EA, KY 7 Reconstruction, Sandy Hook to Memory Gardens Cemetery, Elliott County for KYTC – Project Manager responsible for environmental documentation including baseline studies and the EA for the proposed reconstruction and widening of a 1.6-mile section of KY 7 in south-central Elliott County of eastern Kentucky. The project began in Sandy Hook and proceeded through Bell City to end just north of the Elliott County Memory Gardens Cemetery. 2000

EA, US 460, Frenchburg Hill to West Liberty Road, Menifee County for KYTC – Senior Field Biologist responsible for evaluating impacts of upgrading existing US 460 for approximately 4 miles. Major considerations included kudzu, relocation of a lumber company, residential relocations, a Civil War cemetery, an unmarked cemetery in Mariba, a stream relocation, the crossing of the Daniel Boone National Forest trail, and a big tree candidate. 2000

EA, KY 519 Roadway Design & Environmental Studies, Rowan County for KYTC – Senior Field Biologist responsible for completion of a socio-economic baseline study for this project that studied upgrading roadway for approximately 6 miles. Major considerations included the crossing of Tripplett and Morgan creeks, residential relocations, and floodplain encroachments. In addition, a historic train station and junkyard were included along with a trailer park and 4(f) impact to a Forest Ranger Station. A Community Impact Assessment was completed as was a 4(f) Programmatic Statement. The study reported population, housing, income, poverty, and employment demographics for the county and project area; profiled manufacturing, retail trade, recreation, agriculture, education, transportation, property taxes, local government, and community development within the county; and accessed probable impacts relating to land use, transportation, compatibility with other projects, neighborhood and community disruption, prime farmland, residential relocations, environmental justice, business viability, tourism, education. FONSI received October 2, 2000

Six Ecological Baseline Studies for KYTC – Provided field work for sampling of the aquatic and terrestrial fauna; classification of available habitat based on vegetative cover, terrain, and geology; wetland identification, description, delineation and measurement; and assessment of general water quality. The reports assessed potential impacts to threatened and endangered species, geologic resources, prime farmland resources, wetlands, water quality, floodplains, streams and ponds, and unique natural features. 1992–2000

Bat Habitat Assessment, SR 261 Utility Relocation, Warrick County, Indiana for Vectren Energy Delivery – Responsible for conducting evaluation of roosting habitat for Indiana bat along 0.25 miles of SR261 and conducting informal consultation with USFWS to secure approval to have trees removed within the tree clearing restriction period established by the USFWS. It was concluded that habitat for the Indiana bat was lacking and a finding of “not likely to adversely affect” received USFWS concurrence. 2011

Bat Habitat Assessment, BSCI Replacement Project, Vigo County for Vectren Energy Delivery – Responsible for conducting evaluation of roosting habitat for Indiana bat within a small woodlot that required tree removal within the tree clearing restriction period establish by the USFWS. The bat emergence survey at three potential roost trees yielded no emerging bats and through informal consultation the USFWS agreed that the action was "not likely to adversely affect" the species and that the tree removal was approved. 2011

I-69 Indiana Bat and Northern Long-eared Bat Surveys – Managed and organized annual bat field surveys for all six sections of the I-69 project from 2008 to the present. Also conducted annual bat mist net surveys for Sections 4 and 5 from 2010 to the present resulting in the capture of over 850 bats including Indiana bats and northern long-eared bats. Radio telemetry tracking was conducted for both species on multiple occasions resulting in the discovery of over 20 roost trees. 2008-present

I-69 Crayfish Frog Survey – Organized and conducted acoustic surveys for crayfish frogs in March 2013 totaling 30-40 man-hours. No crayfish frogs were heard at the site; however, the presence of the species was confirmed in nearby areas based on call recognition. Through coordination with IDNR, construction of INDOT mitigation wetlands (220 acres) was authorized and deemed to beneficial for wildlife, including the crayfish frog.

EA, St. Joseph Avenue for the City of Evansville, Indiana – Prepared NEPA documentation for expansion on 1.5 miles of an urban roadway. Involved a thorough inventory and project impact assessment for several sensitive historic and recreational sites, and required a moderate level of Section 106 coordination. Project also included wetland mitigation design at the Mesker Park Zoo and Botanic Gardens. 1999

EA, Industrial Park Road for the City of Ferdinand, Indiana – Senior Field Biologist responsible for studies of new roadway. Major issues included possible hazardous waste and underground storage tanks (USTs), Section 106 historic preservation, archaeology, and noise impacts. FONSI received February 2, 1998

CE, Ouabache State Park Bike Trail Design, Wells County, Indiana for the Indiana Department of Natural Resources – Responsible for NEPA documentation for the 4.2-mile bicycle trail in Ouabache State Recreational Area that links the town of Bluffton to Ouabache State Park. This opened up to the public a large section of park along the Wabash River that was not formerly accessible. The project required minimal disturbance to the sensitive surrounding areas, while remaining in conformance with the technical development of transportation enhancement projects and AASHTO's Guide for the development of Bicycle Facilities. 1998

CR 350S Wetland Monitoring & Mitigation Plan, Tippecanoe County, Indiana for INDOT – Responsible for preparation of Wetland Mitigation and Monitoring Plan. This portion of the project included identification and delineation of existing wetlands on mitigation site, development of final grading design, species planting/seeding recommendations, and wildlife enhancement amenity suggestions. 1998

EA, Airport Runway Extension for the Evansville Regional Airport, Indiana – Senior Field Biologist responsible for environmental studies related to the extension of runway 18-36, which addressed the major issue of relocations, noise, air quality, and visual impacts. FONSI received January 24, 1997

US 31 Corridor Study & Environmental Overview, St. Joseph & Marshall Counties for INDOT – Field Biologist responsible for assisting in a study to determine the feasibility of converting US 31 from an at-grade expressway to a freeway. The corridor links the communities of Indianapolis and South Bend and is the primary travel route between northern and central Indiana. 1997

Southwest Indiana Highway Corridor, Evansville to Bloomington for INDOT – Environmental Planner responsible for conducting many field surveys for animals and plants. Field sampling included the following: 93 stations for fish; 41 locations for mussels; 21 locations for bats; 30 sites sampled twice each (spring and fall) for birds; and trapping for vertebrates for one month at each of two locations in the Patoka River bottoms. Furthermore, sampled for plants via forest plots, wetland surveys, and walking the corridors. This study reviewed more than 100 areas for wetland jurisdictional status, and US Army Corps of Engineers' wetland field forms were completed for each wetland. The fish surveys identified 7,911 individuals from 71 species, while mussel surveys showed 68 individuals from 12 different species. Trapping for vertebrates showed 268 individuals from 15 different species, bird observations totaled 101 from 34 different families, and plants totaled 361 species. In all of these studies, only one federally-listed species was found: the Indiana bat. During this study, many alternative alignments were developed based on the location of socioeconomic, geological, ecological, historical archaeological and public concern areas. Proposed alignments were located to avoid and/or minimize impacts on these resources. 1996

Corridor Location Study, Bloomington to Evansville, Highway (Section III) for INDOT – Assisted in field collections on fishes and environmental data. Assisted in locating approximately 4,000 recorded geological, ecological, historical, and public concern sites. These sites included karst features (e.g., sinkholes and caves), limestone reserves, oil/gas wells, wetlands, threatened and endangered plants and animals records, nature preserves, parks, homes and businesses, bridges, archaeological sites (burial and artifacts), cemeteries, landfills, schools, industrial parks, and others. Proposed alignments were positioned to avoid as many of these areas as possible. 1990–1992

PUBLICATION

Cervone, T.H., J. Sias, **R.K. Yeager,** R. King and M. Allen, 2008 *Bat Occupancy Under a Bridge in Southwestern Indiana*. In Progress. 9pp, 10 figs.

Cervone, T.H. and **R.K. Yeager**, *A Walking Tour of Planted and Lowland Trees in Historic New Harmony (20 years later).* February 2008. University of Southern Indiana Press, Evansville, Indiana 122 pp, 57 illus., 1 fig.

Cervone, T.H. and **Yeager, R.K**. 1988. *Planted and Lowland Trees in Historic New Harmony,* University of Southern Indiana Press, Evansville, Indiana, 172 pp, 57 illus., 1 fig.

Schultheis, S.J., Berger, K.D., Agee, D.M., **Yeager, R.K.**, and Cervone, T.H. 1988, *Summer Fishes of Pigeon Creek Drainage*, Proc. Ind. Acad. Sci. for 1987.

Yeager, R.K., Nichols, D.S., Schultheis, S.J., Galbraith M.T., Lenn S.E., and Cervone, T.H. 1988, *Fishes of Goose Pond and its Drainage Basin*. Proc. Ind. Acad. Sci. for 1987. 96:533-558.

CONTINUING EDUCATION

NEPA Refresher Course, INDOT, November 19, 2014

Acoustic Techniques Course, Helen, GA, April-May 2013

Analook with BCID Analysis Course, Helen, GA, April-May 2013

Confined Space Entry, Environmental Management Institute, July 16, 2013

Design and Implementation of Erosion and Sediment Control, National Highway Institute, Evansville, IN December 11-12, 2012

NEPA Initial Course, INDOT, April 9-12, 2012

National Environmental Policy Act (NEPA) and the Transportation Decision-Making Process, 2012, 2007, 2003

Case Study Workshop-Interstate Engineering CSW, XL Insurance, June 30, 2010

Developing A Biological Assessment, U.S. Fish and Wildlife Service, Frankfort, KY, April 2009

Level 1 Applied Fluvial Geomorphology, Pilot View Resource Conservation & Development, Inc., Asheville, NC, February 23-27, 2009

Level 2 River Morphology & Applications, Pilot View Resource Conservation & Development, Inc., Asheville, NC, March 8-12, 2010

Level 3 River Assessment & Monitoring, National Training Center, Shepherdstown, WV, May 16-26, 2011

Amphibian & Reptile Identification Course, conducted by Dr. Thomas Pauley, May 2008

National Environmental Policy Act Refresher. Conducted by INDOT & FHWA, March 13, 2007

Road Crossing Structure Improvements to Accommodate Wildlife Passage, American Society of Civil Engineers, November 2006

Planning, Site Selection, & Hydrology Models for Constructed Wetlands, Wetland Training Institute, October 2006

Wetland Plant Identification, Wetland Training Institute, Ft. Wayne, Indiana, September 26-29, 2006

Highway Traffic Noise Impacts, INDOT & FHWA, Indiana, September 2006

Principles & Techniques of Electrofishing, US Fish & Wildlife National Conservation Training Center, Ludington, Michigan, April 2006

Biocriteria & QHEI Training, Ohio EPA, Groveport, Ohio, July 2005

Primary Headwater Habitat Program Training, Ohio EPA, Woodlake Environmental Field Station, May 2005

Endangered Species Act: Section 7 – Interagency Cooperation, FHWA, Indianapolis, Indiana, April 2005

Managing Wildlife for Sustainable Forests, IDNR, Indianapolis, Indiana, March 2005

Wetland Delineation with Emphasis on Soils & Hydrology, Wetland Training Institute, New Harmony, Indiana, October 20-25, 2003

Managing the Environmental & Transportation Development Process, Ohio Department of Transportation, 10-day course, August 2002, 3 CEU

Noise Analysis Modeling, KYTC, 1998

Wetland Plant Identification, Biotic Consultants, Inc., 2015, 2013, 2012, 2010, 2008, 2007, 2003, 2000, 1999, 1998, and 1997

Highway Traffic Noise Analysis, University of Louisville, July 1999

Highway Noise Analysis Seminar, University of Louisville, April 1999, 3.2 CEU

Jurisdictional Delineation of Wetlands in Michigan, Michigan Department of Natural Resources, Michigan State University, September 1993, 3.0 CEU

Thomas Cervone, PhD

Vice President & Director of Environmental Services – Principal

"Dr. Tom" serves on Lochmueller Group's (Lochgroup) Board of Directors and as the firm's Director of Environmental Services. His strong academic and professional background in the environmental sciences includes expertise in ecology, herpetology, ichthyology, wetlands, and botany. He is responsible for the management of all environmental studies completed at Lochgroup and has published a number of papers and books.

Dr. Tom enjoys an outstanding reputation with federal and state environmental review agencies. For 8 years, he has served as an Instructor for Indiana Department of Transportation's (INDOT's) NEPA workshops teaching *Section 7 Consultation* and *Secondary and Cumulative Impact* and then later developed curriculum as INDOT's selected provider for the entire NEPA training course. As a result, Dr. Tom and his staff have provided NEPA Training for approximately 120 NEPA consultants, including representatives from INDOT, FHWA, and 6 other states.

Tom was also featured in the Indiana Department of Environmental Management's (IDEM's) video entitled *Wetland Permitting in Indiana* and spoke on Environmental Policy at the 1994 Indiana Governor's Environmental Conference. He also assisted agencies in developing guidelines for streams and wetlands, such as the *Floodway Habitat Mitigation Guidelines for the Indiana Department of Natural Resources (IDNR)*, and assisted with the *Headwater Guidelines Forum* for IDEM. He has developed training in a number of field assessment methods including QHEI, HHEI, box turtle surveys, wildlife crossings, and bridge surveys for bats.

To date, Tom has been responsible for over 100 environmental documents ranging from complex EISs to CEs. In 2004 and 2005, he headed the most comprehensive study on the federally endangered Indiana bat by locating 148 sampling sites, 347 cave evaluations, 60 to 70 cave surveys, 60 to 80 harp trappings and has reviewed a bridge roost for that last 6 years (2006 – 2011). He has worked cooperatively with the USFWS in continuing pre- and post-construction monitoring for this species and has been responsible for all of the Biological Assessments completed on this project. He recently co-authored a paper on Thermal Dataloggers making noise that has worldwide implications, and has a federal permit to study this species as well as the gray bat and the northern long-eared bat. From his work and others, much new information has surfaced on this species, including bridges used as roosting bat habitat.

In 2005, the American Association of State Highway and Transportation Officials Standing Committee on the Environment cited the I-69 Tier 1 Final EIS prepared under Dr. Tom's guidance as one of the top ten examples of best practice nationwide. According to the study, the Lochgroup document "*illustrates how a complex and potentially overwhelming project with multiple impacts on multiple potential alignments over a very large study area can be analyzed in a relatively succinct manner*."

Prior to joining Lochgroup, Dr. Tom taught at St. Bonaventure University, University of Pittsburgh, University of Southern Indiana, Northeastern University, and University of Kentucky where he instructed students in the natural sciences and field study research projects. Under his direction, his students published one book and four papers in Indiana alone.

REPRESENTATIVE PROJECT EXPERIENCE

Electro-Shocking for Coal Mine Permit, Noble County, Ohio for Central Ohio Coal Company – Subconsultant to Strategic Environmental & Ecological Services to provide electro-shocking for fish sampling on two streams.

Surveyed Fishes in the Following Kentucky Projects

- *KY 114 (Salyersville to Prestonsburg) – Middle Creek (especially notable was the northern studfish)*
- *KY 519 (Morehead) – Triplett Creek (especially notable were darters and diversity)*

WITH THE FIRM
Since 1985

YEARS OF EXPERIENCE
41

EDUCATION
Post-Doctorate, Insect Bioassay, St. Bonaventure University, Allegany, New York, 1982-1983

PhD, Ecology, (Mountain Earth Snake) St. Bonaventure University, Allegany, New York, 1983

Masters Studies, Fisheries, St. Bonaventure University (Fish Distribution), 1975

BS, Biology, Lock Haven State University, Lock Haven, Pennsylvania, 1974

REGISTRATION
Scientific Purpose: Indiana

CERTIFICATION
USFWS Region 3 (2010-Present) & Region 4 (2013) Indiana/Gray Bat Federal Fish & Wildlife Permits

Indiana (1992 to Present), Kentucky (1994-2009) & Georgia (2013) Scientific Collecting Permits

INDUSTRY ASSOCIATION
Advisory Board, Indiana State University Center for North American Bat Research Conservation

Midwest Bat Working Group

Indiana Association of Environmental Professionals

Wesselman Woods Nature Center, Board of Directors & Natural Resource Committee

Friends of Patoka River National Wildlife Refuge, Board Member

- *Cooksey's Spring (near Trenton) – West Fork of the Red River (especially notable were the snubnose darter)*
- *Land between the Lakes (Golden Pond – US 68/KY 80) – Streams mostly dry and karst conditions in eastern half*

National Environmental Protection Act Training for INDOT – Developed curriculum and presented at INDOT's 5-day seminar to consultants and INDOT staff. The course covered NEPA requirements and how consultants/INDOT should approach the necessary documentation, including FHWA standards. Responsible for developing course materials and presenting on several topics: 1) agency coordination including early coordination; 2) hazardous material impacts; 3) threatened and endangered species and wildlife impacts; 4) mitigation commitments; 5) organizing a field outing to apply NEPA documentation skills; and 6) a summary of NEPA tips. Also responsible for organizing and scheduling guest speakers from environmental review agencies and private sector. 2011

Wetland & Stream Mitigation for SR 25 (Hoosier Heartland Highway) Improvements, Tippecanoe & Carroll Counties for the Indiana Department of Transportation (INDOT) – Senior Advisor/Technical Review responsible for bioengineering the bank stabilization effort and used natural channel design restoration techniques to relocate two Robinson Branch tributary streams. 2010

Bridge 75 (High Bridge) at CR 450 N over Little Pine Creek Historic Bridge Rehabilitation for Warren County, Indiana – Environmental Lead responsible for Level 3 bridge rehabilitation 2008.

EA, I-65 to US 31W Connector Study, Bowling Green, Kentucky for KYTC – Project Manager responsible for all activities and documentation for a connector roadway between I-65 and US 31W near TransPark. The study area was within a well-developed karst plain comprised of sinkholes and caves. Completed a Biological Assessment, conducted Section 7 consultation, and assisted with public involvement. Specific field tasks included an inventory of flora (including specific searches for the federally listed Eggert's sunflower), small mammal trapping (237 trap-nights in multiple habitat types), and wetland delineations. Also included fall harp trapping at two cave entrances and summer mist netting at two potential maternity roosting sites to survey for gray bats and/or Indiana bats for the purposes of preparing a Biological Assessment. The survey resulted in the capture of three male gray bats, red bats, and eastern pipestrelles. Major considerations included sinkholes, caves, groundwater quality, the Mammoth Cave Shrimp, and historic resources. A Secondary and Cumulative Impact Analysis was also completed. 2008

EA, US 50 Corridor Planning Study, North Vernon for INDOT – Environmental Document Manager responsible for overseeing environmental studies and assessment of an approximate 18-mile segment of the US 50 corridor from I-65 in Jackson County, eastward through North Vernon in Jennings County to near the Jennings/Ripley County Line. The study provided a system-level planning and safety analysis, as well as detailed planning analysis and environmental evaluation of two through-town options (widening and one-way pair) and five new alignment bypasses. Key components of the study were public and agency involvement in the decision-making process and social and environmental impact analysis of project alternatives. A number of alternatives were evaluated both north and south of North Vernon. Three alternatives were recommended for further investigation in an EIS. Major issues were socioeconomic, historic, 4(f), and water resources. Duties also included coordination with many resource agencies, consulting parties, the public, and local elected officials. Includes coordination with the IDEM; the IDNR; EPA; Historic Landmarks Foundation of Indiana; the City of North Vernon; Jackson and Jennings Counties; and many others. 2006-2008

Tapawingo Drive for the City of West Lafayette, Indiana – Environmental Lead responsible for environmental documents for new construction of a 4-lane urban arterial, with a paved walking and biking trail with greenspace, intended to alleviate congestion and open the area for future development. Construction completed in 2006.

EIS, US 31 Plymouth to South Bend, St. Joseph & Marshall Counties for INDOT – Environmental Lead responsible for preparation of an EIS and EA to evaluate this segment of the US 31 study area, approximately 20 miles long by 10 miles wide, running from the southern terminus at US 30, near Plymouth, to the northern terminus at US 20 near South Bend. ROD received 2006.

EA, US 68/KY 80, Marshall & Trigg Counties for KYTC – Senior Advisor/Technical Review for EA for improvements for approximately 27.2 kilometers. FONSI received October 24, 2006

Canal Road Corridor Study & Design for Vigo County, Indiana – Environmental Lead for permitting related to realignment and widening of a 4-lane facility from the proposed SR 641 interchange to I-70 and constructing a bridge over the CSXT Railroad. 2005

EIS, I-69, Evansville, Indiana to Henderson, Kentucky for the INDOT & KYTC – Lochgroup Project Manager responsible for the aquatic and terrestrial baseline report and the noise and conceptual stage relocation plan. This highway starts in Indiana at Green River Road and continues south across the Ohio River and its floodplain to connect to the Pennyrile Parkway south of Henderson, Kentucky. The EIS was performed to identify the purpose and need for the project, conduct an alternative's analysis, identify the

environmental consequences, and propose mitigation measures. Major considerations were the Indiana bat (mist netting showed a pregnant female), wetlands, a bridge crossing, the proposed Green River National Wildlife Refuge, Green River State Forest, Henderson Landfill, bald eagle and blue heron rookery, and a historic home that was razed during the project. A maternity colony for the Indiana bat was developed from the mist netting of a pregnant female. In addition, Dr. Tom worked with both the Indiana and Kentucky regulatory departments for wetlands, animals and plant listings. 2005

Red Bank Commons Permitting, Evansville, Indiana for Kite Capitol, LLC – Senior Advisor/Technical for this effort that entailed impacts to approximately 0.2 acres of jurisdictional stream and 1,300 square feet of palustrine emergent wetlands. 2005

Tier 2 EIS, I-69 Evansville to Indianapolis, Project Management Consultant for INDOT – Deputy Project Manager for Environmental Services responsible for environmental studies and the Section 7 consultation process with USFWS with regard to the Indiana bat, bald eagle, and endangered mussel species. Lochgroup was hired to oversee the project development activities of six section consultants. The development activities include preparation of all EISs and alternatives analysis, environmental impact statement review, travel demand modeling and traffic analysis, corridor travel demand model, traffic microsimulation, design concept traffic performance measures, environmental studies, and public involvement. Unique considerations addressed during Tier 2 were the location and coordination of 50 to 60 wildlife crossings for permeability and cross-connections for wildlife; mist netting and radio-tracking in pre-construction and post-construction monitoring for the Indiana bat; developing a box turtle protocol for surveys and holding through winter and release of an estimated 150-200 box turtles in the spring; and the location, agency coordination, environmental documentation, surveying, Section 106 (historic and archaeological), right-of-way engineering and right-of-way services for an acquisition for some 46 mitigation properties equaling approximately 5,200 acres or 8.1 square miles. Such properties are or will include forest preservation, reforestation, wetlands and stream development, and protection of existing water resources and karst features. In Progress since 2004

University Parkway Permitting for the Vanderburgh County, Indiana – Senior Advisor/Technical Review for field studies and agency coordination in securing permits. 2004

EA, KY 7, Sandy Hook to Memory Gardens, Elliott County for the Kentucky Transportation Cabinet (KYTC) – Senior Advisor/Technical Review for environmental documentation including baseline studies and EA for the proposed reconstruction and widening of a 1.6-mile section in South Central Elliott County of eastern Kentucky. The project began in Sandy Hook and proceeded through Bell City to end just north of the Elliott County Memory Gardens Cemetery. FONSI received March 8, 2004.

I-66 Corridor & Outer Beltline Planning Studies, Bowling Green for KYTC – Environmental Lead responsible for study incorporating two separate projects in the same general vicinity. Each project had its own purpose and need, but because portions of the I-66 Corridor had the potential to serve as a part of the Outer Beltline, a rigorous study of the compatibility of the two projects was conducted. 2004

EA, Bert T. Combs Mountain Parkway (KY 114) Reconstruction & Widening, Salyersville to Prestonsburg for KYTC – Environmental Manager responsible for study to evaluate upgrading existing KY 114 for approximately 21 miles. Major considerations included wetlands, forests, Middle Creek National Battlefield, stream crossings and water quality, residential and commercial relocations, and a 4(f) issue on a "death house." Unique to this project was a Community Impact Assessment and the development of Kentucky's first Public Involvement Plan and Public Involvement Action Plan which included four Community Impact Assessment Meetings. A large tent was set-up along KY 114 where food, drinks, and maps of the project were available during two weekends. FONSI received March 4, 2003

US 231 Improvements, Wetland & Stream Mitigation for Spencer County, Indiana for INDOT – Project Manager responsible for improvements from the Ohio River north to I-64 for approximately 21 miles. Completed and obtained an IDEM 401 Water Quality Certification and USACE Section 404 Permit. Permitting was divided by watershed, with Phase 1 in the Honey Creek Watershed and Phases 2 through 6 in the Little Pigeon watershed. The project included both jurisdictional and isolated wetland impacts as well as stream impacts. 2003

US 231, West Lafayette for INDOT – ROLE responsible for identifying many plants and wetlands throughout this 16-20 mile proposed 4-lane freeway. Most notable a discovery was the cleft phlox, which at that time was a state endangered species. Also within this project, Dr. Tom identified buttonbush and many of obligates associated with Celery Bog and facultative wetland plants in adjoining flatwoods.

Lynch Road Extension Phase III Permitting for Warrick County, Indiana – Senior Advisor/Technical Review for field studies and agency coordination for this proposed road/bridge project. 2003

Silver Spring Permitting, Jasper, Indiana for Kerstien Homes &Designs – Senior Advisor/Technical for this effort that entailed impacts to approximately 0.84 acres of jurisdictional palustrine emergent wetlands and 300 linear feet of stream. 2003

I-66 from Natcher Parkway to I-65 Environmental Overview for KYTC – Project Manager responsible for all field work and public information, as well as creation of GIS layers for human and natural resources in the vicinity of Bowling Green. The project area included Mammoth Cave, karst plain and features, Dripping Springs Escarpment, and historic resources. Suggested using local fire stations to hold public information meetings and solicit feedback from the communities. This innovative approach was a great success, garnering a large amount of information on the project. 2001-2003

EA, US 460, Frenchburg Hill to West Liberty Road, Menifee County, Kentucky for KYTC – Project Manager responsible for a study to evaluate impacts of upgrading existing US 460 for approximately 4 miles. Major considerations included kudzu, relocation of a lumber company, residential relocations, a civil war cemetery, an unmarked cemetery in Mariba, a stream relocation, the crossing of the Daniel Boone National Forest trail, and a big tree candidate. FONSI received August 1, 2002

Pigeon Creek Greenway Passage, West Levee/Industrial Corridor for the City of Evansville, Indiana Parks & Recreation – Environmental Lead for a 3.2-mile Section 3C of this proposed 42-mile greenway along the city's West Levee. The initial phase of the project involved all surveying, environmental studies and permitting, and design through 80% for the entire section. Final design is being done in segments as construction funding becomes available. One segment has been constructed with a second under design. 2001-2003

I-75/US 150 Environmental Overview, Lincoln & Rockcastle Counties for KYTC – Project Manager, 2001

Heim Road Wetland Design, Mitigation & Monitoring for Warrick County, Indiana – Project Manager for replacement of wetlands in the Chandler Bottoms. 2001

CE, Perry Crossing Road for Clark County, Indiana – Environmental Lead for a CE for addition of turn-lanes and shoulders, realignment of curves, and drainage improvements to roadway in a developing area of the county. Major land use changes were occurring along this road including the opening of a nationally known golf course. Residential development was also occurring near the project location. 2001

Hilsmeyer No. 2 Surface Coal Mining for Sun Energy Group, LLC – Completed the Biological Survey of aquatic resources proposed to be impacted by the 350-acre surface mine operation. 2001

Tier 1 EIS, I-69, Evansville to Indianapolis, for INDOT – Environmental Lead responsible for management of the environmental field studies of this major project. As part of this study, over 250 plant species from 70 families were identified; no TES plant species were observed; and biological assessments were completed for a number of mammal, reptile, amphibian, fish, mussel, and bird species. In addition, this project transferred field data into computer-generated forms. Questionnaires on location, hydrology, soils, vegetation, and animals were completed for over 230 wetland and riparian habitats. In the study's final phase, a detailed impact analysis of the remaining alternatives was undertaken. Based on GIS data, specific corridors were identified and mapped for each alternative. Within these corridors, representative "working alignments" were designed to minimize potential environmental disruption within the corridor. The study developed a preferred alternative based on transportation, economic and environmental factors. The Final EIS was recognized by the National Cooperative Highway Research Program as one of the Top 10 NEPA documents in the nation and cited as an example of "best practice." 2000 - 2004

KY 55 Corridor Environmental Overview, Nelson & Spencer Counties, Kentucky for KYTC – Project Manager responsible for a study to evaluate impacts of upgrading approximately 12 miles of KY 55 from Bluegrass Parkway up to Taylorsville, Kentucky. Major considerations included a historic district in Bloomfield, a historic district in Camp Branch, a Civil War battlefield (Quantril Raiders), and a crossing at Salt River. 2000.

Historic Gospel Street Bridge Rehabilitation (Bridge 200) for Orange County, Indiana – Environmental Lead responsible for the rehabilitation of this historic bridge. 2000

US 6 Added Travel Lane Wetland Mitigation & Monitoring Plan, LaPorte County for INDOT – Project Manager for an added a travel lane at the intersection of US 6 and CR 400W that impacted wetland within the Mill Creek drainage basin. In addition, approximately 0.92 acres of jurisdictional palustrine emergent wetlands were filled in. 2000

US 60 Environmental Footprint, Ballard & McCracken Counties, Kentucky for KYTC – Project Manager, 2000

KY 2121 Environmental Overview, Daviess County for KYTC – Project Manager, 2000

US 421 Madison-Milton Bridge Environmental Overview for KYTC

I-66 (Southern Kentucky Corridor) Environmental Overview, Pike County, Kentucky & Mingo County, West Virginia for KYTC – Project Manager that completed all field studies and documentation for this project in eastern Kentucky that crossed Tug Fork. Included working with many communities, including McVay. This is an extremely hilly area of Kentucky with many springs, coal mining, and many streams like Blackberry Creek. Presented information for the governor in Hazard and Pikeville, Kentucky. This information was used for an EIS that followed. 1999 - 2000

CE, Wabash Landing for the City of West Lafayette, Indiana – Environmental Lead for a CE related to the development of the a commercial development. Wetlands, hazardous material and historic resources were the primary consideration. 1999

EA, KY 519 Roadway Design & Environmental Studies, Rowan County, Kentucky for KYTC – Project Manager responsible for upgrade of 6 miles of roadway. Major considerations included the crossing of Tripplett and Morgan creeks, residential relocations, and floodplain encroachments. In addition, a historic train station and junkyard were included along with a trailer park and 4(f) impact to a Forest Ranger Station. A Community Impact Assessment was completed as was a 4(f) Programmatic Statement. The study reported population, housing, income, poverty, and employment demographics for the county and project area; profiled manufacturing, retail trade, recreation, agriculture, education, transportation, property taxes, local government, and community development within the county; and accessed probable impacts relating to land use, transportation, compatibility with other projects, neighborhood and community disruption, prime farmland, residential relocations, environmental justice, business viability, tourism, education. 1999

Environmental Management Consulting, Evansville, Indiana – Project Manager responsible for the development of laboratory designs and protocol on bioassays in testing acute toxicity of effluents; pesticide exposure studies; underground storage tank testing; and inspection/management reports on asbestos in schools (AHERA) and commercial buildings. Certified AHERA Building Inspector and Management Planner as accredited by EPA through the School of Public Health at the University of Illinois.

Wetland Mitigation & Design Plans for INDOT – Completed studies for 28 INDOT wetland mitigation sites. 1998-2004

US 27, Adams County for INDOT – Project Manager for wetland redesign of this mitigation site. INDOT selected the site and completed all studies and coordination prior to monitoring. Responsibilities included redesigning and monitoring this wetland's success. The wetland was ponding too much from the original design. Modifications were made in the design, plus larch and other northern plant species were recommended in the new design (DES 9102421). 1998 - 2004

Wolfe Site Bank, Miami County, Indiana for INDOT – Project Manager responsible for monitoring a wetland mitigation site west of US 31. The area used was a farm field in the floodplain as connected to a forested area with springs. This emergent wetland was dominated by cattails and Scirpus acutus (DES 0012430). 1998 - 2004

US 24 & US 35 Wetland Mitigation Bank, Miami County, Indiana for INDOT – Project Manager for redesign and monitoring a wetland mitigation site west of US 31. The area used was a farm field in the floodplain as connected to a forested area with springs. Many different species of plants were planted in this design including oak and hickories (DES 0012440). 1998 - 2004

US 24, Miami County, Indiana for INDOT – Project Manager responsible for the redesign of the wetland mitigation site near US 24 not far from Logansport. The outlet structure was the main issue. Habitat in this wetland attracted many Canada geese (DES 7302471, 7200430). 1998-2004

SR 26, Knox County, Indiana for INDOT – Project Manager responsible for assisting in the right-of-way services with some discussion on wetland mitigation. The mitigation site was selected and designed by INDOT. Lochgroup completed the purchase of the property (DES 8610865). 1998-2004

Centerville Rest Area, Richmond, Indiana for INDOT – Prepared a Wetland Mitigation and Monitoring Report including determination and delineation of jurisdictional wetlands behind the rest area. INDOT had proposed expanding the rest area lateral to I-69. With the identification of wetlands behind the rest area and review agencies requesting an avoidance of these wetlands, INDOT and the review agencies worked together to reach the decision to expand longitudinally along I-69 rather than away from it. 1998 - 2004

SR 37/I-69 Environmental Overview, **Marion County, Indiana for INDOT** – Project Manager for an Environmental Overview for this is a heavily traveled corridor in northeast Indianapolis. Environmental issues were for the most part socio-economic. The proposed widening would affect many businesses and access, which was a major consideration. All efforts were made by INDOT and consultants to avoid and minimize impacts to both the human and natural environment. 1998

EA, Industrial Park Road for the City of Ferdinand, Indiana – Project Manager responsible for issues related to this new road including possible hazardous waste and underground storage tanks, Section 106 historic preservation, archaeology, and noise impacts. 1998

Ouabache State Park Bike Trail Design, Wells County, Indiana for IDNR – Environmental Lead for a 4.2-mile bicycle trail in Ouabache State Recreational Area that links the town of Bluffton to the state park. This opened up to the public a large section of park along the Wabash River that was not formerly accessible. The project required minimal disturbance to the sensitive surrounding areas, while remaining in conformance with the technical development of transportation enhancement projects and AASHTO's Guide for the development of Bicycle Facilities. 1998

EA, for Runway Extension for the Evansville Regional Airport, Indiana – Lochgroup Project Manager responsible for all activities for completion of an EA for the extension of Runway 18-36 which addressed the major issue of relocations, noise, air quality, and visual impacts. 1997-1999

KY 101 Environmental Overview, Smith Grove, Kentucky for KYTC – Project Manager for study to evaluate upgrades to existing KY 101 for 2 to 3 miles through Smith Grove or a by-pass to the west. Major considerations included Crum Cave (with a moratorium on the grey and Indiana bats, environmental justice, hazardous material, residential and commercial relocations, sinkholes, farming, and archaeology. A historic district was crossed in the heart of the town along with an active railroad. 1997

US 31 Corridor Study & Environmental Overview, Marshall & St. Joseph Counties for INDOT – Environmental Lead responsible for a study to determine the feasibility of converting US 31 from an at-grade expressway to a freeway. The corridor links the communities of Indianapolis and South Bend and is the primary travel route between northern and central Indiana. 1997

Southwest Indiana Highway Corridor, Evansville to Bloomington, Indiana for INDOT – Environmental Lead responsible for evaluating a number of alternative alignments based on socioeconomic, geological, ecological, historical archaeological, and public concern areas. Proposed alignments were located to avoid and/or minimize impacts on these resources. 1996

US 31 Corridor Location & Environmental Studies, Carmel & Hamilton Counties for INDOT – Environmental Lead responsible for completion of all activities in the development of an Environmental Overview to analyze alternative transportation improvements to alleviate congestion on US 31. 1993

EIS, US 231 Corridor Location Study, Lafayette for INDOT – Environmental Lead responsible for overseeing field studies and the documentation of the EIS for this relocation around Purdue University. The project included the complete alternative corridor analysis, thorough environmental analysis, and location planning of a new Wabash River Bridge. 1990

Water Quality of Tunungwant Creek, Northwestern Pennsylvania – Tested water and completed bacteriological identification in Tunungwant Creek. Most notable results showed elevated colony counts of *Escherichia coli* from the grandfathering of old leach beds draining into the creek, especially in Lewis Run. From such data, a sewer line was connected from Lewis Run to Bradford for treatment. In addition, Tunungwant Creek receive effluents in Bradford that caused eutrophication and especially high dissolved oxygen levels during the day and especially low levels at night. The effluents caused for a lush growth of algae on rocks and with the oil sheen on the surface, it is not uncommon for supersaturation levels of oxygen during the day causing bubbles to form in the veins of the caudal fin of fish, and for fish prior to dusk to migrate up adjoining tributaries.

Thomas Cervone, PhD

Vice President & Director of Environmental Services – Principal

ACADEMIC EXPERIENCE

Before joining Lochgroup, Tom served as a Professor of Biology at the University of Southern Indiana and University of Kentucky where, he and his students completed research projects in ichthyology, water quality, and botany. He taught wildlife biology, environmental conservation, plant taxonomy, aquatic biology, and many other courses.

In 1986, he taught the course "Tropical Park Management" for the School for Field Studies. This course, developed by Tom was offered by Northeastern University, with classes held in Big Cypress National Preserve. Research projects involved fishes of Big Cypress Preserve, fuel load estimation of *Cladium jamaicense* prairies, chemical control of *Melaleuca,* and survey studies on a cypress-mixed swamp, a cypress dome, and two pinewoods of the national park. As a graduate student, he taught "Ecology of the Everglades" (field work in the Everglades), ecology of the Allegheny State Park (field work) and other courses at St. Bonaventure University and University of Pittsburgh.

His post doctorate fellowship, which was supported by an EPA-funded grant, was on toxicity, mode of action, and effects on reproductive cycles on the wasp *Bracon hebetor* for various carcinogens. His doctorate was the Antecological study of the Mountain Earth Snake, while his master's research on Fishes in Tunungwant Creek, a brackish drainage in northwestern Pennsylvania. This stream flows through Bradford, one of the major oil producing regions of the US. Point source and non-point sources of brine and oil were evident in his results.

Dr. Tom also served as a Professor for the Allegheny Institute of Natural History in the University of Pittsburgh System where he taught "Vertebrate Natural History" (two-week summer course) to professors and students. This four-credit course includes: lectures on vertebrates and field trips to unique ecosystems in the Allegheny Mountains of Western Pennsylvania and New York. Field trips include sampling aquatic and terrestrial habitats for mammals, birds, fishes, reptiles, and amphibians.

PUBLICATIONS

Cervone, T.H., R.K. Yeager, J. Sias and R. King, 2015. Bats under an Indiana Bridge. Submitted to the Proceedings of the Indiana Academy of Science. 17 pp, 6 figs., 3 tables.

Cervone, T.H., J. Sias, R.K. Yeager, R. King and M. Allen, 2011 Bat Occupancy Under a Bridge in Southwestern Indiana. In Progress. 9 pp, 10 figs.

Willis, K. R., J. W. Jameson, P. A. Faure, J. G. Boyles, V. Brack, Jr. and **T. H. Cervone. 2009.** Thermocron IButton and IBBat Temperataure dataloggers emit ultrasound. Journal of Comparative Physiology B: Biochemistry, Systemic, and Environmental Physiology. Volume 179(7):867-874.

Cervone, T.H. and R.K. Yeager, A Walking Tour of Planted and Lowland Trees in Historic New Harmony (20 years later). February 2008. University of Southern Indiana Press, Evansville, Indiana 122 pp, 57 illus., 1 fig.

Cervone, T.H. 2000. Vertebrate Natural History. 2-Week Course for University of Pittsburgh (Bradford Campus). Pp 238.

Cervone, T.H., Historical and Present Distribution of Fishes in the Patoka River Basin in Pike, Gibson and Dubois Counties, Indiana, 1996, PIAS, 98:165-175.

Cervone, T.H., New Records for *Lythrurus fumeus* (Ribbon Shiner) in Indiana**,** 1993. PIAS, Abstract, p 118.

Cervone, T.H., S.A. Letherland, J.T. Lanigan III, T. K. Spindler, and R.A. Pace, Winter fishes of Bayou Creek drainage. 1989, Proc. Pa, Acad. of Sci., 63(1):20-24.

Cervone, T.H. and R.K. Yeager, Planted and Lowland Trees in Historic New Harmony. 1988, University of Southern Indiana Press, Evansville, IN 172 pp, 57 illus., 1 fig.

Cervone, T.H., W.L. Wissinger, R.V. Mettus, and R.M. Petters, Sterility in adult Bracon hebetor (Hymenoptera: Braconidae) induced by 5-flourouracil. 1988, Jour. Econ. Entomology, 81(1):102-105.

Schultheis, S.J., K.D. Berger, R.K. Yeager, D.M. Agee, and **Cervone, T.H.,** Summer fishes of Pigeon Creek drainage. 1988, Proc. Ind. Acad. Sci. for 1987. 96:523-530.

Yeager, R.K.., D.S. Nichols, S.J. Schultheis, M.T. Galbraith, S.E. Lenn, and **Cervone, T.H.,** Fishes of Goose pond and its drainage basin. 1988, Proc. Ind. Acad. Sci. for 1987. 96:533-558.

Agee, D.H., W.J. Alvey, K.D. Berger, B.S. Leinenbach, and **Cervone, T.H.,** Winter fishes of Stinking Fork. 1988, Proc. Ind. Acad. Sci. for 1987. 96:507-512.

Cervone, T.H., R.M. Langianese, and S.M. Stayer, The fishes of Tunungwant Creek drainage. 1985, Proc. Pa. Acad. Sci., 59:138-146.

Wissinger, W.L., and **Cervone, T.H.**, Reproductive performance and mutagenic response of the wasp bracon hebetor following treatment with the antibiotic bleomycin. 1985, Mutation Research, 149:375-383.

Wissinger, W.L., and **Cervone, T.H.**, Vitellogenic and embryogenic activity of the microtubule disruptor vinblastine following ingestion by the wasp Bracon hebetor. 1985, J. Insect. Physiol., 31(6):471-476.

Cervone, T.H. and R.C. Bothner, The habitat of Virginia valeriae pulchra (Serpentes: Colubridae) in northwestern Pennsylvania. 1984, Pa. Acad. of Sci. Newsletter, 42(2):18.\

Cervone, T.H., W.L. Wissinger, R.V. Mettus, and R.M. Petters, Genotoxic response of the wasp Bracon hebetor (Say) fed 5-fluorouracil and 6-mercaptopurine (Hymenoptera: Braconidae). 1983, Regional Meeting in Providence, R.I., Journal of Econ. Entomology.

Wissinger, W.L., **Cervone, T.H.**, R.M. Petters, and R.W. Mettus, A comparison of bleomycin and vinblastine effects on reproduction in adult Bracon hebetor (Say) wasps (Hymenoptera; Braconidae). 1983, Regional Meeting in Providence, R.I., Jour. of Econ. Entomology.

Cervone, T.H. The natural history of Virginia valeriae pulchra (Serpentes; Colubridae). 1983, Diss. Abstr. (Nov. 1983), 44(5):1332-B.

Cervone, T.H. and R.C. Bothner, The female reproductive cycle of Virginia valeriae pulchra (Serpentes: Colubridae) in northwestern Pennsylvania. 1983, Proc. Roch. Acad. Sci., Inc., 12 November, John Fisher College, Rochester, NY.

Cervone, T.H. and R.C. Bothner, Diet, seasonal occurrence and population structure of Virginia valeriae pulchra (Serpentes; Colubridae) in northwestern Pennsylvania. 1983, Proc. Roch. Acad. Sci., Inc., 12 November, John Fisher College, Rochester, NY.

Cervone, T.H. and W.L. Wissinger, Antivitellogenic properties of purine and pyrimidine analogs on reproductive performance in Bracon hebeter (Hymenoptera: Braconidae). 1983, Proc. Roch. Acad. Sci., Inc., 12 November, John Fisher College Rochester, NY.

Wissinger, W.L. and **Cervone,T.H**., Contrasting the biological effects of the direct and indirect acting mutagens bleomycin and vinblastine using fecundity and fertility patterns of the wasp Bracon hebetor. Proc. Roch. 1983, Acad. Sci., Inc., 12 November, John Fisher College, Rochester, NY.

CONTINUING EDUCATION

NEPA Refresher, INDOT & FHWA, 2 hour training course, 2015

Week Class in West Virginia on Mussels, 2014

Southern Gas Association Conference, hosted by SGA in Louisville, KY, June 2014

Wetland Plant Identification, Conducted by Biotic Consulting, Inc. (Robert Mohlenbrock, PhD) 1997-2012, 2014, 2015

Anabat Techniques Workshop, Conducted by Livengood Consulting, Warsaw, Illinois. April 27-30, 2010

Indiana GIS Conference, Conducted by the Indiana Geographic Information Council, February 23-24, 2010

Wetland Plant Identification, Biotic Consultants, September 15-18, 2008

NEPA Refresher, INDOT & FHWA, August 22, 2008

Amphibian & Reptile Identification Course, conducted by Dr. Thomas Pauley, May 2008

Project Management Bootcamp I, PSMJ Resources, Inc., April 22 & 23, 2008

Liability IQ for Architects & Engineers, XL Insurance July 30, 2007

Section 4(f) Class, INDOT & Federal Highway Administration (FHWA), August, 2006

NEPA Categorical Exclusion, INDOT & FHWA, 8-hour training course, March, 2006

NEPA & the Indiana Transportation Decision-Making Process, Conducted by INDOT & FHWA on July, 2003

Section 7 Consultation, Instructor for INDOT since 2004

Managing Wildlife for Sustainable Forests, IDNR, Indianapolis, Indiana, March, 2005

NEPA Conducting Quality Cumulative Effects Analyses, Conducted by INDOT, March, 2001

Secondary & Cumulative Impact Analysis, FHWA-sponsored Workshop 2001

Wetland Delineation – Emphasis on Hydrology & Soils, Wetland Training Institute, 1999

Seed Anatomy & Identification (SC 280A), Colorado State University, 1999

Wetland Training, Wetland Delineator Certification Program, August 1999

Fishes of Indiana, Sampling & Research for Book, 1996

Identification of Bat Species, Indiana State University, Terre Haute, Indiana**,** 1996

Collection of Kentucky Crayfishes - Identified Species, Kentucky Transportation Cabinet, 1996

Highway Noise Analysis, University of Louisville, 3.2 CEU, 1995

Modeling of Mobile Source Air Quality Impacts, University of Central Florida, May, 1993

Delineation of Wetlands, USACE, Wilmington, NC 1991

POST-DOCTORATE

Brenten Reust

Environmental Biologist

Brenten is an environmental biologist with eight years of experience in restoration ecology, permitting, and environmental field work. Brenten specializes in stream and wetland mitigation and has experience with jurisdictional determination, Rosgen Level 3 classifications, rapid bioassessment protocols for stream physical habitat assessments, 401 Water Quality Certification (WQC) and USACE Section 404 permits, compliance monitoring, botanical surveys, fish and macroinvertebrate surveys, groundwater investigations, water quality assessments, nuisance wild animal controls, and habitat restoration. He has completed stream and wetland characterizations of over 5,000 acres for jurisdictional determination, biannual assessments of 250 acres of wetland, and monitored 200,000 linear feet of stream for compliance. Brenten also has extensive experience with invasive plant and animal control throughout the Eastern US for habitat conservation in wetlands, forests, and prairies using a highly selective Integrated Pest Management Program.

While a faculty research assistant with the Oregon State University College of Agricultural Sciences and Forestry, he researched science based best management practices to prevent the spread of *Phytophthora ramorum*, the sudden oak death pathogen. He coordinated this research with state governments, academic entities, and private nursery growers throughout the Northwest in an effort to manage *Phytophthora spp*.

Brenten also performed research at Indiana University Department of Geography that was funded by Department of Energy and NASA grants. He investigated biogeochemical processes that occur at the level of canopy leaves and soil microbes to those occurring at the ecosystem, landscape, and regional scales using a variety of micrometeorological measurements, remote sensing, and ecosystem modeling. He used a suite of instruments to collect data including: incoming radiation, CO2 and H2O concentrations, wind speed and direction, precipitation, temperature, relative humidity, sap flow velocity, photosynthesis, soil moisture, and arbuscular and ectomycorrhizal fungi associations.

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YEARS OF EXPERIENCE
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EDUCATION
MS, Environmental Science, Major in Applied Ecology and Water Resources, Indiana University, Bloomington, IN 2012

BS, Public Affairs, Major in Environmental Policy, Indiana University - Fort Wayne, 2008

AS, Business, Indiana University - Fort Wayne, 2007

CERTIFICATION
Nuisance Wild Animal Control Permit: Indiana

United States Forest Service Class A Faller Certification (2009-2012): North Carolina

Pesticide Applicator License (2009-2014): Indiana

Pesticide Applicator License (2009-2009): Massachusetts

REPRESENTATIVE PROJECT EXPERIENCE

NEPA Services for West Lake Corridor New Starts Project for Northern Indiana Commuter Transportation District (NICTD) – Environmental Biologist on the team that is preparing a combined Final Environmental Impact Statement/ROD on an aggressive schedule. The project will advance a nine-mile extension of the South Shore Line, known as the West Lake Corridor, southward to provide new passenger rail services to Lake County, Indiana.

Double Track NWI for NICTD – Environmental Biologist that was part of a team that investigated approximately 25 miles of various habitats adjacent to the South Shore line tracks from Gary to Michigan City, Indiana. The purpose of the investigation was to assess the presence of federal (Mead's milkweed, Pitcher's thistle, and white prairie fringed-orchid) and state listed plant species and conduct a habitat assessment for the Indiana bat and northern long-eared bat. Additionally, floristic quality assessments (FQA) were conducted at 37 habitat unit areas and 47 individual wetland locations, and woodland tree composition was quantified in terms of species, size and stage of decay at 11 locations. A Phase 1 bat habitat assessment was conducted at 24 woodland locations in accordance with the U.S. Fish and Wildlife Service 2016 Range-Wide Indiana Bat Summer Survey Guidelines to identify potential bat roost and foraging habitat for the Indiana bat and the northern long-eared bat. Field efforts required close coordination with NICTD operations personnel to insure worker safety including Railroad Education training.

CONTINUING ENGINEERING

Redefining the Waters of the U.S. Wetland Training Institute – Webinar 2015

Indiana Society of Mining and Reclamation Annual Seminar – Jasper, Evansville Indiana 2014, 2015

NC State University River Course 101: Stream Morphology Assessment (16 PDHs) – Ashville, North Carolina 2014

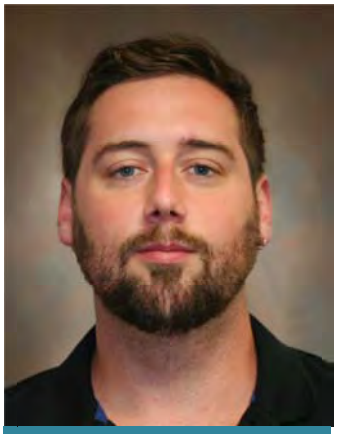
Sean Langley

Environmental Biologist

Sean is an Environmental Biologist that specializes in bat ecology. His field experience includes harp trapping, wind turbine mortality surveys, SensorGnome set up and use, telemetry tower construction, infrared bat portal surveys, bat identification in the Eastern US, bat roost emergence counts, portal surveys, bird banding, and mist netting. He researched roosting dynamics of the northern long-eared bat, *Myotis septentrionalis*, for Virginia Tech, US Geological Survey, and the Army Corps of Engineers Co-op during the summer of 2012.

REPRESENTATIVE PROJECT EXPERIENCE

Tier 2 EIS, I-69, Evansville to Indianapolis, for INDOT – Bat Ecologist involved in conducting radio-telemetry and pre- and post-construction monitoring for the Indiana bat.



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YEARS OF EXPERIENCE
4

EDUCATION
BS, Biology and Environmental Studies, Manchester University, North Manchester, Indiana, 2013