

APPENDIX D

Aquatic/Terrestrial Resources Baseline



Ecological Baseline Study *of*

KYTC Item I-115, I-115.1, I-118

US 60 from 0.5 miles west of KY 310 to east of Kevil
Ballard and McCracken Counties, Kentucky

Prepared for

The Kentucky Transportation Cabinet
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I. INTRODUCTION

QK4 has been contracted by the Kentucky Transportation Cabinet (KYTC) to develop an Environmental Assessment (EA) in support of the proposed improvements to US 60. The proposed project will begin east of La Center, approximately 0.5 miles west of KY 310, and extend west to the existing four-lane section east of Kevil in Ballard and McCracken Counties, Kentucky (KYTC Item # I-115, I-115.1, and I-118), herein referred to as the “project.” Third Rock Consultants, LLC (Third Rock) has been retained as a subconsultant to QK4 to conduct an Ecological Baseline Study to assess potential impacts to ecological resources resulting from preliminary design alternatives. This report documents the findings and conclusions of that effort and was prepared in accordance with KYTC’s *Environmental Guidance Manual* (2014) and Division of Environmental Analysis *Ecological Study Format – Guidance and Accountability Form* TC58-43 (2014).

II. PROJECT DESCRIPTION

A. Location

The project involves improvements to approximately 6.7 miles of US 60, beginning at the end of the existing four-lane section east of the community of La Center and ending at the existing four-lane section east of Kevil in Ballard and McCracken Counties, Kentucky.

B. Purpose and Need

The purpose of this project is to reconstruct US 60 to improve the opportunity for freight movement and increase safety by modifying geometrics to meet current design standards.

C. Proposed Alternatives

Three (3) preliminary alternatives have been developed, herein and on project exhibits referred to as Alternative 1, Alternative 2, and Alternative 3 (**Exhibit I, Appendix A**).

1. **Alternative 1** begins east of the bridge over Humphrey Creek, creating a new route on new alignment south of existing US 60. It ends at the improved 4-lane section near Lester Harris Road. For the environmental baselines, the assumed cross-section is a 4-lane divided rural highway.
2. **Alternative 2** begins east of the bridge over Humphrey Creek, generally following the existing US 60 alignment. For the environmental baselines, the assumed cross-section is a 4-lane divided rural highway with 5-lane urban section through Kevil.
3. **Alternative 3** begins east of the bridge over Humphrey Creek, creating a new route along the old railroad bed west of Kevil and then generally following the existing US 60 alignment through Kevil to the east. For the environmental baselines, the assumed cross-section is a 4-lane divided rural highway with 5-lane urban section through Kevil.

D. Typical Section

Alternatives will utilize a combination of rural and urban typical sections as illustrated on the detail included in **Appendix B**.

III. CORRESPONDENCE WITH STATE AND FEDERAL AGENCIES

The U.S. Fish and Wildlife Service (USFWS), Kentucky Department of Fish and Wildlife Resources (KDFWR), and Kentucky State Nature Preserves Commission (KSNPC) were contacted to solicit occurrence information for federal or state endangered, threatened, or special concern species, wetlands, and unique natural communities. The Kentucky Division of Water (KDOW) was contacted to solicit input regarding national or state Scenic and Wild Rivers, Outstanding State Resource Waters, or other unique aquatic habitats within the project corridor, as well as historic water quality and biological data collected within the vicinity of the project. The Kentucky Division of Forestry (KDOF) was contacted to solicit information regarding national or state champion trees and the Kentucky Speleological Society (KSS) was contacted to determine if any caves are known to be within a 5-km buffer of the project corridor. Resulting correspondence is included **Appendix C**.

IV. ENVIRONMENTAL SETTING

A. Climate

Based on records from 1981 through 2010 compiled by the Midwestern Regional Climate Center for a weather station in Paducah, Kentucky, approximately 10 miles west of the project, the warmest month of the year is July, with an average maximum temperature of 89.3 degrees Fahrenheit; while the coldest month of the year is January, with an average minimum temperature of 25.8 degrees Fahrenheit. The annual average precipitation is 49.08". The wettest month of the year is May, with an average rainfall of 4.94" (Midwest Climate, 2019). The average length of the growing season for Ballard and McCracken counties, from the last freezing temperature in the spring to the first in the fall, is approximately 202 days (Humphrey, 1976).

B. Physiography

The project lies within the Jackson Purchase or Mississippi Embayment Physiographic Region (KGS, 2019). This is a coastal plain region described as "relatively flat lying, with numerous lakes, ponds, sloughs, and swamps" (KGS, 2019). It is an undulating plain with local relief of not more than 50 feet except near a major stream (McFarlan, 1943).

The project is in the Mississippi Valley Loess Plains III ecoregion (74), within the Loess Plains Level IV subdivision (74b). The Loess Plains is a productive agricultural area composed of gently rolling uplands, broad bottomlands, and terraces (Woods et al., 2002). It is mantled by thick loess and alluvium and is underlain by weak, unconsolidated coastal plain sediments (Woods et al., 2002). Potential natural vegetation is a mosaic of oak-hickory forests and bluestem prairie; grasslands and forested wetlands were once wide-spread but most has now been replaced by cropland (Woods et

al., 2002). High turbidity and siltation are common in the streams and rivers; many channelized streams occur (Woods et al., 2002).

C. Topography

As illustrated on **Exhibit 2 (Appendix A)**, elevations in the project area range from approximately 350 feet above mean sea level (AMSL) to 450 feet AMSL. The topography is predominantly slightly dissected level to sloping uplands with broad ridges that are gently sloping on the sides.

D. Geology

As illustrated on **Exhibit 3 (Appendix A)**, the project is underlain by Alluvium in stream valleys and by Loess and Continental Deposits in uplands. In this area of western Kentucky, where Cretaceous and Tertiary sediments occur at the surface, the deposits are unconsolidated sediment instead of rock and are easily eroded (KGS 1997-2019). This area is relatively flat, with numerous lakes, ponds, and swamps; local relief is generally less than 100 feet (KGS 1997-2019).

E. Soils

Soil types were identified using attributes in the Natural Resource Conservation Service Soil Survey Geographic Database (NRCS SSURGO) for Ballard and McCracken County as illustrated on **Exhibit 4 (Appendix A)**. Soils in the project corridor are comprised almost entirely of silt loam, including a high percentage of Grenada silt loam, Vicksburg silt loam, Loring silt loam, and Calloway silt loam. Also present in the project corridor are areas of Falaya-Collins complex, Center silt loam, Feliciana silt loam, Kurk silt loam, Loring-Purchase complex, Routon silt loam, and Waverly silt loam. The dominant soil types within the project corridor are classified as well drained, moderately well drained, or somewhat poorly drained. Waverly silt loam is a mapped hydric soil occurring within the project corridor.

F. Watershed

The project lies in the Upper Humphrey Creek (HUC 12 – 051402060601), Bayou Creek – Ohio River (HUC 12 – '051402060701), and Middle Humphrey Creek (HUC 12 – 051402060602) watersheds. The proposed alternatives involve crossings of unnamed tributaries to Humphrey Creek, Bayou Creek, and unnamed tributaries to Bayou Creek. Humphrey Creek and Bayou Creek flow directly to the Ohio River. Humphrey Creek, downstream of the project, is included in the Kentucky 2016 303 (d) list (KDOW 2016). The pollutant listed for Humphrey Creek is fecal coliform of an unknown source. Bayou Creek, from the Ohio River to the headwaters, is included in the Kentucky 2016 303(d) list (KDOW 2016). The pollutants listed for Bayou Creek include copper, lead, mercury, sedimentation/siltation, and nutrient/eutrophication biological indicators. The suspected sources of these pollutions are inappropriate waste disposition, industrial point source discharge, and non-irrigated crop production.

According to correspondence with KDOW, no Cold Water Aquatic Habitat, Outstanding State Resource Waters, Exceptional Waters, Reference Reach Waters, Kentucky Wild River or Outstanding National Resource Waters are in the project corridor.

G. Land Use

Land use within the project corridor was digitized by Third Rock using high resolution aerial imagery and is summarized in **Table I** (below). The disturbance area for Alternative 1 is approximately 140 acres, of which the majority is cultivated crops and hay/pasture, followed by developed, open space. Alternative 2 is approximately 115 acres, of which the majority is developed, open space followed by developed, low intensity. Alternative 3 is approximately 100 acres, of which the majority is deciduous forest followed by cultivated crops.

Table I. Land Use Summary¹

Land Cover	Alternative 1		Alternative 2		Alternative 3	
	Area (ac)	Rel. Abund. (%)	Area (ac)	Rel. Abund. (%)	Area (ac)	Rel. Abund. (%)
Barren Land	0.00	0.00	0.00	0.00	0.69	0.01
Cultivated Crops	66.70	0.48	1.81	0.02	21.73	0.22
Deciduous Forest	7.48	0.05	7.20	0.06	38.03	0.38
Developed, Low Intensity	4.47	0.03	7.57	0.07	5.94	0.06
Developed, Medium Intensity	0.88	0.01	3.04	0.03	1.95	0.02
Developed, Open Space	23.13	0.17	88.93	0.77	19.19	0.19
Emergent Herbaceous Wetlands	0.48	0.00	0.47	0.00	0.38	0.00
Evergreen Forest	0.92	0.01	1.50	0.01	1.57	0.02
Hay/Pasture	35.09	0.25	1.49	0.01	2.86	0.03
Woody Wetlands	0.73	0.01	2.74	0.02	7.46	0.07
Open Water	0.00	0.00	0.09	0.00	0.00	0.00
Total	139.88	1.00	114.84	1.00	99.80	1.00

¹ 2011 National Land Cover Database

H. Floral Community

Flora belongs to the Mississippi Embayment Section of the Western Mesophytic Forest Region (Braun 1950). This section displays a mosaic of unlike vegetation types, including prairie, oak-hickory forest, swamp forest, and mixed mesophytic communities (Braun 1950). Prairies were once extensive but are now mostly in cultivation. The oak-hickory forest communities, occurring on the rolling and moderately dissected uplands, vary in composition in relation to topography and soils. White oak (*Quercus alba*) and tulip poplar (*Liriodendron tulipifera*) are abundant, as is southern red oak (*Quercus falcata*); hickories are almost always present (Braun 1950). American beech (*Fagus grandifolia*) and sugar maple (*Acer saccharum*) occur in the lowest part of the white oak woods, or on stream slopes (Braun 1950). The understory of the oak woods can include dogwood (*Cornus florida*), wild black

cherry (*Prunus serotina*), winged elm (*Ulmus alata*), sour gum (*Nyssa sylvatica*), and persimmon (*Diospyros virginiana*) (Braun 1950). Broad alluvial valleys, at lower elevations than the rolling oak upland forests, can be occupied by dense forest of water tolerant oaks, swamp cottonwood (*Populus heterophylla*), cottonwood (*Populus deltoides*), American elm (*Ulmus americana*), sugarberry (*Celtis laevigata*), river birch (*Betula nigra*), sycamore (*Platanus occidentalis*), red maple (*Acer rubrum*), sweet gum (*Liquidambar styraciflua*), and bald cypress (*Taxodium distichum*) (Braun 1950).

V. METHODS

A. Literature and Office Review

Prior to initiating field reconnaissance, various publicly available mapping and data resources were reviewed. Design mapping provided by QK4 on February 5, 2019 was imported into ArcView, where it was integrated with aerial and topographic maps, as well as a variety of environmental shapefiles such as streams, National Wetland Inventory (NWI) mapping, U.S. Geological Survey (USGS) geologic quadrangles, and U.S. Department of Agriculture (USDA) Natural Resources Conservation Service Soils mapping. Each design alternative was evaluated for the potential for impacts to aquatic and terrestrial resources in the project corridor (e.g., stream crossings, wetland intersections, forested bat habitat, etc.). Notes were made regarding resources that would require attention during the field effort. Further results of this review are discussed as appropriate in the following sections.

B. Aquatic Sampling

Aquatic sampling was conducted May 29, 2018, August 12 and 13, 2018, and February 13, 14, and 15, 2019 to establish the baseline biological condition of each resource and evaluate the overall community health of the streams in the project area. Species and habitats observed during the sampling effort were photographed (Photo Log, **Appendix D**); observations and data were recorded on agency-approved field data sheets and forms included in **Appendix E**.

I. Macroinvertebrates

The macroinvertebrate community was sampled on May 29, 2018 using quantitative and qualitative methods described in KDOW (2015a). At each sampling site, quantitative sampling consisted of four (4) composite 0.25-m squared kicknet samples taken from a minimum of two (2) riffle habitats. Qualitative sampling consisted of dip-net sweeps and visual searches of all remaining habitats (leaf packs, depositional areas in pools, root wads, woody debris, slab rocks). Quantitative and qualitative samples were placed in separate containers. Samples were preserved with 95% ethanol and transported to the laboratory for processing. At the laboratory, all samples were processed (sorted), following methods described by KDOW (2015b). A minimum of 300 organisms were removed randomly from the composite kicknet sample. A representative of each unique taxa was picked from each qualitative sample. Macroinvertebrates were identified to the lowest possible taxonomic level and recorded in Third Rock's Macroinvertebrate Laboratory Information Management System (MacLIMS).

2. Fish

Fish sampling was conducted on August 12 and 13, 2018 following methods developed by KDOW (2010). At each sampling site, the fish community was sampled using a Smith-Root backpack electroshocker in conjunction with seining. Fish were identified in the field, enumerated, recorded, and released unharmed. Voucher photographs were taken of each species encountered and are included in **Appendix D**.

3. Water Quality

Grab samples were collected August 12 and 13, 2018 and subsequently analyzed for the following parameters: acidity, alkalinity, chloride, carbon dioxide, hardness, iron, ammonia nitrogen, dissolved oxygen, pH, sulfate, and orthophosphate. Field measurements of water temperature, pH, dissolved oxygen, turbidity, and specific conductance were taken at each site using a Hydrolab multi-parameter water quality instrument. Sampling and analyses were conducted in accordance with current KDOW methodology (2011). A copy of the laboratory chain-of-custody (COC) is included in **Appendix E**.

4. Aquatic Habitat

U.S. Environmental Protection Agency's (USEPA) Rapid Bioassessment Protocols (RBP) for Use in Wadeable Streams and Rivers were used to evaluate stream habitat on February 13, 14, and 15, 2019. Physical characteristics and habitat quality were evaluated, and scores recorded on RBP Habitat Assessment Field Data Sheets (Barbour et al. 1999).

C. Terrestrial Sampling

Terrestrial sampling was conducted on May 29, 2018, August 12 and 13, 2018, and February 13, 14, and 15, 2019 to establish the baseline biological condition of each resource and evaluate the overall community health of project corridor. Species and habitats observed during the sampling effort were photographed (Photo Log, **Appendix D**); observations and data were recorded on agency-approved field data sheets included in **Appendix E**.

1. Floral

The floral community of the project was examined by walking the proposed alignments. For each unique habitat encountered during the pedestrian survey, the plant community was documented by listing the observed trees, shrubs, and herbaceous vegetation.

2. Faunal

Faunal surveys included searches within each unique habitat for organisms (including avifauna) as well as road kill, scat, tracks, bedding places and overturning rocks and logs.

3. Terrestrial Habitat

Habitat within the footprint of the proposed alternatives was assessed during the pedestrian survey in conjunction with floral and faunal surveys. An area extending a kilometer from the project corridor was examined for caves or sinkholes that could provide suitable roost habitat for bats.

D. Wetland Sampling

Soil mapping of Ballard and McCracken Counties, NWI maps, USGS topographic maps, and aerial maps were analyzed prior to the field visit to identify potential wetland features. Routine wetland delineation was conducted in accordance with the U.S. Army Corps of Engineers (USACE) Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region. Wetlands observed during the sampling effort were photographed (Photo Log, **Appendix D**); observations and data were recorded on agency-approved wetland determination forms included in **Appendix E**.

E. Threatened / Endangered Species Sampling

Literature and office review as well as agency coordination were used to identify potential habitat for each listed species within the project corridor prior to field reconnaissance to identify and quantify suitable habitat. A buffer area extending a kilometer from the project corridor was surveyed for bat roost habitat such as caves or open sinkholes on September 12 and 13, 2018. Potential bat habitat indicated on topographic maps and geologic quadrangles, or those reported by residents or coordinating agencies, was examined in the field for suitability as bat habitat.

VI. RESULTS

A. Literature and Office Review

USFWS indicated four (4) federally-listed species have the potential to occur within the project vicinity, KDFWR indicated no listed species, and KSNPC indicated 17 state-listed species, two (2) of which have a USFWS status of Species of Management Concern (SOMC). A summary of species considered for this baseline are summarized in **Table 2**.

Table 2. Threatened and Endangered Species

Common Name	Scientific Name	Status	Corresponding Agency		
			USFWS	KDFWR	KSNPC
Mammals					
Gray Bat	<i>Myotis grisescens</i>	Federally Endangered	X		
Indiana Bat	<i>Myotis sodalis</i>	Federally Endangered	X		
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	Federally Endangered	X		
Southeastern Bat	<i>Myotis austroriparius</i>	State Endangered			X
Little Brown Bat	<i>Myotis lucifugus</i>	State Endangered*			X
Evening Bat	<i>Nycticeius humeralis</i>	State Special Concern			X

Table 2. Threatened and Endangered Species

Common Name	Scientific Name	Status	Corresponding Agency		
			USFWS	KDFWR	KSNPC
Fish					
Redspotted Sunfish	<i>Lepomis miniatus</i>	State Threatened			X
Black Buffalo	<i>Ictiobus niger</i>	State Special Concern			X
Plants					
Lakecress	<i>Armoracia lacustris</i>	State Threatened			X
Prairie Milkweed	<i>Asclepias hirtella</i>	State Threatened			X
Cream Wild Indigo	<i>Baptisia bracteata</i> var. <i>glabrescens</i>	State Special Concern			X
Blue-joint Reedgrass	<i>Calamagrostis canadensis</i> var. <i>macouniana</i>	State Historic			X
Brown Bog Sedge	<i>Carex buxbaumii</i>	State Endangered			X
Large Sedge	<i>Carex gigantea</i>	State Endangered			X
Woolly Sedge	<i>Carex pellita</i>	State Historic			X
Bog Rush	<i>Juncus elliotii</i>	State Historic			X
Bush's Muhly	<i>Muhlenbergia bushii</i>	State Endangered			X
Reptiles and Amphibians					
Western Mud Snake	<i>Farancia abacura reinwardtii</i>	State Special Concern			X
Northern Crawfish Frog	<i>Rana areolate circulosa</i>	State Special Concern			X
Birds					
Least Tern	<i>Sterna antillarum</i>	Federally Endangered	X		
Bell's Vireo	<i>Vireo bellii</i>	State Special Concern*			X

*USFWS Status of Species of Management Concern

The following sections summarize habitat requirements for the listed species.

I. Gray Bat

Gray bats are restricted to regions where large cave systems occur. Gray bats use caves throughout the year. Generally, the species hibernates in deep, cool caves with a vertical opening or shaft. Within Kentucky, the species is most common in the cave region of the south-central portion of the state. Gray bats disperse nightly from cave roosts to forage along streams (LaVal et al. 1977; LaVal and LaVal 1980). Both male and female adult gray bats select caves that are closely associated with, or in proximity to, large bodies of water (rivers, lakes, or reservoirs). They forage over the bodies of water almost exclusively.

2. Indiana Bat

Indiana bats hibernate during the winter months in limestone caves and abandoned underground mines known as hibernacula. Winter habitat has been documented throughout Kentucky with Priority I hibernacula being found along Pine Mountain in the Dissected Appalachian Plateau, Carter Caves within the Northern Forested Plateau Escarpment, and the Crawford-Mammoth Cave Uplands.

After hibernation, most females depart from the caves and abandoned underground mines during April, while males typically remain longer before migrating to summer habitats. A few males may even occupy the hibernacula during the summer months. During the summer months, Indiana bats travel, forage, and roost within a variety of interconnected forested habitats, including riparian corridors, bottomlands, and uplands. Indiana bats typically roost under exfoliating bark, in cavities of dead and live trees, and in snags (*i.e.*, dead trees or dead portions of live trees). Roost trees with some sun exposure seem to be preferred. Trees greater than 16" in diameter at breast height (DBH) are considered optimal for maternity colony roosts, but trees in excess of 9" DBH appear to provide suitable maternity roosting habitat.

Water sources for the Indiana bat in Kentucky include stream corridors, ponds, and water filled road ruts in forests. Indiana bats generally prefer foraging in wooded areas (LaVal et al. 1977, and Butchkoski and Hassinger 2002), and are frequently associated with streams, floodplain forests, forested wetlands, and impounded water.

3. Northern Long-eared Bat

Northern Long-eared bats are typically found in cracks and crevices within caves and mines during winter months, generally at low densities (Whitaker and Hamilton 1998). These winter hibernacula are often large with high humidity, cool temperatures, and no air currents.

During summer, these bats typically roost singly or in small colonies underneath loose bark or tree cavities, similar to the Indiana bat. Preference for any specific tree species does not appear to exist (more opportunistic in nature). Manmade structures such as bridges, barns, sheds, cabins, and other structures have been known to provide roost habitat as well. Northern long-eared bats switch summer roosts every two (2) to three (3) days and appear more opportunistic in roost selection than Indiana bats (Carter and Feldhammer 2005). These bats have been known to use shorter trees, live trees, and trees with more canopy cover than Indiana bats, but roost selection overlap probably does exist. As with Indiana bats, males appear to more readily use smaller diameter trees as roost site than females.

Water sources for the northern long-eared bat in Kentucky include stream corridors, ponds, and water filled road ruts in forests. The species generally prefers foraging in wooded areas (LaVal et al. 1977, and Butchkoski and Hassinger 2002), and is frequently

associated with streams, floodplain forests, forested wetlands, and impounded water bodies.

4. Southeastern Bat

Southeastern bats roost primarily in caves, where suitable caves are available, or in hollows of bottomland hardwood trees or in structures such as abandoned buildings, bridges, culverts, or bat houses (NatureServe 2019). Roost sites, whether in caves or trees, are often over water. Foraging habitat consists of water bodies, riparian floodplain forests, flatwoods, or wooded wetlands with permanent open water nearby (NatureServe 2019). Kentucky populations of southeastern bats winter in caves (often with Indiana bat) but are rare in most caves in summer, when most roost in large hollow trees (NatureServe 2019).

5. Little Brown Bat

Little brown bats use a wide range of habitats and often use human-made structures for resting and maternity sites; they also use caves and hollow trees (NatureServe 2019). Foraging habitat is generalized; foraging occurs over water, along the margins of lakes and streams, or in woodlands near water (NatureServe 2019). Winter hibernation sites can be caves, tunnels, abandoned mines, and similar sites that have a relatively stable temperature of about 2-12 degrees Celsius (NatureServe 2019). Maternity colonies commonly are in warm sites in buildings (e.g., attics) and other structures; also, infrequently in hollow trees (NatureServe 2019).

6. Evening Bat

Evening bats occur in deciduous, mixed deciduous-coniferous, and pine-dominated forests, which may be interspersed with cultivated areas (NatureServe 2019). Foraging occurs in open areas and around tree canopies (NatureServe 2019). Males tend to roost solitarily; females form nursery colonies in summer, under loose bark, in tree cavities, or in buildings (NatureServe 2019). Roosts also include cavities in live or dead trees, spaces behind loose tree bark, tree foliage, leaf litter, rock crevices, abandoned burrows in the ground, and nooks, spaces, and crevices in many types of human-made structures; rarely caves (NatureServe 2019).

7. Redspotted Sunfish

This small fish occurs in swamps, sloughs, bottomland lakes, pools of creeks and small to medium rivers, and less brackish portions of coastal estuaries (NatureServe 2019). It prefers quiet or moderately flowing waters with heavy vegetation or other cover and a bottom of mud or sand (NatureServe 2019). The redspotted sunfish feeds mainly on benthic insects and crustaceans, sometimes eating terrestrial insects that enter the water (NatureServe 2019).

8. Black Buffalo

Habitat for this fish includes pools and backwaters of small to large rivers, reservoirs, and lakes (NatureServe 2019). Black buffalo are often in strong currents of large rivers; spawning occurs in flooded areas (NatureServe 2019). Black buffalo are known to eat planktonic and bottom organisms such as insects, mollusks, and vegetation (NatureServe 2019).

9. Lakecress

The primary habitat of this wetland plant includes areas surrounding rivers such as oxbows and forested floodplains, pools along rivers, quiet shallow water along lake margins or in the backwaters of slow-moving streams, muddy rocky shores of large ponds and lakes, inundated roadside sloughs with open water, cypress swamps, seasonal sloughs, and open water in marshes (NatureServe 2019).

10. Prairie Milkweed

This green milkweed plant occurs in prairies, old fields, barrens, and glades (LBJWC 2019), and in roadside habitats (Jones 2005).

11. Cream Wild Indigo

This perennial plant with pea-like flowers occurs in prairies and open woods, in well drained, sandy to loamy soils (LBJWC 2019), and in barrens (Jones 2005).

12. Blue-joint Reedgrass

This grass-like plant with conspicuous tufts occurs in swamp margins, marshes, and shores (Jones 2005).

13. Brown Bog Sedge

This plant is found in a variety of wet places, most commonly bogs and wet meadows, plus fens, marshes, wet shores, swamps, prairie swales, wet river bottom prairie, alluvial meadows, pastures, ditches, rarely on rock exposures, and springs (NatureServe 2019). Occurring in sun or semi-shade, usually in calcareous or neutral substrates (NatureServe 2019).

14. Large Sedge

This plant occurs in swamps and wet woods (NatureServe 2019), and wet swamp forests, forest openings, open swamps (Flora of North America 2019).

15. Woolly Sedge

Habitats for this plant include shallow water (Jones 2005) in wet to moist prairies and dolomite prairies, prairie swales, sedge meadows, acidic seeps and calcareous seeps, swamps, openings in floodplain woodlands, edges of poorly drained fields, and roadside ditches (Illinois Wildflowers 2019). Usually, woolly sedge is found in sunny wetlands, where it tolerates degradation of habitat to some extent (Illinois Wildflowers 2019). Occasionally, it will spread into the drier ground of adjacent prairies and meadows (Illinois Wildflowers 2019).

16. Bog Rush

This plant occurs in wet soil (Jones 2005), wet sands, peaty sands, or peat, exposed shores of ponds and lakes, depressions in savannas and flatwoods, moist to wet, much disturbed clearings, roadsides and ditches (Flora of North America 2019).

17. Bush's Muhly

This perennial grass plant occurs in moist woods (Jones 2005) and prairie type habitats (KY Rare Plant Database 2019).

18. Western Mud Snake

This shiny black snake with pink or red belly occurs in western Kentucky along the Ohio and Mississippi River counties and wetlands of adjacent counties (OEPOS 2019). Habitat for this snake includes lowland swamps, slow moving streams with muddy bottoms and aquatic plants (OEPOS 2019). The Western mud snake feeds on salamanders, tadpoles, frogs, and fish; nests are found in cavities in the ground or in rotten logs; and holes are used for hibernation through the winter (OEPOS 2019).

19. Northern Crawfish Frog

This frog occurs in and around a crayfish burrow in an open grassland, pasture, or old field (KDFWR 2019). The burrow can sometimes be a mile or more from the frogs breeding site, which is a pond or seasonal pool (KDFWR 2019).

20. Least Tern

The habitat for this bird is seacoasts, beaches, bays, estuaries, lagoons, lakes, and rivers where it rests and loafs on sandy beaches, mudflats, and salt-pond dikes (NatureServe 2019). Nests are found in shallow depressions on level ground on sandy or gravelly beaches and banks of rivers or lakes, typically in areas with sparse or no vegetation; also, on dredge spoils; on mainland or on barrier island beaches; and on flat gravel-covered rooftops of buildings or other similarly barren artificial sites (NatureServe 2019). Good nesting areas tend to be well beyond the high tide mark, have shell particles/stones/debris

for egg camouflage, and be out of the way of off-road vehicles and public recreation areas, not subject to unusual predation pressure, and adjacent to plentiful sources of small fishes (NatureServe 2019). Interior populations nest mainly on riverine sandbars or salt flats that become exposed during periods of low water (NatureServe 2019).

21. Bell's Vireo

Habitat for this small bird includes riparian areas, old fields, shrubland, and woodlands (NatureServe 2019). Breeding habitat includes dense brush, willow thickets, streamside thickets, and scrub oak; nests are found in a shrub or low tree, usually averaging about one meter above ground, typically near the edge of a thicket (NatureServe 2019). Bell's vireo may nest in any successional stage forest with dense understory vegetation. Nesting success depends on an optimum microclimate, and adequate shade may be critical for successful nesting at low elevations (NatureServe 2019). In migration and winter, habitat is dense scrub adjacent to watercourses and riparian gallery forests (NatureServe 2019). This bird eats insects and small spiders, rarely fruits, and forages in dense brush, occasionally in treetops (NatureServe 2019).

B. Aquatic Sampling

I. Macroinvertebrates

Sampling results were analyzed using the following community metrics: Taxa Richness, Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) (EPT) Richness, Modified Percent EPT Abundance, Percent Ephemeroptera Abundance, Modified Hilsenhoff Biotic Index (mHBI), Percent Chironomidae and Oligochaeta, and Percent Clingers. These metrics are used to calculate a Macroinvertebrate Bioassessment Index (MBI). Aquatic sampling locations are illustrated on **Exhibit 5 (Appendix A)**.

a. Station 1

Macroinvertebrate diversity was low for the unnamed tributary to Humphrey Creek (Station 1) with a total of 23 macroinvertebrate taxa recorded. Of the 23 taxa collected, 2 were EPT, which are generally pollution intolerant. EPT comprised 0.7% of the macroinvertebrate community. Conversely pollution tolerant midges and worms comprised 89.4% of the community. Clingers (organisms that need hard, silt-free substrate to "cling" to) composed 11% of the sample, possibly indicating embedded substrates. The mHBI score, an indicator of organic pollution, was 8.33 for Station 1. An mHBI score of 0 is the least impaired, while a score of 10 represents the most impaired. The resulting MBI rating was "Very Poor" with a score of 13.4.

b. Station 2

Diversity was low at Bayou Creek (Station 2) with a total of 19 total taxa. One taxon of pollution intolerant EPT was collected and comprised 0.3% of the macroinvertebrate

community. Pollution tolerant midges and worms dominated the macroinvertebrate community of Station 2 comprising 66.2% of the community. Embeddedness of substrates might be a problem at Station 2 with clingers comprising only 9.1% of the macroinvertebrate community. A high mHBI score (8.09) may indicate organic pollution affecting the macroinvertebrate community of Bayou Creek at Station 2. The MBI rating was “Very Poor” with a score of 15.3.

c. Station 3

Station 3 (unnamed tributary to Humphrey Creek) also had low diversity with 19 total taxa collected, of which 1 taxon was pollution intolerant EPT (*Caenis* sp). *Caenis* sp. comprised 0.3% of the macroinvertebrate community. Almost the entire macroinvertebrate community was comprised of pollution tolerant midges and worms (89.7%). Clingers were mostly absent at Station 3 comprising 4.8% of the community. Like the other streams sampled, organic pollution may be an impairment with a mHBI score of 8.3. The MBI rating was “Very Poor” with a score of 10.7.

d. Station 4

Station 4 (unnamed tributary to Humphrey Creek) had the highest taxa richness of the 4 streams with 24 total taxa but had no EPT taxa collected. Station 4 also had the lowest relative abundance (49.5%) of midges and worms. Clingers were also mostly absent from Station 4 comprising 2% of the community. As indicated by the mHBI score (7.63) organic pollution may be affecting the macroinvertebrate community at Station 4. The MBI rating was “Very Poor” with a score of 17.8.

A summary of the MBI scores and ratings is presented in **Table 3**. Laboratory Bench Sheets and macroinvertebrate data set are included in **Appendix F**.

Table 3. MBI Scores and Ratings

Parameter	Score			
	Station 1	Station 2	Station 3	Station 4
Taxa Richness	23	19	19	24
EPT Richness	2	1	1	0
mHBI	8.33	8.09	8.3	7.63
%EPT	0.7	0.3	0.3	0
% Ephemeroptera	0.7	0.3	0.3	0
%C + O	89.4	66.2	89.7	49.5
%Clingers	11.0	9.1	4.8	2.0
MBI Score	13.4	15.3	10.7	17.8
MBI Rating¹	Very Poor	Very Poor	Very Poor	Very Poor

2. Fish Sampling

A total of 9 species of fish were identified at three (3) of four (4) sampling locations as noted in **Appendix F**. Diversity was low for all stations; darters, madtoms and sculpins, a generally pollution sensitive group, were absent from all stations, except for Station 3 in which a slough darter (*Etheostoma gracile*) was collected. Simple lithophile fish species, which require relatively clean gravel and exhibit simple spawning behavior, were absent from all streams sampled. Pollution tolerant fish species were abundant at all streams sampled. Facultative headwater individuals (FHW) are fish species that are atypical of headwater streams, and their presence tends to increase with impairment. All streams sampled were dominated by FHW individuals. Index of Biotic Integrity (IBI) scores, based on criteria for the Mississippi Valley Interior River (MVR) ecoregion, are summarized below.

a. Station 1

A reach of an unnamed tributary to Humphrey Creek (Station 1) was electrofished for 1220 seconds. A total of 282 individuals representing 7 taxa were collected. Stoneroller (*Camptostoma anomalum*) was the most abundant species collected, followed by creek chub (*Semotilus atromaculatus*). Station 1 scored a 39 on the Kentucky Index of Biotic Integrity (KIBI) resulting in a “fair” rating.

b. Station 2

A reach of Bayou Creek (Station 2) was electrofished for 1,012 seconds. A total of 227 individuals representing 8 taxa were collected. Juvenile sunfish (*Lepomis sp.*) and green sunfish (*Lepomis cyanellus*) were the most abundant species collected, followed by mosquitofish (*Gambusia affinis*). Station 2 scored a 56 on the KIBI resulting in a “good” rating.

c. Station 3

A reach of an unnamed tributary to Humphrey Creek (Station 3) was electrofished for 1,133 seconds. A total of 343 individuals representing 9 taxa were collected. Creek chub was the most abundant species collected, followed by stoneroller (*Camptostoma anomalum*). Station 3 scored a 48 on the KIBI resulting in a “good” rating.

d. Station 4

An unnamed tributary to Humphrey Creek (Station 4) did not have any flow and was dry during the field visit for the fish survey. Stream 4 has a small drainage area (0.18 mi²) and the flow is intermittent.

A summary of KIBI scores and ratings is presented in **Table 4**, page 16.

Table 4. KIBI Scores and Ratings

Metric	Station 1	Station 2	Station 3	Station 4
Native Species Richness	8	8	9	NA
Darter, Madtom, Sculpin Richness	0	0	1	NA
Intolerant Species Richness	0	0	0	NA
Simple Lithophile Species Richness	0	0	0	NA
Insectivore Individuals	7	37	23	NA
Facultative Headwater Individuals	74	92	60	NA
Tolerant Individuals	33	55	53	NA
Total Individuals	282	227	343	NA
Drainage Area (mi ²)	3.0	0.95	1.72	0.18
Sampling Effort (seconds)	1,220	1,012	1,133	NA
Fish Capture/Sampling Effort	0.23	0.22	0.3	NA
IBI Score	39	56	48	NA
IBI Class / Rating¹	Fair	Good	Good	NA

¹ IBI Ratings MVIR Headwater Streams: Very Poor (0-15), Poor (16-31), Fair (33-47), Good (48-66), Excellent (E>67)

3. Water Quality

Measurements of pH, dissolved oxygen, and temperature were within Warmwater Aquatic Habitat (WAH) criteria. Water quality results are presented in **Table 5**; laboratory analytical reports are included in **Appendix F**. Water quality results were compared to surface water standards established by 401 KAR 10:031 (2013) when available and the results are presented in **Table 6** (page 17). All water chemistries were within WAH acute and chronic criteria as illustrated.

Table 5. Water Quality Results

Parameter	Station 1	Station 2	Station 3
Temperature (°C)	20.8	22.3	20.4
pH (Standard Units)	7.5	7.25	7.75
Dissolved Oxygen (mg/L)	5.5	6.6	6.2
Dissolved Oxygen (% Saturation)	66.1	79.2	75.3
Turbidity (NTU)	0.0	0.1	0.0
Specific Conductance (µS)	252	279	350
RBP Habitat Assessment	105	79	100
Habitat Rating	Poor	Poor	Poor
Hardness (mg/L as CaC)	87	101	68
Ammonia nitrogen (mg/L as N)	<0.05	<0.05	<0.05
Chloride (mg/L)	15	18	49
Iron, Total Recoverable (mg/L)	<0.02	<0.02	<0.02
Acidity (mg/L)	<10	<10	<10
Alkalinity (mg/L)	91	103	66

Parameter	Station 1	Station 2	Station 3
Carbon dioxide (mg/L)	86	88	60
Orthophosphosphate (mg/L)	0.17	0.13	0.79
Sulfate (mg/L as S)	5.0	9.0	24

Table 6. Kentucky Surface Water Standards

Pollutant	Human Health	WAH ²	
	DWS ¹	Acute	Chronic
Dissolved Oxygen (mg/L) ³	-	4.0	5.0
Specific conductance (µS/cm) ⁴	-	No adverse effect	
Temperature (°C) ⁵	-	31.7	-
pH (SU) ⁶	-	< 6.0 – 9.0 >	
Alkalinity (mg/L as CaCO ₃) ⁷	-	Not reduced more than 25%	
Ammonia, un-ionized (mg/L as N) ⁸	-	0.05	-
Chloride (mg/L)	250	1200	600
Iron (mg/L) ⁹	0.300	4.000	1.000
Sulfate (mg/L as S)	250	-	-

¹ Domestic water supply source (DWS) criteria applies to existing points of public water supply intake.

² Warmwater Aquatic Habitat (WAH) criteria applies to aquatic life in the stream.

³ Dissolved Oxygen concentrations are minimums with the “chronic” criteria as a 24-hour average.

⁴ Specific conductance has narrative criteria that it “shall not be changed to the extent that the indigenous aquatic community is adversely affected.”

⁵ Monthly instantaneous maximum guidelines for May to July range from 23°C to 32°C.

⁶ pH shall also not fluctuate more than 1.0 pH unit over a period of 24 hours.

⁷ If natural alkalinity is below 20 mg/L CaCO₃, there shall not be a reduction below the natural level. Alkalinity shall not be reduced or increased to a degree that may adversely affect the aquatic community.

⁸ Un-ionized ammonia shall be determined from values for total ammonia-N, in mg/L, pH and temperature, by means of the following equation: $Y = 1.2 \text{ (Total ammonia-N)} / (1 + 10^{\text{pKa-pH}})$; $\text{pKa} = 0.0902 + (2730 / (273.2 + T_c))$ where: T_c = temperature, degrees Celsius and Y = un-ionized ammonia (mg/L).

⁹ The chronic criterion for iron shall not exceed 3.5 mg/L if aquatic life has not been shown to be adversely affected.

4. Aquatic Habitat

Stream habitat was evaluated in 38 locations (**Exhibit 5, Appendix A**). As presented in **Table 7**, page 18, RBP scores ranged from 70 to 142. In the Mississippi Valley Interior River bioregion, RBP scores less than 113 are rated “poor,” scores from 114 to 134 are rated “fair,” and scores greater than 135 are rated “good” (KDOW 2011). RBP field data sheets are included in **Appendix E**.

Table 7. RBP Habitat Scores

Stream	Flow Type ¹	Score ²	Rating
Stream 1	E	97	Poor
Stream 2	E	70	Poor
Stream 3	P	116	Fair
Stream 4	I	74	Poor
Stream 5	I	86	Poor
Stream 6	I	87	Poor
Stream 7	P	105	Poor
Stream 8	I	106	Poor
Stream 9	P	113	Poor
Stream 10	E	84	Poor
Stream 11	I	99	Poor
Stream 12	P	111	Poor
Stream 13	I	103	Poor
Stream 14	I	107	Poor
Stream 15	I	86	Poor
Stream 16	P	125	Fair
Stream 17	I	119	Fair
Stream 18	I	100	Poor
Stream 19	E	89	Poor
Stream 20	E	122	Fair
Stream 21	E	116	Fair
Stream 22	I	106	Poor
Stream 23	I	97	Poor
Stream 24	I	142	Good
Stream 25	I	125	Fair
Stream 26	I	100	Poor
Stream 27	E	91	Poor
Stream 28	I	111	Poor
Stream 29	I	135	Good
Stream 30	E	117	Fair
Stream 31	I	121	Fair
Stream 32	E	89	Poor
Stream 33	E	73	Poor
Stream 34	E	65	Poor
Stream 35	P	105	Poor
Stream 36	I	79	Poor
Stream 37	P	100	Poor
Stream 38	I	81	Poor

¹ P = Perennial; I = Intermittent; E = Ephemeral

² Headwater and Wadeable: 135 and above, good; 114-134, fair; 113 and below, poor.

C. Terrestrial Sampling

No unique species or terrestrial habitats were observed. Coordination with KDOF indicates that there are no state champion trees within the project corridor. Nearly all species encountered are species tolerant of landscape alteration by humans. Floral communities identified during field investigations include species common to narrow stream riparian zones adjacent to cropland, cropland edges, roadsides, utility line corridors, and forest edges. Terrestrial fauna and flora species encountered were noted and are compiled into a single data set included in **Appendix F**.

D. Wetland Sampling

Fourteen (14) wetlands and two (2) ponds were observed within the project corridor. Wetlands are primarily forested (Cowardin Class PFO). It is likely that six (6) of the wetlands may be considered non-jurisdictional by the U.S. Army Corps of Engineers (USACE) due to their lack of connection with surface water. Wetlands are summarized in **Table 9** (Page 21).

E. Threatened / Endangered Species Sampling

1. Gray, Indiana, Northern Long-eared, Southeastern, Little Brown, and Evening Bats

The amount of suitable summer foraging and roosting habitat (i.e. forests) for Indiana, northern long-eared, southeastern, little brown, and evening bat, and foraging habitat (i.e. streams) for the gray bat, within the disturbance limits of each alternative is summarized in **Table 8** (page 20) and illustrated on **Exhibits 6 and 7 (Appendix A)**.

No portals (caves or open sinkholes) representing year-round roosting habitat for gray and southeastern bats, or winter roosting habitat for Indiana, northern long-eared, or little brown bats, were observed within one (1) kilometer of the project. No caves were reported by KSS to be in the 5-km project buffer.

2. Redspotted Sunfish and Black Buffalo Fish

No habitat for these state-listed fish was observed in the project alternatives.

3. Lakecress, Prairie Milkweed, Cream Wild Indigo, Blue-joint Reedgrass, Brown Bog Sedge, Large Sedge, Woolly Sedge, Bog Rush and Bush's Muhly

Wetlands within the footprint of the proposed alternatives may provide habitat for the state listed plants: lakecress, brown bog sedge, woolly sedge, and bog rush, as illustrated on **Exhibits 6 and 7 (Appendix A)** and summarized in **Table 8** (page 20). Woolly sedge and bog rush are reported by the KSNPC as Historic records and are unlikely to occur in the project area.

4. Western Mud Snake and Northern Crawfish Frog

Wetlands E and L may provide habitat for these state-listed species as illustrated on **Exhibits 6 and 7 (Appendix A)** and summarized in **Table 8** (page 20).

5. Least Tern and Bell's Vireo

No habitat was observed in the project area for the federally endangered least tern. Habitat for the Bell's vireo may be present in riparian areas and woodlands within the project area as illustrated on **Exhibits 6 and 7 (Appendix A)** and summarized in **Table 8**. Bell's vireo is a state special concern species and is federally listed as a species of management concern.

Table 8. Listed Species Habitat per Alternative

Species	Habitat Type	Alt. 1	Alt. 2	Alt. 3
Indiana, northern long-eared, southeastern, little brown, and evening bats	Summer Foraging and Roosting (Forests)	18 acres	14 acres	47 acres
Gray, Indiana, northern long-eared, southeastern, little brown, and evening bats	Foraging (Streams)	3,594 feet	3,142 feet	6,378 feet
Brown bog sedge, woolly sedge, and bog rush	Wetlands	0.1 acres	0.6 acres	2.4 acres
Western Mud Snake, Northern Crawfish Frog, Lakecress	Wetlands E and L	0 acres	0 acres	1.1 acres
Bell's Vireo	Riparian areas and woodlands	18 acres	14 acres	47 acres

VII. IMPACTS AND SUGGESTED MITIGATION MEASURES

A. Significant Ecological Resources

I. Impacts

There are no state wildlife management areas, national or state forests or parks, exemplary natural communities, champion trees, wild or scenic rivers, exceptional waters, or Outstanding National or State Resource Waters in the project corridor.

2. Suggested Mitigation Measures

An effects analysis of the project regarding federally endangered bats that may inhabit forests and forage over streams and wetlands within the project area should be performed as part of a Biological Assessment for this project.

B. Aquatic Ecosystems

I. Impacts

Surface aquatic ecosystems include 38 streams, 14 wetlands, and 2 ponds within the disturbance limits of the alternatives. **Table 9** summarizes aquatic ecosystem impacts by alternative.

Table 9. Aquatic Ecosystem Impacts¹

Aquatic Resource	Stream Length (ft) and Wetland Area (ac) in Alternative			Stream		Drainage Area (Sq Mi) ³
	1	2	3	Order	Type ²	
Stream 1 UNT Humphrey Creek	0.0	603.3	605.8	2	E	0.17
Stream 2 UNT Humphrey Creek	587.6	610.8	595.9	1	E	<0.20*
Stream 3 UNT Humphrey Creek	0.0	200.9	0.0	2	P	0.17
Stream 4 UNT Humphrey Creek	0.0	124.1	0.0	2	I	0.085
Stream 5 UNT Humphrey Creek	256.6	296.7	0.0	3	I	0.27
Stream 6 UNT Humphrey Creek	0.0	416.2	349.2	3	I	0.32
Stream 7 UNT Humphrey Creek	0.0	242.9	205.5	3	P	0.32
Stream 8 UNT Humphrey Creek	0.0	117.7	117.7	2	I	0.24
Stream 9 UNT Humphrey Creek	0.0	458.4	458.4	2	P	0.6
Stream 10 UNT Humphrey Creek	207.0	72.7	72.7	1	E	0.05
Stream 11 UNT Bayou Creek	327.8	0.0	0.0	2	I	0.09
Stream 12 UNT Bayou Creek	881.3	0.0	0.0	1	P	0.27
Stream 13 UNT Humphrey Creek	0.0	0.0	273.7	1	I	0.02
Stream 14 UNT Humphrey Creek	0.0	0.0	56.2	1	I	0.001
Stream 15 UNT Humphrey Creek	0.0	0.0	43.5	1	I	0.001
Stream 16 UNT Humphrey Creek	0.0	0.0	788.3	4	P	1.06
Stream 17 UNT Humphrey Creek	0.0	0.0	69.1	1	I	0.05
Stream 18 UNT Humphrey Creek	0.0	0.0	264.9	1	I	<0.20*
Stream 19 UNT Humphrey Creek	0.0	0.0	81.7	4	E	0.47
Stream 20 UNT Humphrey Creek	0.0	0.0	92.4	1	E	0.0003
Stream 21 UNT Humphrey Creek **	0.0	0.0	317.8	1	E	<0.20*
Stream 22 UNT Humphrey Creek	0.0	0.0	227.9	3	I	0.11
Stream 23 UNT Humphrey Creek	0.0	0.0	112.4	1	I	0.0003
Stream 24 UNT Humphrey Creek	0.0	0.0	159.8	1	I	<0.20*
Stream 25 UNT Humphrey Creek	0.0	0.0	284.7	1	I	<0.20*

Table 9. Aquatic Ecosystem Impacts¹

Aquatic Resource	Stream Length (ft) and Wetland Area (ac) in Alternative			Stream		Drainage Area (Sq Mi) ³
	1	2	3	Order	Type ²	
Stream 26 UNT Humphrey Creek	0.0	0.0	63.5	2	I	0.12
Stream 27 UNT Humphrey Creek	0.0	0.0	76.5	1	E	<0.20*
Stream 28 UNT Humphrey Creek	0.0	0.0	602.7	1	I	<0.20*
Stream 29 UNT Humphrey Creek	213.2	0.0	0.0	2	I	0.08
Stream 30 UNT Humphrey Creek	42.8	0.0	0.0	1	E	<0.20*
Stream 31 UNT Humphrey Creek	257.6	0.0	0.0	2	I	0.05
Stream 32 UNT Humphrey Creek	202.1	0.0	0.0	1	E	<0.20*
Stream 33 UNT Humphrey Creek	196.2	0.0	0.0	1	E	<0.20*
Stream 34 UNT Bayou Creek	224.6	0.0	0.0	1	E	<0.20*
Stream 35 UNT Humphrey Creek	190.4	270.5	530.6	4	P	3
Stream 36 Bayou Creek	210.6	0.0	0.0	3	I	0.9
Stream 37 UNT Humphrey Creek	200.0	0.0	0.0	4	P	1.68
Stream 38 UNT Humphrey Creek	301.7	217.0	0.0	3	I	0.15
Wetland A	0.045	0.132	0.132		PFO	
Wetland B	0.097	0.497	0.653		PFO	
Wetland C**	0.000	0.000	0.000		PEM	
Wetland D**	0.000	0.000	0.000		PEM	
Wetland E**	0.000	0.000	0.620		PFO	
Wetland F	0.000	0.000	0.028		PFO	
Wetland G	0.000	0.000	0.191		PFO	
Wetland H	0.000	0.000	0.137		PFO	
Wetland I**	0.000	0.000	0.062		PFO	
Wetland J**	0.000	0.000	0.060		PFO	
Wetland K**	0.000	0.000	0.033		PFO	
Wetland L	0.000	0.000	0.472		PFO	
Wetland M**	0.000	0.000	0.002		PEM	
Wetland N	0.000	0.000	0.029		PFO	
Wetland O	0.000	0.000	0.000		PFO	
Pond 1	0.000	0.091	0.000			
Pond 2	0.000	0.000	0.112			

¹Length/acreage within disturbance limits calculated using ArcMap GIS and design mapping provided by QK4 on February 5, 2019.

²P = Perennial; I = Intermittent; E = Ephemeral; PFO = Palustrine Forested; PEM = Palustrine Emergent

³Drainage area calculated using USGS StreamStats.

*Watershed unavailable from USGS StreamStats due to small drainage area.

**Isolated feature

2. Suggested Mitigation Measures

See Sections VII.C. 2 and VII.E. 2 for suggested mitigation measures for streams and wetlands.

C. Streams

I. Impacts

Construction activities and associated erosion will produce short-term and long-term impacts to streams in the project corridor. Potential direct, indirect, and cumulative impacts are summarized below:

- a. During construction, the potential for sedimentation will increase as sediments are exposed, extracted, and moved. Increased sedimentation can cause reduced stream capacity, which can increase flooding potential, and smothering of aquatic habitat.
- b. Because fresh sediment and rock are exposed, levels may increase for parameters such as turbidity, conductivity, and suspended solids.
- c. Potential increases in the amount of impervious surface following construction may contribute to greater and more rapid surface runoff to streams.
- d. Increased runoff during storm events may cause increased instream flows and velocities.
- e. New road surfaces will increase the potential for road salt, oil, antifreeze, and other non-point source pollutants to impact aquatic environments.
- f. Removal of the stream canopy will cause an increase in average stream temperatures during warmer months. Higher stream temperatures will support lower concentrations of dissolved oxygen. Both factors will have a negative impact on resident animal communities (fish, amphibians, mussels, macroinvertebrates). In addition, more open canopies and the subsequent increase in sunlight could promote the establishment of excessive algal growths.
- g. If not revegetated, streambanks will be less stable and could erode and release sediment into the stream channel. Increased sediment inputs will reduce instream cover for fish and macroinvertebrates.
- h. Removal of riparian vegetation along streams will also reduce the amount of coarse woody debris (sticks, leaves) entering the stream systems. This material represents an energy source for organisms inhabiting stream systems.
- i. Changes in quality and quantity could cause negative impacts on the aquatic community.

2. Suggested Mitigation Measures

Strict adherence to KYTC's *Standard Specifications for Road and Bridge Construction* (KYTC 2012) will minimize erosion and instream siltation. Guidance for sediment control is also provided in the Federal Highway Administration *Best Management Practices for Erosion and Sediment Control* (FHWA 1995). An erosion control plan will be developed for the project and approved by KYTC's Division of Environmental Analysis (DEA) prior to construction. The plan should include stringent erosion control methods, and all erosion control measures should be monitored periodically to ensure that they are functioning as planned. Similarly, KDFWR

recommended numerous BMP for all portions of the project corridor where streams are crossed (see KDFWR response in **Appendix C**).

Regardless of the alternative selected, project impacts are anticipated to require a 404 Permit issued by the USACE and a 401 Water Quality Certification and/or Permit to Construct along a Stream issued by KDOW. All alternatives will require permanent stream loss greater than 300' on a single stream; therefore, mitigation for stream impacts may be required.

D. Terrestrial Ecosystems

1. Impacts

No unique flora or fauna were observed during the field survey. Terrestrial disturbances from construction activities will include disturbance of deciduous forest along the riparian zone of streams and small forests associated with slopes and property boundaries.

Habitat fragmentation created by road construction is undesirable. Roads can act as barriers to terrestrial species (both flora and fauna), diminishing or even preventing migration between previously contiguous communities. Isolated communities are known to be less stable and may consequently be lost. New road construction through intact forest habitat will increase the edge effect. While benefiting species associated with edges, those requiring large uninterrupted habitats will be adversely affected.

All alternatives are likely to increase habitat fragmentation. Alternative 3 would require the most impacts to forested habitat, 39.6 acres. Alternative 2 would require 8.7 acres of forest conversion, and Alternative 2 would require the least amount of forest conversion, 8.4 acres.

2. Suggested Mitigation Methods

Not Applicable

E. Wetlands

1. Impacts

The construction of all alternatives will result in a direct impact to wetlands through filling, grading, and conversion to roadway (**Table 9**, page 21). Alternative 3 would require the most impacts to wetland habitat, 2.4 acres. Alternative 2 would require 0.6 acres of wetland conversion, and Alternative 1 would require the least amount of wetland conversion, 0.1 acres.

2. Suggested Mitigation Methods

Avoidance measures should be used to avoid, reduce, or eliminate impacts to wetlands. Proper BMPs to reduce or eliminate runoff of contaminants should be used, including the proper use of silt fencing to protect wetlands from contamination and sedimentation. Strict adherence to

KYTC's *Standard Specifications for Road and Bridge Construction* (KYTC 2012) will minimize erosion and instream siltation. Guidance for sediment control is also provided in the Federal Highway Administration *Best Management Practices for Erosion and Sediment Control* (FHWA 1995). An erosion control plan will be developed for the project and approved by KYTC's Division of Environmental Analysis prior to construction. The plan should include stringent erosion control methods. All erosion control measures should be monitored periodically to ensure that they are functioning as planned.

F. Threatened / Endangered Species

I. Impacts

Impacts to summer roosting and foraging habitat (i.e. forests) for the federally endangered Indiana bat, federally threatened northern long-eared bat, and state listed southeastern myotis, little brown bat, and evening bat, will be greater for Alternative 3 (47 acres) than Alternative 1 (18 acres) or Alternative 2 (14 acres). Impacts to streams, which provide foraging habitat for the federally endangered gray bat and other listed bat species, is also greater for Alternative 3 (6,378 feet), than for Alternative 1 (3,594 feet), or Alternative 2 (3,142 feet).

Impacts to habitat for the state listed plants, brown bog sedge, woolly sedge, and bog rush will be greater for Alternative 3 (2.4 acres) than Alternative 1 (0.1 acres) or Alternative 2 (0.6 acres).

Impacts to habitat for the state listed western mud snake, northern crawfish frog, and lakecress plant will be greater for Alternative 3 (1.1 acres) than Alternative 1 (0 acres) or Alternative 2 (0 acres).

Impacts to habitat for the state listed Bell's vireo bird will be greater for Alternative 3 (47 acres) than Alternative 1 (18 acres) or Alternative 2 (14 acres).

Impacts to habitat for federal and state listed species is summarized in **Table 8** (page 20).

2. Suggested Mitigation Methods

All resources should be utilized to minimize impacts to habitats conducive to threatened and endangered species. BMPs should be applied at stream crossings to minimize erosion and sedimentation in streams. Implementation of a well-developed erosion control plan, as well as the utilization of diversion channels and silt barriers, temporary seeding and mulching of cut and fill slopes, and limiting instream activity will minimize these adverse impacts.

Mitigation for impacts to forested Indiana bat habitat should be addressed by adhering to the September 6, 2012 Indiana Bat Programmatic Agreement between KYTC, Federal Highway Administration (FHWA), and the USFWS and/or Range Wide Consultation and Conservation Strategy. Because the project is not located within 1/2 mile of a known hibernacula or within 1/4 mile of a known summer maternity roost tree, it is covered under the final 4(d) rule, and

compensatory mitigation and seasonal tree clearing restrictions will not be required for impacts to the northern long-eared bat.

Impacts to gray bat habitat and winter roost habitat for Indiana bat, northern long-eared bat, and the state listed southeastern Myotis bat, little brown bat, and evening bat, should be addressed in a Biological Assessment that includes an effects analysis regarding the project's impacts to forests and streams.

VIII. SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY

The project will have short-term impacts to ecological resources through some increase in sedimentation during construction. During construction activities there may be an increase in sedimentation entering project streams and wetlands. Construction activities (e.g. heavy equipment operation, demolition, etc.) may result in a temporary increase in ambient noise levels, dust generation, disturbance of wildlife, and increased storm runoff.

Each alternative will require permanent conversion of land to paved roadway. Forests will be fragmented by the new roadway, and each alternative will require the permanent loss of forest habitat.

Impacts to long-term productivity will be higher for Alternative 3, as it will result in the loss of more acres of forest habitat, greater wetland impacts, and longer stream impacts.

IX. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The conversion of forests and edge habitat to pavement and the removal of blocks of mature trees represents an irreversible and irretrievable commitment of resources, as does the filling of wetlands and encapsulation of streams.

X. ALTERNATIVES ANALYSIS AND RECOMMENDATIONS

Table 10 summarizes potential project impacts to ecological resources within the project corridor.

Table 10. Project Impacts by Alternative

Resource Impacts ¹	Alternative		
	1	2	3
Stream Length	4,299.5 ft	3,631.2 ft	6, 450.7 ft
Wetland Area	0.1 ac	0.6 ac	2.4 ac
Forest/Bat Habitat Area	18 ac	14 ac	47 ac
Land Converted to Roadway	140 ac	115 ac	100 ac
State Listed Brown Bog Sedge, Woolly Sedge, and Bog Rush Habitat	18 ac	14 ac	47 ac
State Listed Western Mud Snake, Northern Crawfish Frog, Lakecress Habitat	0 ac	0 ac	1.1 ac
State Listed Bell's Vireo Habitat	18 acres	14 acres	47 acres

¹ Length/acreage within disturbance limits calculated using ArcMap GIS and design mapping provided by QK4 on Feb 5, 2019.

XI. SUMMARY

No habitats of exceptional quality or rarity were identified within the project corridor.

The fish community of the project area streams ranked “fair” and “good,” the benthic community ranked “very poor,” and habitat assessment for most streams (28 of 38) ranked “poor.”

Suitable summer foraging and roosting habitat (forests) for threatened and endangered bats will be permanently lost. Alternative 3 will result in greater loss of forest than Alternative 1 or 2.

Permanent impacts to streams are expected for all alternatives, although they are greater for Alternative 3. Impacts to wetlands are expected, most from Alternative 3. Impacts to water resources are likely to require a 404 permit issued by the USACE. Stream and wetland mitigation may be required.

BMPs to protect streams and wetlands should be implemented.

Based upon evaluation of potential impacts, Alternative 3 will result in the most disturbance of aquatic and terrestrial habitats. Alternatives 1 and 2 are similar, but Alternative 2 will result in the least amount of disturbance to aquatic and terrestrial habitats.

XII. REFERENCES

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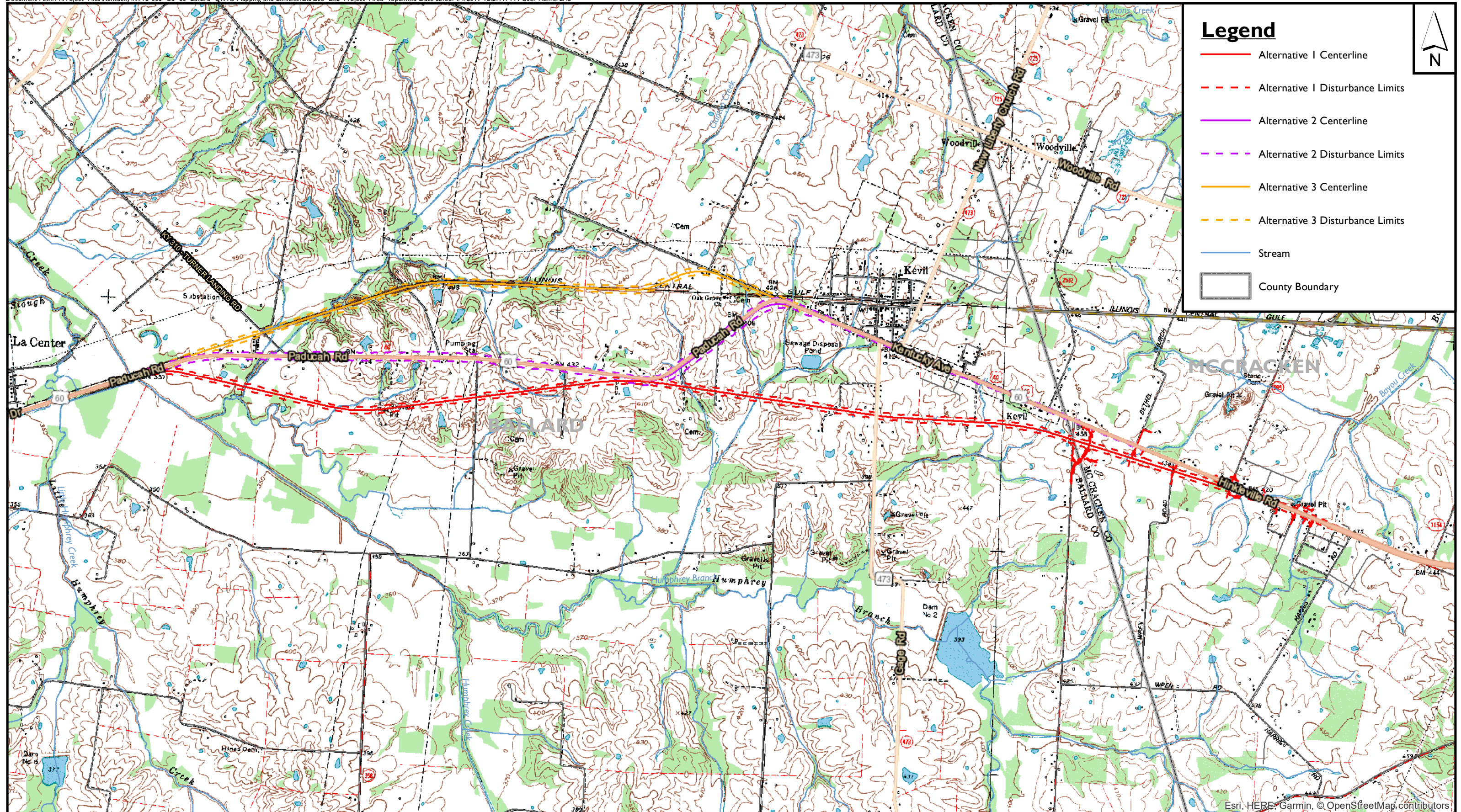
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APPENDIX A

EXHIBITS 1-7



<p>Prepared by: Third Rock Consultants, LLC 2526 Regency Road, Suite 180 Lexington, Kentucky 40503</p>	<p>0 0.5 1 2 Miles</p> <p>NOTE: Design alternative mapping provided by QK4, 2/5/19.</p>	<p>Exhibit I - Project Area (Aerial) US 60 (from 0.5 miles west of KY 310 to east of Kevil) KYTC Item I-115, I-115.1, and I-118 Ballard - McCracken Counties</p>	<p>Prepared for: Kentucky Transportation Cabinet Division of Environmental Analysis 200 Mero Street Frankfort, Kentucky 40622</p>
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Prepared by:
Third Rock Consultants, LLC
2526 Regency Road, Suite 180
Lexington, Kentucky 40503

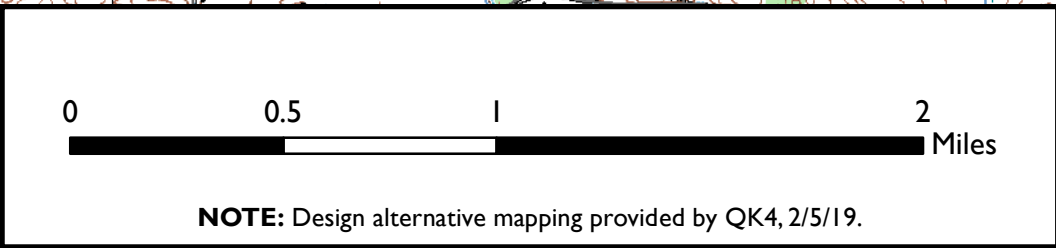
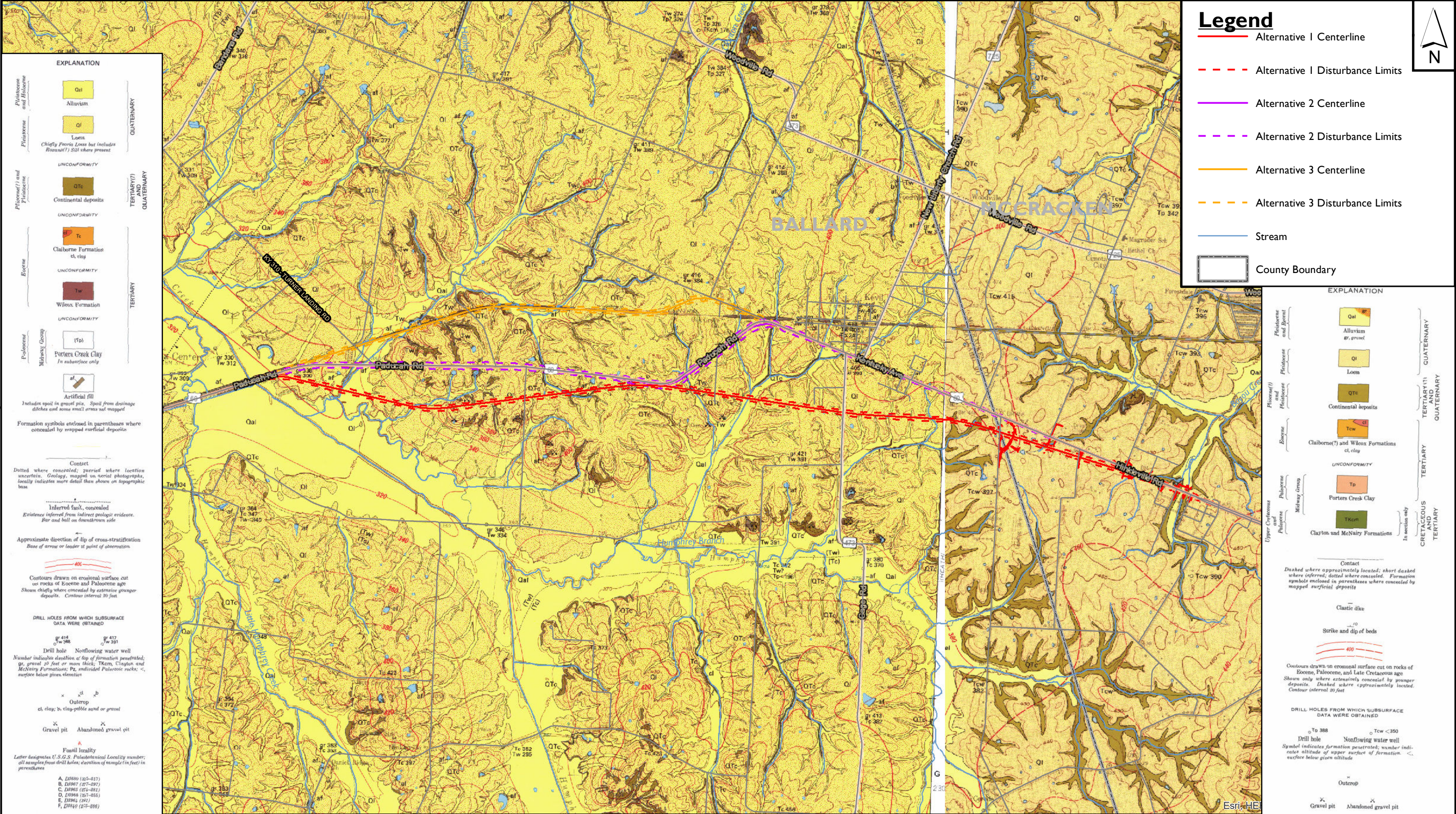
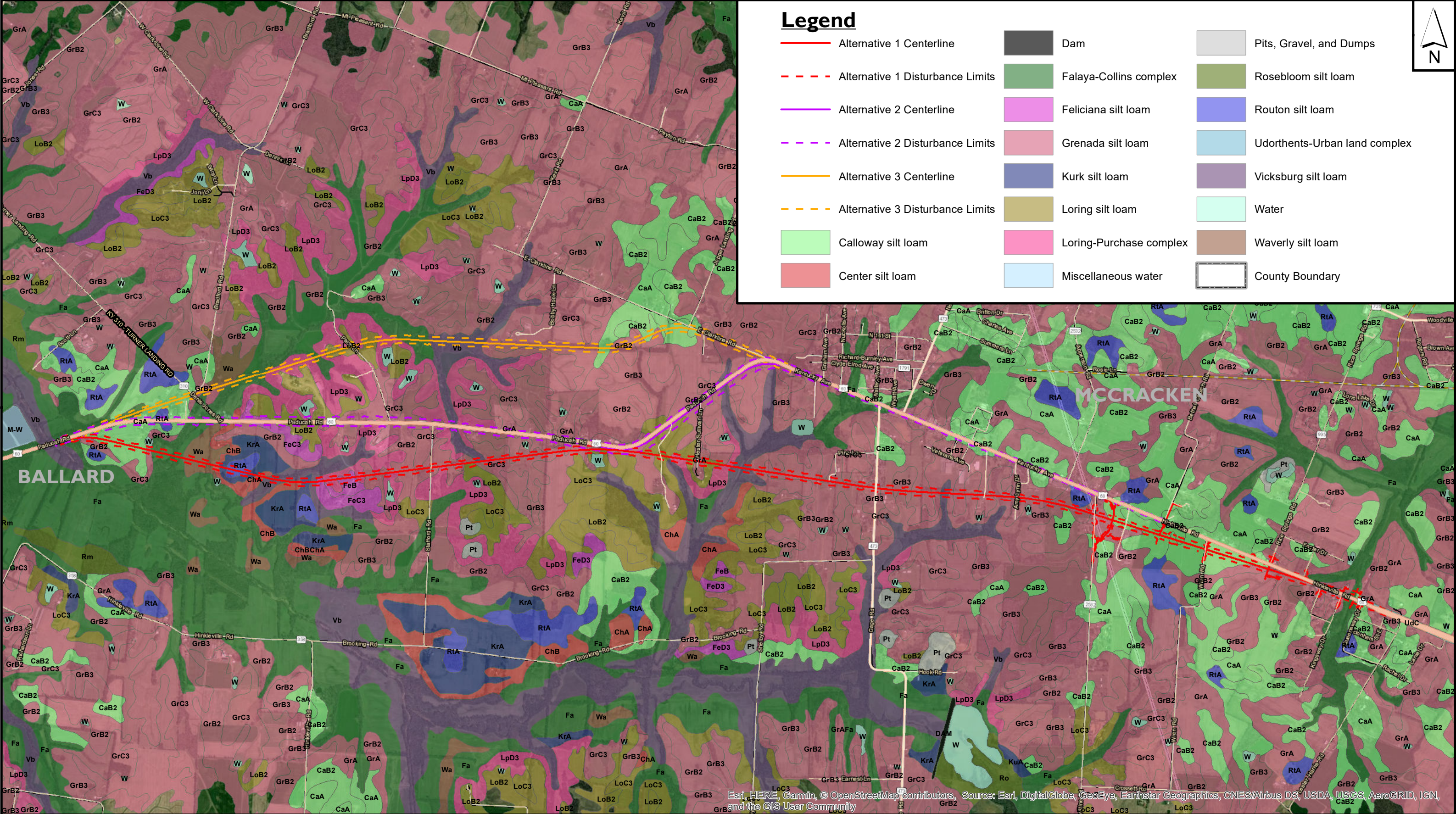


Exhibit 2 - Project Area (Topography)
US 60 (from 0.5 miles west
of KY 310 to east of Kevil)
KYTC Item I-115, I-115.1, and I-118
Ballard - McCracken Counties

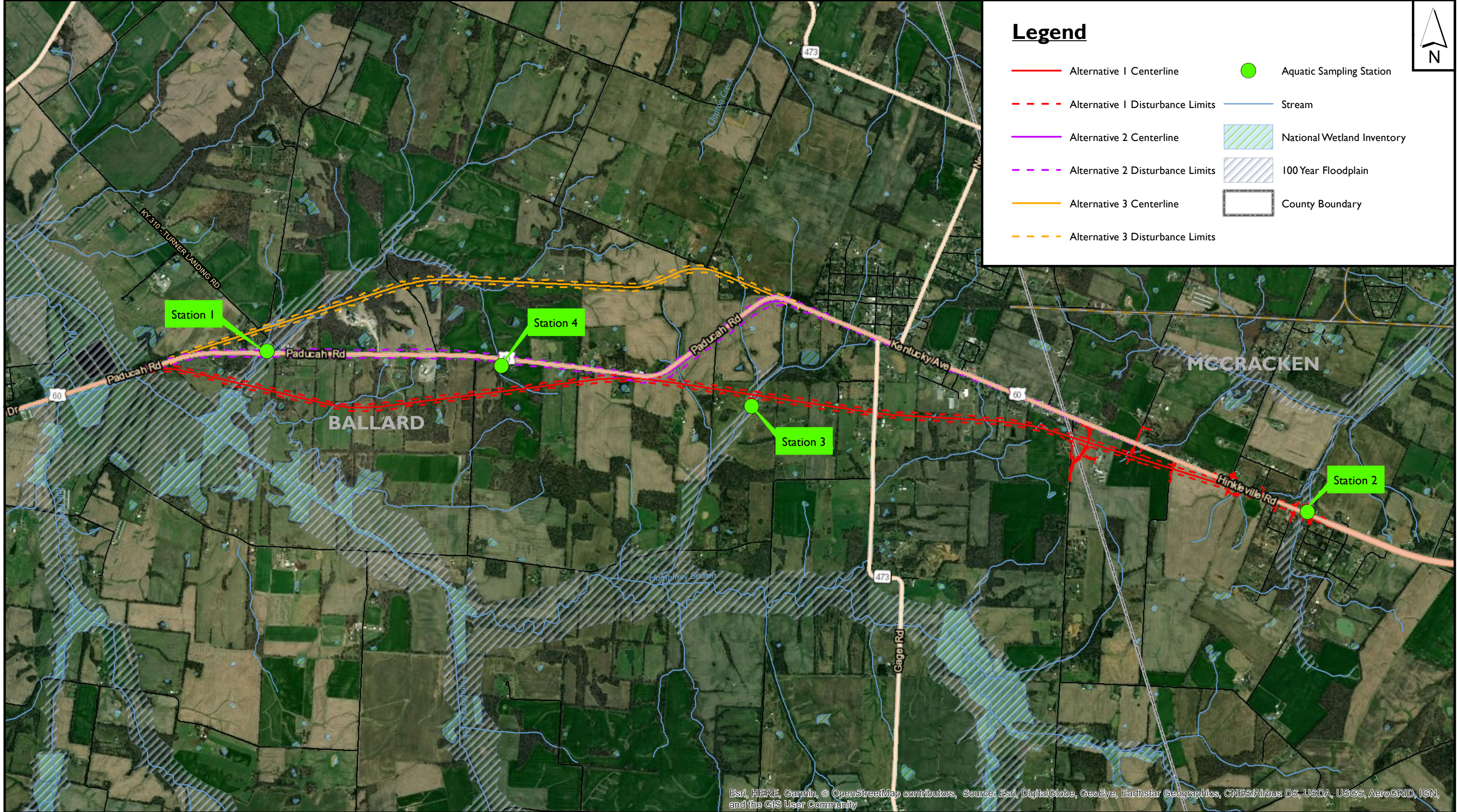
Prepared for:
Kentucky Transportation Cabinet
Division of Environmental Analysis
200 Mero Street
Frankfort, Kentucky 40622



<p>Prepared by: Third Rock Consultants, LLC 2526 Regency Road, Suite 180 Lexington, Kentucky 40503</p>	<p>0 0.5 1 2 Miles</p> <p>NOTE: Design alternative mapping provided by QK4, 2/5/19.</p>	<p>Exhibit 3 - Project Area (Geology) US 60 (from 0.5 miles west of KY 310 to east of Kevil) KYTC Item I-115, I-115.1, and I-118 Ballard - McCracken Counties</p>	<p>Prepared for: Kentucky Transportation Cabinet Division of Environmental Analysis 200 Mero Street Frankfort, Kentucky 40622</p>
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<p>Prepared by: Third Rock Consultants, LLC 2526 Regency Road, Suite 180 Lexington, Kentucky 40503</p>	<p>0 0.5 1 2 Miles</p> <p>NOTE: Design alternative mapping provided by QK4, 2/5/19.</p>	<p>Exhibit 4 - Project Area (Soils) US 60 (from 0.5 miles west of KY 310 to east of Kevil) KYTC Item I-115, I-115.1, and I-118 Ballard - McCracken Counties</p>	<p>Prepared for: Kentucky Transportation Cabinet Division of Environmental Analysis 200 Mero Street Frankfort, Kentucky 40622</p>
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<p>Prepared by: Third Rock Consultants, LLC 2526 Regency Road, Suite 180 Lexington, Kentucky 40503</p>	<p>0 0.5 1 2 Miles</p> <p>NOTE: Design alternative mapping provided by QK4, 2/5/19.</p>	<p>Exhibit 5 - Aquatic Sampling Locations US 60 (from 0.5 miles west of KY 310 to east of Kevil) KYTC Item I-115, I-115.1, and I-118 Ballard - McCracken Counties</p>	<p>Prepared for: Kentucky Transportation Cabinet Division of Environmental Analysis 200 Mero Street Frankfort, Kentucky 40622</p>
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Legend

- Alternative 1 Centerline

--- Alternative 1 Disturbance Limits

— Alternative 2 Centerline

--- Alternative 2 Disturbance Limits

— Alternative 3 Centerline

--- Alternative 3 Disturbance Limits

— Stream

Lakecress, Western Mud Snake, and Northern Crawfish Frog Habitat

Stream Foraging Habitat for Bats

Observed Wetlands and Brown Bog Sedge, Woolly Sedge, and Bog Rush Habitat

Summer Foraging and Roosting Habitat for Bats and Bell's Vireo Habitat

National Wetland Inventory

100 Year Floodplain

County Boundary
- The map displays an aerial view of the area between Ballard and McCracken Counties, Kentucky, showing the proposed US 60 corridor. Three alternatives are shown: Alternative 1 (red lines), Alternative 2 (purple lines), and Alternative 3 (orange lines). The map includes labels for various wetlands (A through O) and streams (1 through 38). The map also shows existing wetlands, floodplains, and county boundaries. A north arrow is located in the top right corner.
- Esri, HERE, Garmin, © OpenStreetMap contributors, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
- Prepared by:
Third Rock Consultants, LLC
2526 Regency Road, Suite 180
Lexington, Kentucky 40503
- 0 0.25 0.5
Miles
- NOTE: Design alternative mapping provided by QK4, 2/5/19.
- Exhibit 6A - Habitat Locations (Aerial)**
US 60 (from 0.5 miles west
of KY 310 to east of Kevil)
KYTC Item I-115, I-115.1, and I-118
Ballard - McCracken Counties
- Prepared for:
Kentucky Transportation Cabinet
Division of Environmental Analysis
200 Mero Street
Frankfort, Kentucky 40622

Legend

- Alternative 1 Centerline

Alternative 1 Disturbance Limits

Alternative 2 Centerline

Alternative 2 Disturbance Limits

Alternative 3 Centerline

Alternative 3 Disturbance Limits

Stream
- Stream Foraging Habitat for Bats

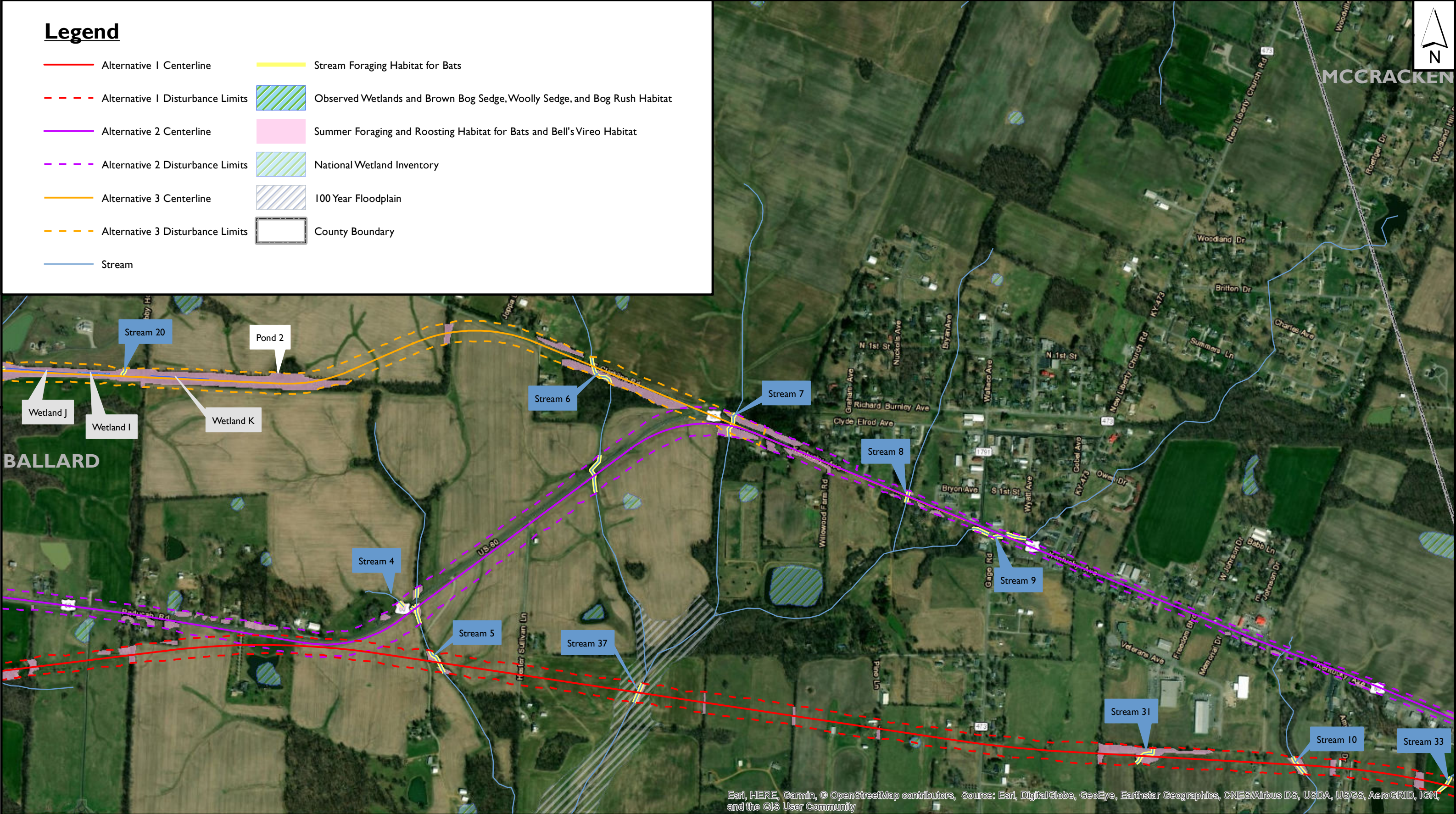
Observed Wetlands and Brown Bog Sedge, Woolly Sedge, and Bog Rush Habitat

Summer Foraging and Roosting Habitat for Bats and Bell's Vireo Habitat

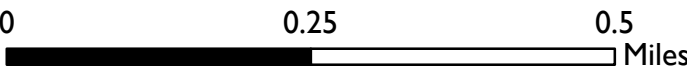
National Wetland Inventory

100 Year Floodplain

County Boundary



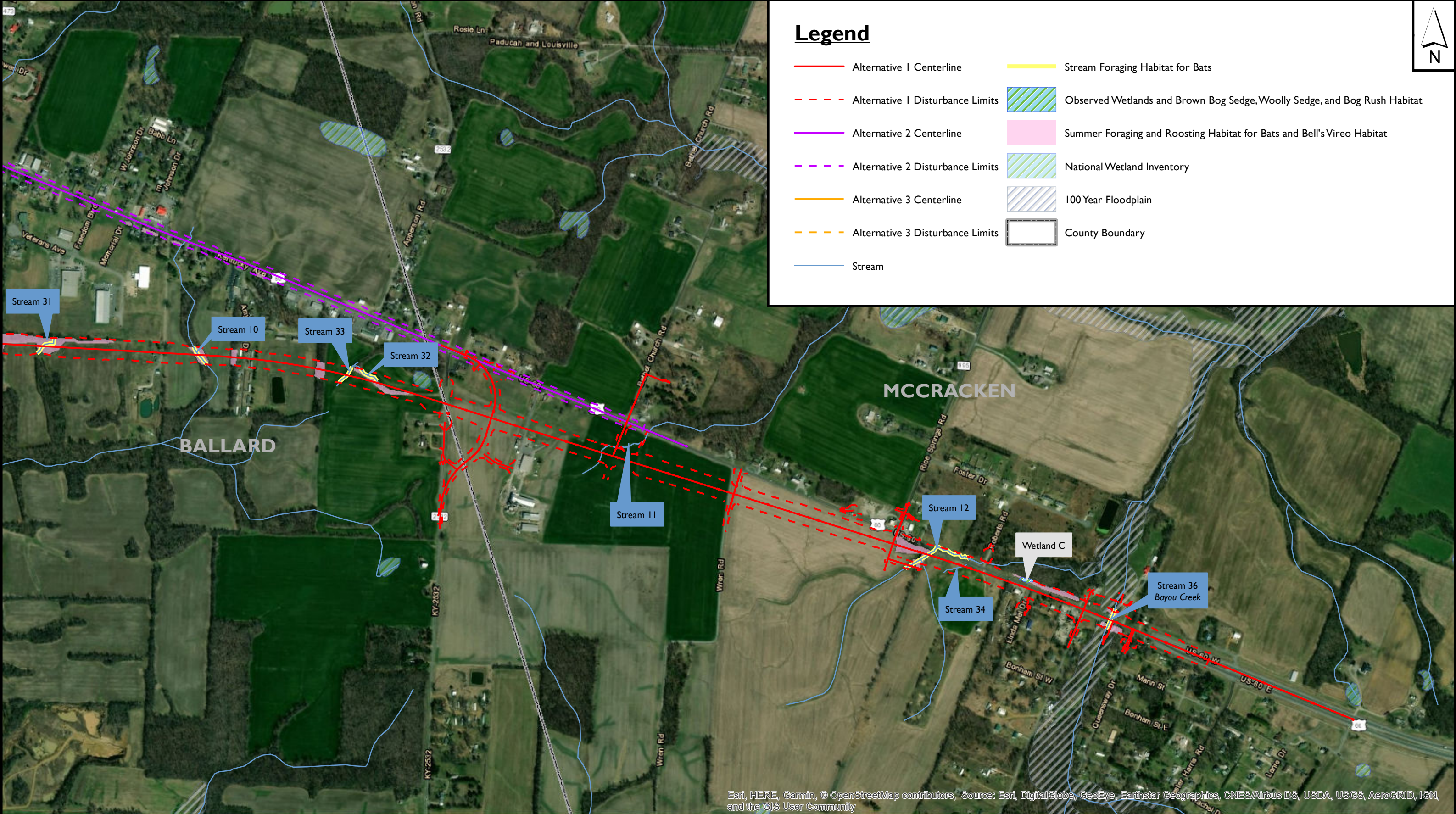
Prepared by:
Third Rock Consultants, LLC
2526 Regency Road, Suite 180
Lexington, Kentucky 40503



NOTE: Design alternative mapping provided by QK4, 2/5/19.

Exhibit 6B - Habitat Locations (Aerial)
US 60 (from 0.5 miles west of KY 310 to east of Kevil)
KYTC Item I-115, I-115.1, and I-118
Ballard - McCracken Counties

Prepared for:
Kentucky Transportation Cabinet
Division of Environmental Analysis
200 Mero Street
Frankfort, Kentucky 40622



<p>Prepared by: Third Rock Consultants, LLC 2526 Regency Road, Suite 180 Lexington, Kentucky 40503</p>	<p>0 0.25 0.5 Miles</p> <p>NOTE: Design alternative mapping provided by QK4, 2/5/19.</p>	<p>Exhibit 6C - Habitat Locations (Aerial) US 60 (from 0.5 miles west of KY 310 to east of Kevil) KYTC Item I-115, I-115.1, and I-118 Ballard - McCracken Counties</p>	<p>Prepared for: Kentucky Transportation Cabinet Division of Environmental Analysis 200 Mero Street Frankfort, Kentucky 40622</p>
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Legend

- Alternative 1 Centerline

- - - Alternative 1 Disturbance Limits

— Alternative 2 Centerline

- - - Alternative 2 Disturbance Limits

— Alternative 3 Centerline

- - - Alternative 3 Disturbance Limits

— Stream

Lakecress, Western Mud Snake, and Northern Crawfish Frog Habitat

Stream Foraging Habitat for Bats

Observed Wetlands and Brown Bog Sedge, Woolly Sedge, and Bog Rush Habitat

Summer Foraging and Roosting Habitat for Bats and Bell's Vireo Habitat

National Wetland Inventory

100 Year Floodplain

County Boundary
-
- Prepared by:
Third Rock Consultants, LLC
2526 Regency Road, Suite 180
Lexington, Kentucky 40503
-
- NOTE: Design alternative mapping provided by QK4, 2/5/19.
- Exhibit 7A - Habitat Locations (Topography)**
US 60 (from 0.5 miles west
of KY 310 to east of Kevil)
KYTC Item I-115, I-115.1, and I-118
Ballard - McCracken Counties
- Prepared for:
Kentucky Transportation Cabinet
Division of Environmental Analysis
200 Mero Street
Frankfort, Kentucky 40622

Legend

- Alternative 1 Centerline

Alternative 1 Disturbance Limits

Alternative 2 Centerline

Alternative 2 Disturbance Limits

Alternative 3 Centerline

Alternative 3 Disturbance Limits

Stream
- Stream Foraging Habitat for Bats

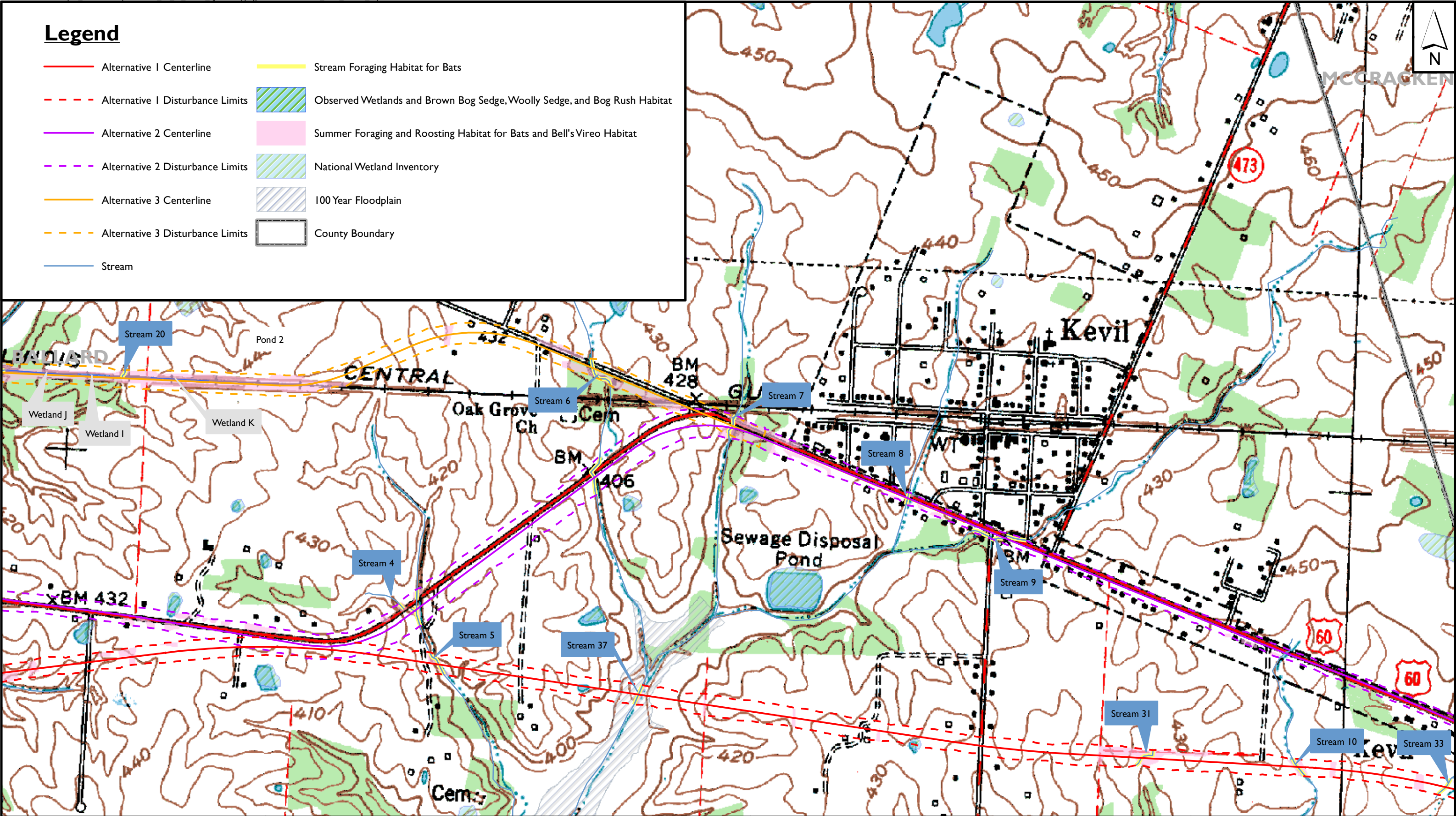
Observed Wetlands and Brown Bog Sedge, Woolly Sedge, and Bog Rush Habitat

Summer Foraging and Roosting Habitat for Bats and Bell's Vireo Habitat

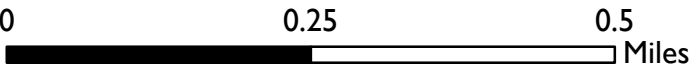
National Wetland Inventory

100 Year Floodplain

County Boundary



Prepared by:
Third Rock Consultants, LLC
2526 Regency Road, Suite 180
Lexington, Kentucky 40503



NOTE: Design alternative mapping provided by QK4, 2/5/19.

Exhibit 7B - Habitat Locations (Topography)
US 60 (from 0.5 miles west
of KY 310 to east of Kevil)
KYTC Item I-115, I-115.1, and I-118
Ballard - McCracken Counties

Prepared for:
Kentucky Transportation Cabinet
Division of Environmental Analysis
200 Mero Street
Frankfort, Kentucky 40622

A horizontal scale bar with a black background. It has tick marks at 0, 0.25, and 0.5. The word "Miles" is at the right end.

Prepared for:
Kentucky Transportation Cabinet
Division of Environmental Analysis
200 Mero Street
Frankfort, Kentucky 40622

APPENDIX B

TYPICAL SECTION

FILE NAME: T:\KYTC\02 PROJECTS\202-102 BALLARD US 60\1-115.00\VPBS\02-TYPICALS&SUMMARY\TYPICAL SECTIONS.DGN

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DATE PLOTTED: March 25, 2019

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MicroStation v8.1i.7.443

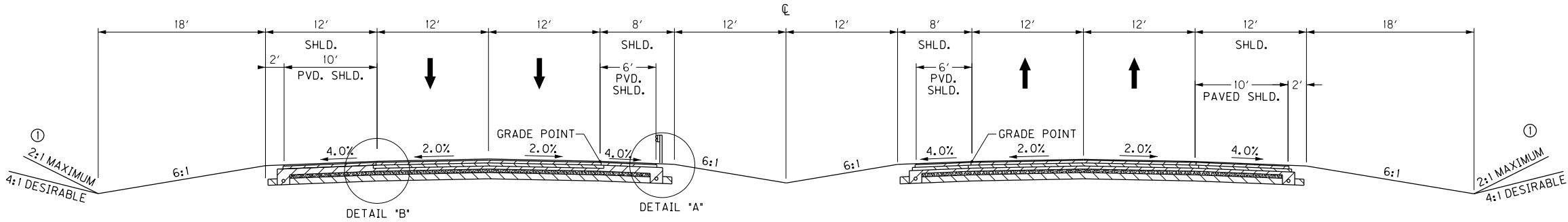
TYPICAL SECTIONS

US 60

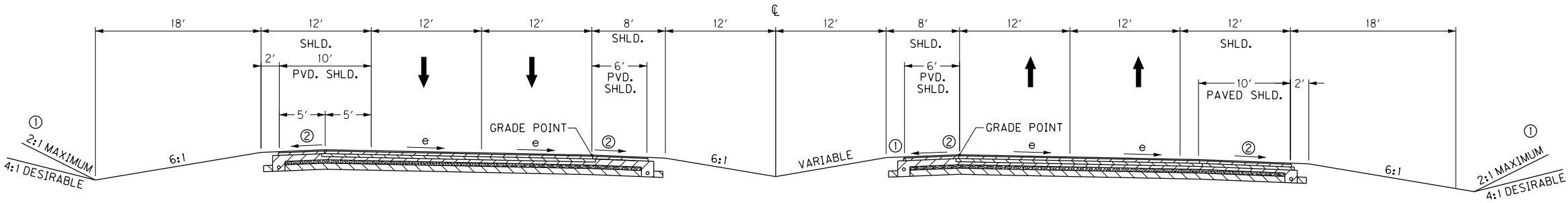
COUNTY OF	ITEM NO.	SHEET NO.
BALLARD	1-115.00	R2

NOTES:

- SEE CROSS SECTIONS FOR SLOPES OUTSIDE THE LIMITS OF THE SHOULDER.
- SUPERELEVATED SHOULDER TO BE CONSTRUCTED TO SUPERELEVATION RATE. AT NO TIME WILL THE SLOPE BE FLATTER THAN THE SLOPE INDICATED FOR NORMAL SECTION.
- ASPHALT SEAL COAT REQUIRED FROM OUTSIDE EDGE OF PAVED SHOULDER TO A POINT 2 FEET DOWN THE DITCH OR FILL SLOPE. TWO APPLICATIONS OF THE FOLLOWING:
ASPHALT SEAL COAT 2.4 LBS/SQ. YD.
ASPHALT SEAL AGGREGATE 20 LBS/SQ. YD.
(SIZE #8 OR #9)



RURAL (NORMAL) SECTION
TEMPLATE USED ON ALIGNMENT SECTIONS:
1-A, 1-B
2-A, 2B
3



RURAL (SUPERELEVATED) SECTION
TEMPLATE USED ON ALIGNMENT SECTIONS:
1-A, 1-B
2-A, 2-B
3

FILE NAME: T:\KYTC\02 PROJECTS\202-102 BALLARD US 60\1-115.00\VPBF\S\02-TYPICALS&SUMMARY\TYPICAL SECTIONS.DGN

USER: mwimsott
DATE PLOTTED: March 25, 2019

E-SHEET NAME:

MicroStation v8.1i.7.443

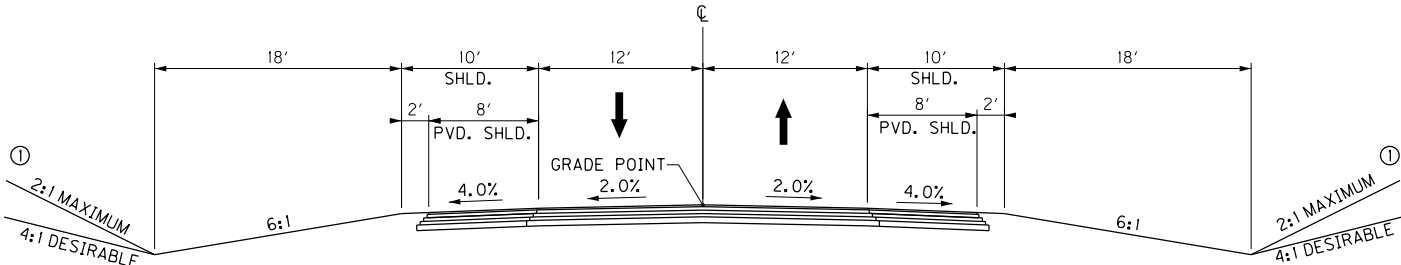
TYPICAL SECTIONS

US 60

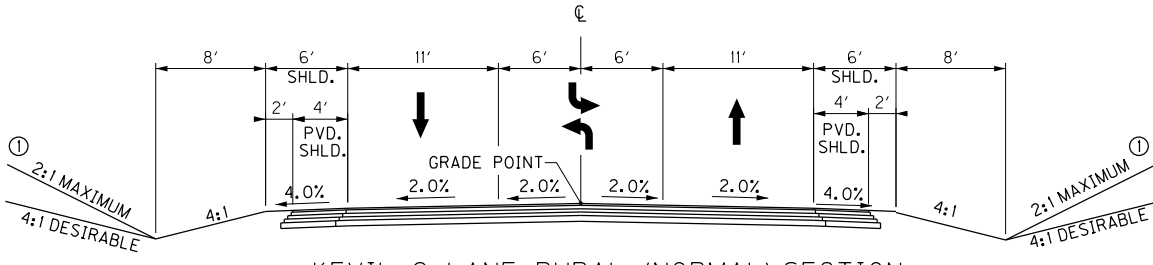
COUNTY OF	ITEM NO.	SHEET NO.
BALLARD	1-115.00	R2

NOTES:

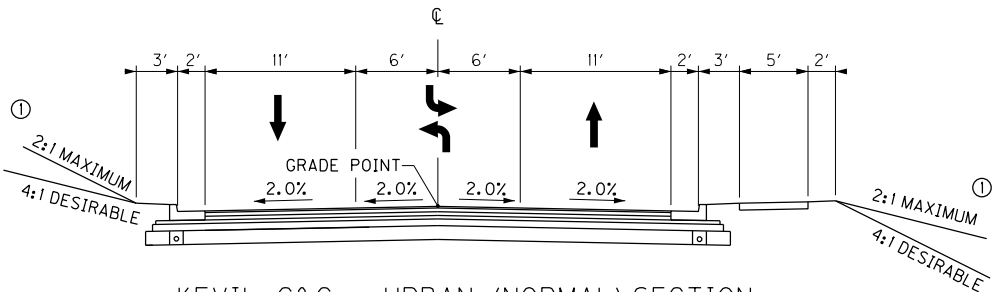
- ① SEE CROSS SECTIONS FOR SLOPES OUTSIDE THE LIMITS OF THE SHOULDER.
- ② SUPERELEVATED SHOULDER TO BE CONSTRUCTED TO SUPERELEVATION RATE. AT NO TIME WILL THE SLOPE BE FLATTER THAN THE SLOPE INDICATED FOR NORMAL SECTION.
- ③ ASPHALT SEAL COAT REQUIRED FROM OUTSIDE EDGE OF PAVED SHOULDER TO A POINT 2 FEET DOWN THE DITCH OR FILL SLOPE. TWO APPLICATIONS OF THE FOLLOWING:
ASPHALT SEAL COAT 2.4 LBS/SQ. YD.
ASPHALT SEAL AGGREGATE 20 LBS/SQ. YD.
(SIZE #8 OR #9)



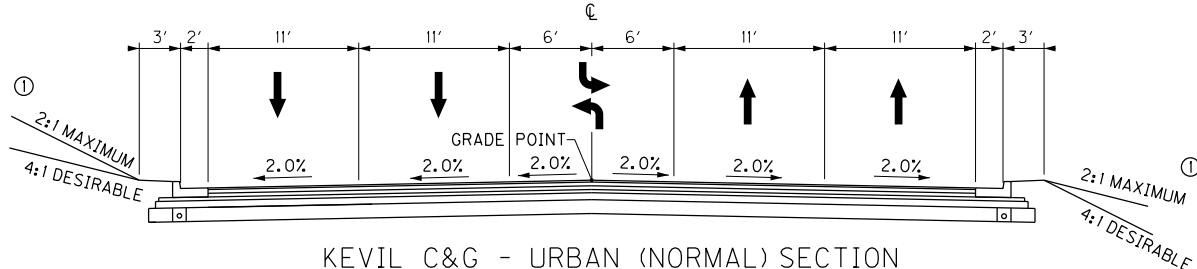
SUPER 2 - RURAL (NORMAL) SECTION
TEMPLATE USED ON ALIGNMENT SECTIONS:
1-A, 1-B
2-A, 2-B
3



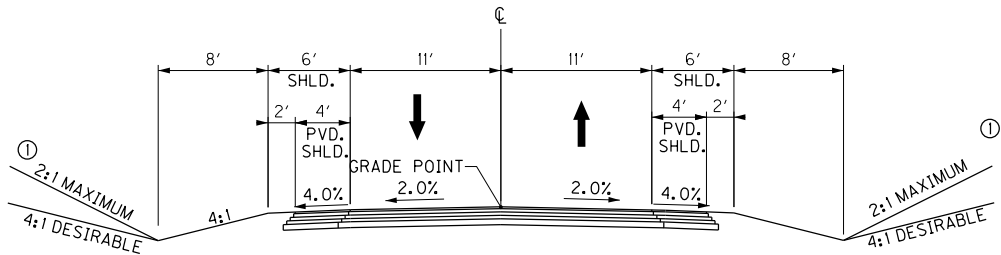
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TEMPLATE USED ON ALIGNMENT SECTIONS:
2-C



KEVIL C&G - URBAN (NORMAL) SECTION
2 LANE W/ TWLTL
TEMPLATE USED ON ALIGNMENT SECTIONS:
2-C



KEVIL C&G - URBAN (NORMAL) SECTION
4 LANE W/ TWLTL
TEMPLATE USED ON ALIGNMENT SECTIONS:
2-C



PBFS 2 LANE - RURAL (NORMAL) SECTION
TEMPLATE USED ON ALIGNMENT SECTIONS:
1-A, 1-B

APPENDIX C

AGENCY CORRESPONDENCE



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Kentucky Ecological Services Field Office
J C Watts Federal Building, Room 265
330 West Broadway
Frankfort, KY 40601-8670
Phone: (502) 695-0468 Fax: (502) 695-1024
<http://www.fws.gov/frankfort/>

In Reply Refer To:

August 02, 2018

Consultation Code: 04EK1000-2018-SLI-1961

Event Code: 04EK1000-2018-E-05129

Project Name: KY18-005_US_60_Ballard_QK4

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

Your concern for the protection of endangered and threatened species is greatly appreciated. The purpose of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.) (ESA) is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. The species list attached to this letter fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the ESA to provide information as to whether any proposed or listed species may be present in the area of a proposed action. This is not a concurrence letter; additional consultation with the Service may be required.

The Information in Your Species List:

The enclosed species list identifies federal trust species and critical habitat that may occur within the boundary that you entered into IPaC. For your species list to most accurately represent the species that may potentially be affected by the proposed project, the boundary that you input into IPaC should represent the entire “action area” of the proposed project by considering all the potential “effects of the action,” including potential direct, indirect, and cumulative effects, to federally-listed species or their critical habitat as defined in 50 CFR 402.02. This includes effects of any “interrelated actions” that are part of a larger action and depend on the larger action for their justification and “interdependent actions” that have no independent utility apart from the action under consideration (e.g.; utilities, access roads, etc.) and future actions that are reasonably certain to occur as a result of the proposed project (e.g.; development in response to a new road). If your project is likely to have significant indirect effects that extend well beyond the project footprint (e.g., long-term impacts to water quality), we highly recommend that you

coordinate with the Service early to appropriately define your action area and ensure that you are evaluating all the species that could potentially be affected.

We must advise you that our database is a compilation of collection records made available by various individuals and resource agencies available to the Service and may not be all-inclusive. This information is seldom based on comprehensive surveys of all potential habitats and, thus, does not necessarily provide conclusive evidence that species are present or absent at a specific locality. New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list.

Please note that “critical habitat” refers to specific areas identified as essential for the conservation of a species that have been designated by regulation. Critical habitat usually does not include all the habitat that the species is known to occupy or all the habitat that may be important to the species. Thus, even if your project area does not include critical habitat, the species on the list may still be present.

Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the ESA, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and associated information. To re-access your project in IPaC, go to the IPaC web site (<https://ecos.fws.gov/ipac/>), select “Need an updated species list?”, and enter the consultation code on this letter.

ESA Obligations for Federal Projects:

Under sections 7(a)(1) and 7(a)(2) of the ESA and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

If a Federal project (a project authorized, funded, or carried out by a federal agency) may affect federally-listed species or critical habitat, the Federal agency is required to consult with the Service under section 7 of the ESA, pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at: <http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). Recommended contents of a Biological Assessment are described at 50 CFR 402.12. For projects other than major construction activities, the Service suggests that a biological evaluation

similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat.

ESA Obligations for Non-federal Projects:

Proposed projects that do not have a federal nexus (non-federal projects) are not subject to the obligation to consult under section 7 of the ESA. However, section 9 of the ESA prohibits certain activities that directly or indirectly affect federally-listed species. These prohibitions apply to all individuals subject to the jurisdiction of the United States. Non-federal project proponents can request technical assistance from the Service regarding recommendations on how to avoid and/or minimize impacts to listed species. The project proponent can choose to implement avoidance, minimization, and mitigation measures in a proposed project design to avoid ESA violations.

Additional Species-specific Information:

In addition to the species list, IPaC also provides general species-specific technical assistance that may be helpful when designing a project and evaluating potential impacts to species. To access this information from the IPaC site (<https://ecos.fws.gov/ipac/>), click on the text “My Projects” on the left of the black bar at the top of the screen (you will need to be logged into your account to do this). Click on the project name in the list of projects; then, click on the “Project Home” button that appears. Next, click on the “See Resources” button under the “Resources” heading. A list of species will appear on the screen. Directly above this list, on the right side, is a link that will take you to pdfs of the “Species Guidelines” available for species in your list. Alternatively, these documents and a link to the “ECOS species profile” can be accessed by clicking on an individual species in the online resource list.

Next Steps:

Requests for additional technical assistance or consultation from the Kentucky Field Office should be submitted following guidance on the following page <http://www.fws.gov/frankfort/PreDevelopment.html> and the document retrieved by clicking the “outline” link at that page. When submitting correspondence about your project to our office, please include the Consultation Tracking Number in the header of this letter. (There is no need to provide us with a copy of the IPaC-generated letter and species list.)

Attachment(s):

- Official Species List
-

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Kentucky Ecological Services Field Office

J C Watts Federal Building, Room 265

330 West Broadway

Frankfort, KY 40601-8670

(502) 695-0468

Project Summary

Consultation Code: 04EK1000-2018-SLI-1961

Event Code: 04EK1000-2018-E-05129

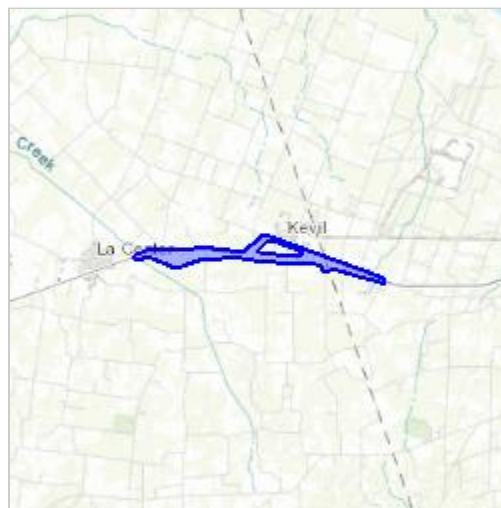
Project Name: KY18-005_US_60_Ballard_QK4

Project Type: TRANSPORTATION

Project Description: The Kentucky Transportation Cabinet (KYTC) Department of Highways District 1 has selected QK4 to develop an Environmental Assessment (EA) in support of proposed improvements of US 60 beginning where the existing US 60 four-lane cross-section into Paducah ends, east of the community of La Center. Designs have been developed under three separate KYTC Item numbers, including a southern “preferred alternative” on new alignment. All activities completed to date used state funding; however, the project is converting to federal funding, triggering additional alternatives evaluation due to impacts associated with the previously identified preferred. QK4 will evaluate a No Build alternative and two build alternatives: (1) the alignment shown in the RFP, with potential tweaks to minimize effects to historic resources; and, (2) a performance-based flexible solution generally following the existing alignment.

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/place/37.07656950346461N88.8841870551216W>



Counties: Ballard, KY | McCracken, KY

Endangered Species Act Species

There is a total of 4 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 3 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
<p>Gray Bat <i>Myotis grisescens</i></p> <p>No critical habitat has been designated for this species.</p> <p>Species profile: https://ecos.fws.gov/ecp/species/6329</p>	Endangered
<p>Indiana Bat <i>Myotis sodalis</i></p> <p>There is final critical habitat for this species. Your location is outside the critical habitat.</p> <p>This species only needs to be considered under the following conditions:</p> <ul style="list-style-type: none"> ▪ All activities in this location should consider possible effects to this species. The project area includes "potential" habitat. <p>Species profile: https://ecos.fws.gov/ecp/species/5949</p> <p>Species survey guidelines: https://ecos.fws.gov/ipac/guideline/survey/population/1/office/42431.pdf</p>	Endangered
<p>Northern Long-eared Bat <i>Myotis septentrionalis</i></p> <p>No critical habitat has been designated for this species.</p> <p>This species only needs to be considered under the following conditions:</p> <ul style="list-style-type: none"> ▪ The specified area includes areas in which incidental take would not be prohibited under the 4(d) rule. For reporting purposes, please use the "streamlined consultation form," linked to in the "general project design guidelines" for the species. <p>Species profile: https://ecos.fws.gov/ecp/species/9045</p>	Threatened

Birds

NAME	STATUS
Least Tern <i>Sterna antillarum</i> Population: interior pop. No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: <ul style="list-style-type: none">▪ This species should be addressed if the action area includes bare open areas with sparse to no vegetation (e.g., sand and gravel pits, agricultural fields) and the action would occur during the nesting season (April - August). Species profile: https://ecos.fws.gov/ecp/species/8505	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.



**TOURISM, ARTS AND HERITAGE CABINET
KENTUCKY DEPARTMENT OF FISH & WILDLIFE RESOURCES**

Matthew G. Bevin
Governor

Don Parkinson
Secretary

#1 Sportsman's Lane
Frankfort, Kentucky 40601
Phone (502) 564-3400
1-800-858-1549
Fax (502) 564-0506
fw.ky.gov

Regina Stivers
Deputy Secretary

Frank Jemley, III
Acting Commissioner

17 August 2018

Third Rock Consultants, LLC
Attn: Chelsey Olson
2526 Regency Road, Suite 180
Lexington, KY 40503

RE: KY 18-005
U.S. 60 – Ballard County, Kentucky

Dear Mr. Scott:

The Kentucky Department of Fish and Wildlife Resources (KDFWR) has received your request for information pertaining to the subject project. The Kentucky Fish and Wildlife Information System indicates that no federally or state-listed species are known to occur within close proximity of the project site. Please be aware our database system is a dynamic one that only represents our current knowledge of various species distributions.

No caves, critical habitats, wildlife management areas, or other unique natural areas are known to occur within the project corridor. Please consult with the U.S. Fish and Wildlife Service Kentucky Field Office regarding federally-listed species and tree-clearing related to bats. Further, KDFWR recommends that you contact the appropriate US Army Corps of Engineers office and the Kentucky Division of Water prior to any work within the waterways or wetland habitats of Kentucky. KDFWR recommends the following for the portions of the project that impact streams:

- Channel changes located within the project area should incorporate natural stream channel design.
- If culverts are used, the culvert should be designed to allow the passage of aquatic organisms.
- Culverts should be designed so that degradation upstream and downstream of the culvert does not occur.
- Development/excavation during low flow period to minimize disturbances.
- Proper placement of erosion control structures below highly disturbed areas to minimize entry of silt into area streams.
- Replanting of disturbed areas after construction, including stream banks, with native vegetation for soil stabilization and enhancement of fish and wildlife populations. We recommend a 100 foot forested buffer along each stream bank.
- Return all disturbed instream habitat to a stable condition upon completion of construction in the area.
- Preservation of any tree canopy overhanging any streams within the project area.



To minimize indirect impacts to the aquatic environment, the KDFWR recommends that erosion control measures be developed and implemented prior to construction to reduce siltation into waterways located within the project area. Such erosion control measures may include, but are not limited to silt fences, staked straw bales, brush barriers, sediment basins, and diversion ditches. Erosion control measures will need to be installed prior to construction and should be inspected and repaired regularly as needed.

I hope this information is helpful to you, and if you have questions or require additional information, please call me at (502) 564-7109 extension 4453.

Sincerely,

A handwritten signature in cursive script, appearing to read "Dan Stoelb".

Dan Stoelb
Environmental Scientist

Cc: Environmental Section File



KENTUCKY STATE NATURE PRESERVES COMMISSION

Matthew G. Bevin
Governor

300 Sower Blvd
Frankfort, Kentucky 40601-1132
Phone 502-573-2886
Fax 502-573-2355
<http://naturepreserves.ky.gov>

Charles G. Snavelly
Secretary

Zeb Weese
Executive Director

June 7, 2018

William Olson
Third Rock Consultants
2526 Regency Road
Lexington, KY 40503

Project: US 60 Improvements; KY18-005
Project ID: 18-0030
Project Type: Transportation
Site Acreage: 50,257.31
Site Lat/Lon: 37.077499 / -88.900954
County: Ballard; McCracken
USGS Quad: Bandana; Heath; Joppa; La Center
Watershed HUC12: Bayou Creek-Ohio River; Clanton Creek; Lower
Humphrey Creek; Middle Humphrey Creek; Shawnee
Creek +
Physiographic Region: Purchase

Dear William Olson,

This letter is in response to your data request for the project referenced above. We have reviewed our Natural Heritage Program Database to determine if any of the endangered, threatened, or special concern plants and animals or exemplary natural communities monitored by the Kentucky State Nature Preserves Commission occur within your general project area. Your project does pose a concern at this time, therefore please see the attached reports for more detailed information.

I would like to take this opportunity to remind you of the terms of the data request license, which you agreed upon in order to submit your request. The license agreement states "Data and data products received from the Kentucky State Nature Preserves Commission, including any portion thereof, may not be reproduced in any form or by any means without the express written authorization of the Kentucky State Nature Preserves Commission." The exact location of plants, animals, and natural communities, if released by the Kentucky State Nature Preserves Commission, may not be released in any document or correspondence. These products are provided on a temporary basis for the express project (described above) of the requester, and may not be redistributed, resold or copied without the written permission of the Kentucky State Nature Preserves Heritage Branch (300 Sower Blvd - 4th Floor, Frankfort, KY, 40601. Phone: (502) 782-7828).

Please note that the quantity and quality of data collected by the Kentucky Natural Heritage Program are dependent on the research and observations of many individuals and organizations. In most cases, this information is not the result of comprehensive or site-specific field surveys; many natural areas in Kentucky have never been thoroughly surveyed and new plants and animals are still being discovered. For these reasons, the Kentucky Natural Heritage Program cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of Kentucky. Heritage reports summarize the existing information known to the Kentucky Natural Heritage



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Project ID: 18-0030
June 7, 2018
Page 2

Program at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. We would greatly appreciate receiving any pertinent information obtained as a result of on-site surveys.

If you have any questions, or if I can be of further assistance, please do not hesitate to contact me.

Sincerely,

Ian Horn
Geoprocessing Specialist



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Standard Occurrence Report

KSNPC monitored species within 1 Miles of Project Area

EO ID	Scientific Name	Common Name	GRank	SRank	SPROT	USES A	Last Obs Date	Precision	EO Rank	Lat / Lon	Directions	Habitat
2105	<i>Amoracia lacustris</i>	Lakecress	G4?	S1S2	T		1974-06-24	G	H	37.1639 / -89.0458	BALLARD COUNTY WILDLIFE MANAGEMENT AREA.	Quiet shores or muddy waters of sloughs, cypress swamps, seasonal sloughs, or slow water.
14297	<i>Asclepias hirtella</i>	Prairie milkweed	G5	S2	T		1974-06-25	G	E	37.1059 / -88.8353	West KY. WMA.	Fields, barrens and roadsides.
9354	<i>Baptisia bracteata</i> var. <i>glabrescens</i>	Cream Wild Indigo	G4G5T4T5	S3	S		1997-05-11	S	C	37.1008 / -88.8044	WEST KY WMA, RD AROUND NUCLEAR PLANT (DYKE RD).	Prairies and open dry or upland woods; sandhills.
7611	<i>Calamagrostis canadensis</i> var. <i>macouniana</i>	Blue-joint Reedgrass	G5T5?	SH	H		1974-06-03	G	H	37.1639 / -89.0458	BALLARD COUNTY WILDLIFE MANAGEMENT AREA.	Open swamps, wet meadows, prairies, pond margins, wet ditches.
7926	<i>Carex buxbaumii</i>	Brown Bog Sedge	G5	S1	E		1970-05-18	G	H	37.1611 / -89.0317	BALLARD COUNTY WILDLIFE MANAGEMENT AREA.	Open wet areas such as wet meadows and bogs.
6739	<i>Carex gigantea</i>	Large Sedge	G4	S1S2	E		1976-07-10	G	H	37.1639 / -89.0458	BALLARD COUNTY WILDLIFE MANAGEMENT AREA.	Bottomland forests and floodplain swamps; also cypress depressions (Weakley 2011).
7508	<i>Carex pellita</i>	Woolly Sedge	G5	SH	H		1976-05-09	G	H	37.1797 / -89.0269	BALLARD COUNTY WILDLIFE MANAGEMENT AREA.	Rich meadows, swales and shores (Fernald 1970).
5379	<i>Farancia abacura reinwardtii</i>	Western Mud Snake	G5T5	S3	S		1986-pre	M	U	37.0778 / -88.9549	W of Kevil on US 60, Ballard Co [plotted on US 60 at Humphrey Creek, between Kevil and La Center].	Wooded swamps, sloughs.
6909	<i>Ictiobus niger</i>	Black Buffalo	G5	S3	S		1996-07	S	D	37.1525 / -88.9375	CLANTON CREEK AT KY 358 (SITE 27).	Reservoirs and medium to large rivers with moderate to low gradient and sometime swift current (Becker 1983, Pflieger 1975, Smith 1979, Trautman 1981, and Burr and Warren 1986).
7041	<i>Ictiobus niger</i>	Black Buffalo	G5	S3	S		1997-03	S	D	37.1267 / -88.8244	BIG BAYOU CREEK (CA. 0.4 STREAM KM S OF WEST BOONE RD CROSSING).	Reservoirs and medium to large rivers with moderate to low gradient and sometime swift current (Becker 1983, Pflieger 1975, Smith 1979, Trautman 1981, and Burr and Warren 1986).

Standard Occurrence Report

KSNPC monitored species within 1 Miles of Project Area

EO ID	Scientific Name	Common Name	GRank	SRank	SPROT	USES A	Last Obs Date	Precision	EO Rank	Lat / Lon	Directions	Habitat
10536	<i>Juncus elliotii</i>	Bog Rush	G4G5	SH	H		1970-05-28	G	H	37.1639 / -89.0458	BALLARD COUNTY WILDLIFE MANAGEMENT AREA.	Margins of ponds and lakes, depressions in savannas and flatwoods, wet, disturbed clearings, roadside ditches (Weakley 1998); damp or wet, sandy or peaty soil, particularly in pine barrens.
12049	<i>Lepomis miniatus</i>	Redspotted Sunfish	G5	S2	T		2004-08-04	S	D	37.089 / -88.8324	Bayou Creek, McCracken County: at KY 725 crossing	Occurs in well-vegetated swamps, sloughs, bottomland lakes, and low gradient streams (Burr and Mayden 1979, Pflieger 1975, Smith 1979, Burr and Warren 1986, Einler adn Starnes 1993).
931	<i>Muhlenbergia bushii</i>	Bush's Muhly	G5	S1S2	E		1971-09-08	G	H	37.1639 / -89.0458	BALLARD COUNTY WILDLIFE MANAGEMENT AREA.	Moist woods.
1398	<i>Myotis austroriparius</i>	Southeastern Myotis	G4	S1S2	E	SOMC	1999-07-14	S	E	37.0989 / -88.8247	West Kentucky WMA, Bayou Creek just upstream of South Acid Road.	Primarily uses caves for hibernacula and uses caves, bridges, and hollow trees as summer maternity and roosting sites.
15462	<i>Myotis lucifugus</i>	Little Brown Bat	G3	S5	N		1999-07-28	S	E	37.0989 / -88.8247	West Kentucky WMA, Bayou Creek just upstream of South Acid Road (124A). Along Bayou Creek, N of South Acid Rd (125B)	
15465	<i>Myotis lucifugus</i>	Little Brown Bat	G3	S5	N		1999-08-02	S	E	37.1289 / -88.8259	Along Bayou Creek, approx 1305 m NW of industrial waste ponds	
9706	<i>Nycticeius humeralis</i>	Evening Bat	G5	S3	S		1999-08-02	S	E	37.13 / -88.8261	West Ky WMA, along Bayou Creek ca 0.8 air mi WSW of headquarters.	The evening bat is a colonial species that roosts in trees and houses. It apparently migrates southward in winter.
502	<i>Rana areolata circulosa</i>	Northern Crawfish Frog	G4T4	S3	S		2003-03-21	S	C	37.0699 / -88.8211	10 mi W of Paducah, E side of Magruder Rd, 1.2 mi S of Woodville Rd, ca 0.5 mi N of US 60.	Breeds in ponds in farmland and edge. Remains underground throughout most of the year, using crayfish burrows in moist grasslands and meadows.

Standard Occurrence Report

KSNPC monitored species within 1 Miles of Project Area

EO ID	Scientific Name	Common Name	GRank	SRank	SPROT	USES A	Last Obs Date	Precision	EO Rank	Lat / Lon	Directions	Habitat
2013	<i>Rana areolata circulosa</i>	Northern Crawfish Frog	G4T4	S3	S		1991-03-21	S	C	37.1517 / -88.8674	South side KY 358, 0.6 rd mi W jct KY 725 and KY 358 (012A), S side KY 358, ca 0.2 rd mi E jct KY 358 and Joppa Landing Road (012B), and S side KY 358 ca 0.05 air mi SSW of jct KY 358 and Joppa Landing Road (012C).	Breeds in ponds in farmland and edge. Remains underground throughout most of the year, using crayfish burrows in moist grasslands and meadows.
3169	<i>Rana areolata circulosa</i>	Northern Crawfish Frog	G4T4	S3	S		1991-03-22	S	C	37.0059 / -88.8538	Just NE of jct KY 286 and KY 1367 (005A) and N side of KY 286, ca 0.1 rd mi W of jct KY 1367 (005B).	Breeds in ponds in farmland and edge. Remains underground throughout most of the year, using crayfish burrows in moist grasslands and meadows.
3488	<i>Rana areolata circulosa</i>	Northern Crawfish Frog	G4T4	S3	S		1991-03-20	S	C	37.0833 / -88.8133	Circa 0.2 air mi E of KY 1154, ca 1.2 rd mi N of its jct w/ US 60 (007A), 10.0 mi W of Paducah, nr US 60 at jct Magruder and Woodville [KY 725] roads (007B), N side KY 725, NE of jct MacGruder Rd (007C), and SW of Magruder Rd, just S of RR tracks (007D).	Breeds in ponds in farmland and edge. Remains underground throughout most of the year, using crayfish burrows in moist grasslands and meadows.
3751	<i>Rana areolata circulosa</i>	Northern Crawfish Frog	G4T4	S3	S		1963-04-26	M	H	37.0777 / -88.9729	La Center, at city limits.	Breeds in ponds in farmland and edge. Remains underground throughout most of the year, using crayfish burrows in moist grasslands and meadows.
4065	<i>Rana areolata circulosa</i>	Northern Crawfish Frog	G4T4	S3	S		1991-03-18	S	C	37.1301 / -88.8281	Circa 0.2 rd mi E of Bethel Church Road, ca 1.0 rd mi S jct KY 358 (013A) and ca 1.0 air mi SSE jct KY 358 and Bethel Church Road (013B).	Breeds in ponds in farmland and edge. Remains underground throughout most of the year, using crayfish burrows in moist grasslands and meadows.
5676	<i>Rana areolata circulosa</i>	Northern Crawfish Frog	G4T4	S3	S		1991-03-18	S	C	37.1133 / -88.8289	West Kentucky WMA, N side Water Works Rd, just W of filtration plant.	Breeds in ponds in farmland and edge. Remains underground throughout most of the year, using crayfish burrows in moist grasslands and meadows.

Standard Occurrence Report

KSNPC monitored species within 1 Miles of Project Area

EO ID	Scientific Name	Common Name	GRank	SRank	SPROT	USES A	Last Obs Date	Precision	EO Rank	Lat / Lon	Directions	Habitat
6767	<i>Rana areolata circumlosa</i>	Northern Crawfish Frog	G4T4	S3	S		1991-03-20	S	C	37.15 / -88.9047	West side of Reed Rd, 0.15 rd mi S of Jct Vaughn Rd.	Breeds in ponds in farmland and edge. Remains underground throughout most of the year, using crayfish burrows in moist grasslands and meadows.
7330	<i>Rana areolata circumlosa</i>	Northern Crawfish Frog	G4T4	S3	S		1991-03-18	S	C	37.1307 / -88.8215	West Kentucky WMA, ca 0.6 rd mi SW of jct KY 995 and KY 358, ca 0.15 air mi W of KY 995, ca 0.5 rd mi SW of WMA office (lodge).	Breeds in ponds in farmland and edge. Remains underground throughout most of the year, using crayfish burrows in moist grasslands and meadows.
8345	<i>Rana areolata circumlosa</i>	Northern Crawfish Frog	G4T4	S3	S		1991-03-20	S	C	37.0897 / -88.8419	Circa 0.4 air mi NW of Spring Bayou Church on KY 725 (008A) and ca 0.7 rd mi W of Spring Bayou Church on KY 725 on N side of rd (008B).	Breeds in ponds in farmland and edge. Remains underground throughout most of the year, using crayfish burrows in moist grasslands and meadows.
8576	<i>Rana areolata circumlosa</i>	Northern Crawfish Frog	G4T4	S3	S		1991-03-21	S	C	37.1599 / -88.8827	Ragland, S side KY 358, ca 0.4 rd mi W jct KY 1563 and KY 358 (016A) and ca 0.1 air mi SE of jct KY 358 and KY 1563 (016B).	Breeds in ponds in farmland and edge. Remains underground throughout most of the year, using crayfish burrows in moist grasslands and meadows.
8695	<i>Rana areolata circumlosa</i>	Northern Crawfish Frog	G4T4	S3	S		1991-03-22	S	C	37.0031 / -88.8739	Northwest side of KY 286, ca 0.3 rd mi E of Bethel Cumberland Church.	Breeds in ponds in farmland and edge. Remains underground throughout most of the year, using crayfish burrows in moist grasslands and meadows.
9267	<i>Rana areolata circumlosa</i>	Northern Crawfish Frog	G4T4	S3	S		1963-03-19	M	H	36.9983 / -88.8758	0.9 mi E of Gage [plotted 0.9 rd mi E on KY 286].	Breeds in ponds in farmland and edge. Remains underground throughout most of the year, using crayfish burrows in moist grasslands and meadows.
9859	<i>Rana areolata circumlosa</i>	Northern Crawfish Frog	G4T4	S3	S		1964-03-13	M	H	37.0631 / -88.7914	US 60, 0.6 mi E of Future City, 10 mi W of Paducah.	Breeds in ponds in farmland and edge. Remains underground throughout most of the year, using crayfish burrows in moist grasslands and meadows.

Standard Occurrence Report

KSNPC monitored species within 1 Miles of Project Area

EO ID	Scientific Name	Common Name	GRank	SRank	SPROT	USES	Last Obs Date	Precision	EO Rank	Lat / Lon	Directions	Habitat
12576	<i>Rana areolata circumlosa</i>	Northern Crawfish Frog	G4T4	S3	S		2007-03-14	S	C	37.1008 / -88.8009	West KY WMA, W side of Little Bayou Creek, at SE corner of Gaseous Diffusion Plant, 1.0 air mi NW of Heath.	Breeds in ponds in farmland and edge. Remains underground throughout most of the year, using crayfish burrows in moist grasslands and meadows.
7044	<i>Vireo bellii</i>	Bell's Vireo	G5	S2S3B	S	SOMC	1994-05-05	S	C	37.1264 / -88.8181	West Kentucky WMA, W side of main gravel rd, ca 1.0 mi S of entrance on KY 358.	Open grassland habitat with scattered small trees or shrubs including reclaimed surface mines, powerline rights-of-way, etc.

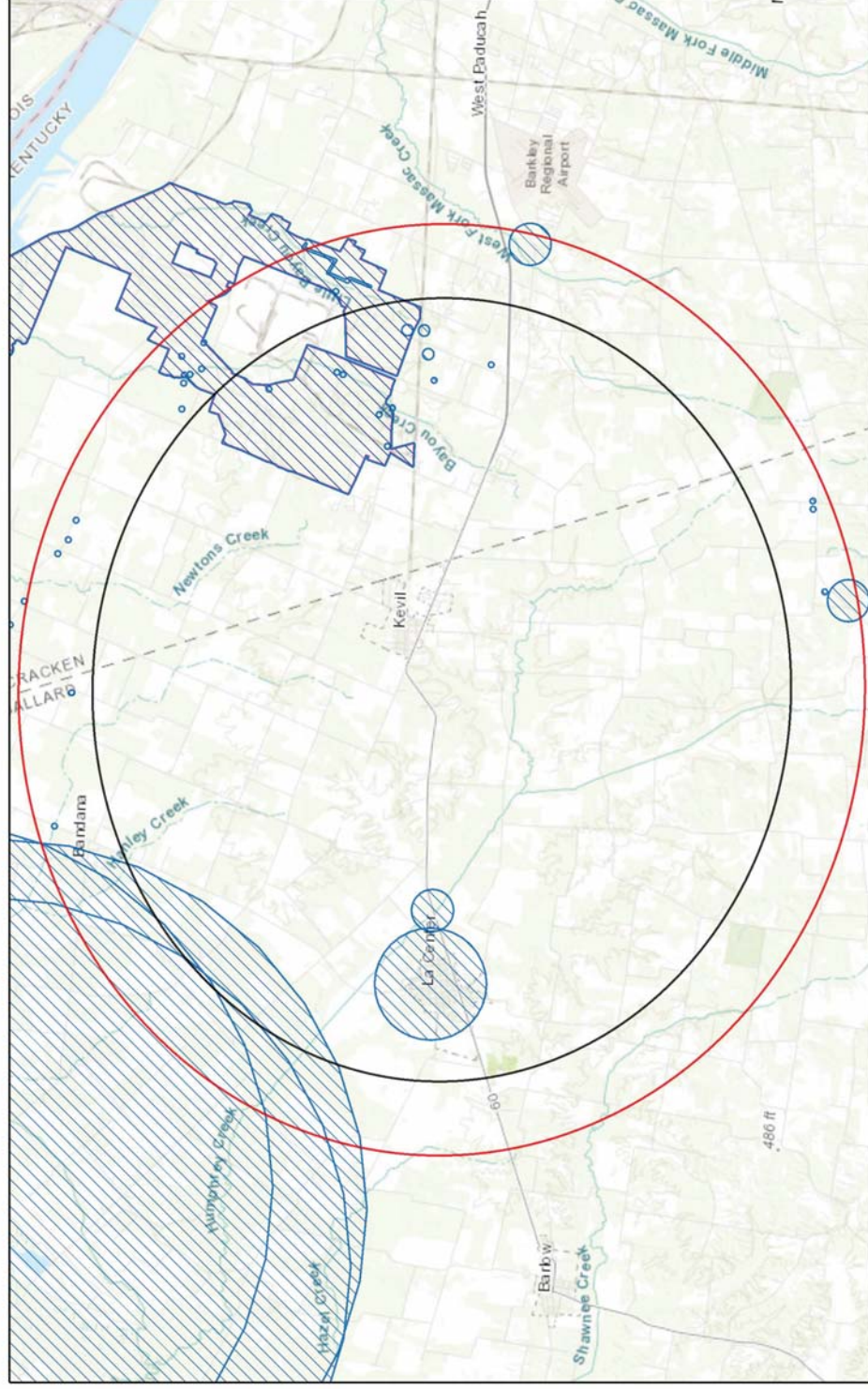
Managed Areas within 1 Miles of Project Area

MA ID	Managed Area Name	Unit Type	Owner Name	Managing Institution
140	West Kentucky Wildlife Management Area	State Wildlife Management Area	TVA & US Dept. of Energy & KY Department of Fish and Wildlife Resources	Department of Fish and Wildlife Resources





THESE DATA ARE VALID ONLY ON THE DATE ON WHICH THE REPORT WAS GENERATED.

THESE DATA MAY ONLY BE USED FOR THE PROJECT NAMED ABOVE.

US 60 Improvements



June 7, 2018

-  Project Boundary
-  Buffered Project Boundary
-  Managed Areas
-  Element Occurrences

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, Geobase, IGN, Kadaster NL, Ordnance Survey, Esri

Molly C. Foree

From: Vogeler, Samantha N (EEC) <samantha.vogeler@ky.gov>
Sent: Friday, August 10, 2018 1:18 PM
To: William C. Olson
Cc: KY18-005_US_60_Ballard_QK4
Subject: RE: Information Request

There are currently no significant aquatic resources in the vicinity.

Samantha Vogeler

Environmental Biologist Consultant
Kentucky Energy and Environment Cabinet
Water Quality Certification Section
300 Sower Blvd, Frankfort, KY 40601
Office: 502-782-6995 Samantha.Vogeler@ky.gov

From: William C. Olson [mailto:colson@thirdrockconsultants.com]
Sent: Thursday, August 09, 2018 4:47 PM
To: Vogeler, Samantha N (EEC) <samantha.vogeler@ky.gov>
Cc: KY18-005_US_60_Ballard_QK4 <KY18-005_KY_90_Ecosystems_QK4@thirdrockconsultants.com>
Subject: Information Request

Samantha, can you please provide us with any known significant aquatic resources in the vicinity of the attached project?

Thank you,
Chelsey

Chelsey Olson, Ecologist
Third Rock Consultants, LLC | 2526 Regency Road | Suite 180 | Lexington, KY 40503
Office: (859) 977-2000 | Cell: (859) 619-8011 | www.thirdrockconsultants.com

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This email has been scanned for viruses and malware by **Mimecast Ltd.**

Molly C. Foree

From: Porter, Chuck (EEC) <Chuck.Porter@ky.gov>
Sent: Monday, March 25, 2019 2:59 PM
To: William C. Olson
Subject: RE: Information Request

Mr. Olsen,

I am very sorry for not getting back with you regarding your request. The project area as shown on the attached map does not have any State Big Trees contained within the red boundary. All champion trees in Ballard County are on the WMA (Wildlife Management Area) properties. I hope this satisfies your request and again.....I am sorry for any delay.

Chuck

From: William C. Olson [mailto:colson@thirdrockconsultants.com]
Sent: Monday, March 25, 2019 1:14 PM
To: Porter, Chuck (EEC) <Chuck.Porter@ky.gov>
Cc: Rain A. Storm <rstorm@thirdrockconsultants.com>; KY18-005_US_60_Ballard_QK4 <KY18-005_KY_90_Ecosystems_QK4@thirdrockconsultants.com>
Subject: FW: Information Request

****CAUTION** PDF attachments may contain links to malicious sites. To verify the destination of the hyperlink in an attachment, hover your mouse over the link and verify the link address. If you are unfamiliar with the address or the address looks suspicious, do not click on the link and delete the email immediately. Please contact the COT Service Desk ServiceCorrespondence@ky.gov for any assistance.**

Hi Chuck, I sent you an information request on 8/20/18 but have not received a response. Could you please provide a response as soon as possible? We are hoping to submit a report by the end of the week.

Thank you,
Chelsey

From: William C. Olson
Sent: Monday, August 20, 2018 1:28 PM
To: 'Chuck.Porter@ky.gov' <Chuck.Porter@ky.gov>
Cc: KY18-005_US_60_Ballard_QK4 <KY18-005_KY_90_Ecosystems_QK4@thirdrockconsultants.com>
Subject: Information Request

Chuck can you please provide me with any information on state/national champion trees and/or state forests that may be impacted by the attached project?

Thank you,
Chelsey

Chelsey Olson, Ecologist
Third Rock Consultants, LLC | 2526 Regency Road | Suite 180 | Lexington, KY 40503
Office: (859) 977-2000 | Cell: (859) 619-8011 | www.thirdrockconsultants.com

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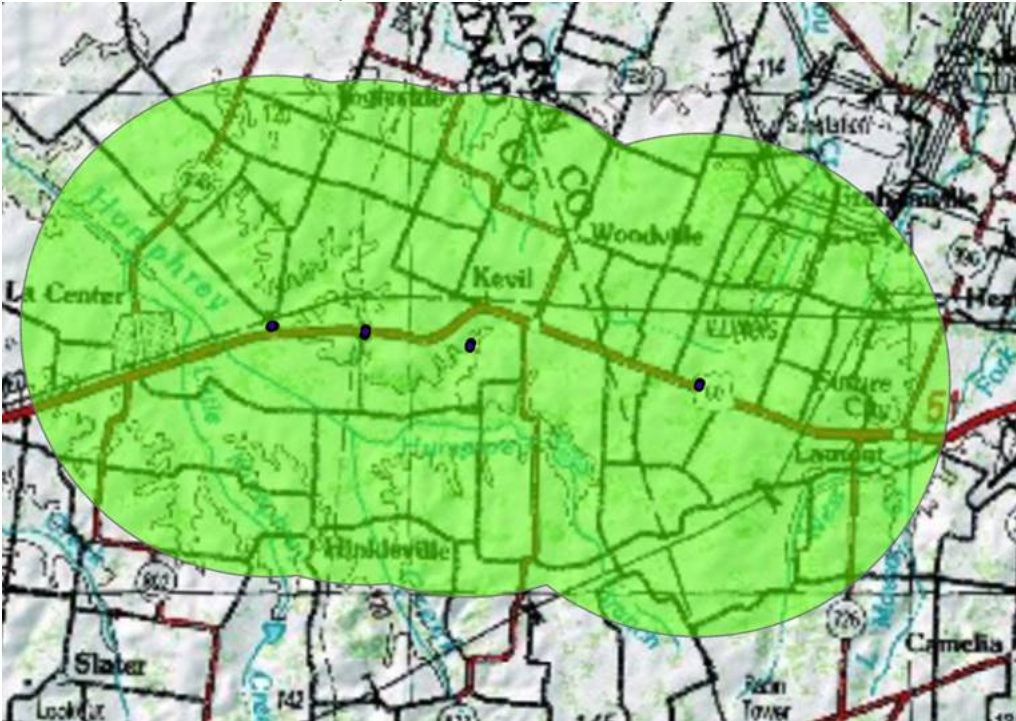
This email has been scanned for viruses and malware by **Mimecast Ltd.**

Molly C. Foree

From: Howard <hkalnitz@fuse.net>
Sent: Wednesday, June 20, 2018 8:54 PM
To: William C. Olson
Cc: caverjoshbrewer23@gmail.com; currens@email.uky.edu; vanders33@yahoo.com; sarahmariecaver@gmail.com
Subject: RE: KSS Data Request by William Chelsey Olson () (2nd request)

William

Find enclosed the results of your 2nd request:



We find no caves in your requested 5km buffer around your project area.

Ownership, distribution, and replication rights are specifically not granted to any requesters. Requesters may be asked to sign a confidentiality agreement stating that the information shall not be disseminated without written permission of the Data Access Committee, or other agreements as requested by the committee. Wherever applicable, the requester may be asked to make a report stating the scope of their use of the data and any findings to the KSS in a timely manner.

Data reported by the KSS is as has been reported to us, but not guaranteed to be complete or correct. Use Caution when operating in karst terrains.

Commercial requests for data are assessed a fee for the search, and for the data returned. There is a \$50 search fee, and a fee of \$10 for each location returned.

Charge for this search is 50\$= 50\$, you will be invoiced by our treasurer..

Howard Kalnitz
KSS Database Committee

From: Kentucky Speleological Survey <christopherdmorris@gmail.com>

Sent: Thursday, June 7, 2018 11:11 AM

To: christopherdmorris@gmail.com

Cc: caverjoshbrewer23@gmail.com; currens@email.uky.edu; vanders33@yahoo.com; sarahmariecaver@gmail.com; hkalnitz@fuse.net

Subject: KSS Data Request by William Chelsey Olson

Name:	William Chelsey Olson
Address:	2526 Regency Road, Suite 180, Lexington
City:	Kentucky
State:	KY
Phone:	8599772000
Email:	colson@thirdrockconsultants.com
Organization:	Third Rock Consultants
Data/Information Requested:	We are interested in information concerning caves/karst features that may exist within 5 kilometers of the project area.
Intended Use of Data/Information:	Third Rock Consultants is conducting an Environmental Assessment for proposed improvements to US 60.
Qualifications:	Biologist
Attachment(s):	

IP: [64.191.149.26](#)

APPENDIX D

PHOTO LOG



Corn Field and Forested Fencerow.jpg



Forest with Multiple Snags.jpg



Forested Riparian.jpg



Old Rail Bed Corridor with Large Berms on North and South Sides (Alternative 3).jpg



Old Rail Bed on Top of Large Berm, Steep Slopes to the North and South (Alternative 3).jpg



Pond I, No Wetland Fringe.jpg



Pond 2 on North Side of Old Rail Bed Berm (Alternative 3).jpg



Roadside Ornamentals - No Bat Habitat.jpg



Rolling Field with Grass Swale.jpg



Rolling Field with Scattered Trees.jpg



Snags and Shagbark Near Pond.jpg



Snags of Maternity Size.jpg



Utility Right-of-Way Corridor.jpg



Utility Right-of-Way with Scrub Shrub Habitat.jpg



White Oak Snag.jpg



Station 1 UT Humphries Creek downstream view from upstream end.jpg



Station 2 Bayou creek downstream end.jpg



Station 3 UT Humphries creek mid point .jpg



Station 4 UT Humphries creek upstream view - dry during fish survey.jpg



Stream I, Downstream View.jpg



Stream I0, Downstream View.jpg



Stream 11, Upstream View.jpg



Stream 12, Downstream View.jpg



Stream 13, Downstream View.jpg



Stream 13, Upstream View From Confluence With Wetland
F.jpg



Stream 15, Upstream View From Confluence With Stream
13.jpg



Stream 16, Upstream View.jpg



Stream 17, Upstream View From Confluence With Stream 16.jpg



Stream 18, Downstream View.jpg



Stream 19, Downstream View Toward Confluence With Stream 16.jpg



Stream 2, Upstream View.jpg



Stream 20, Downstream View From Top of Berm.jpg



Stream 21, Downstream View From Head of Stream.jpg



Stream 22, Downstream View.jpg



Stream 23, Downstream View.jpg



Stream 24, Upstream View.jpg



Stream 25, Downstream View.jpg



Stream 26, Upstream View From Confluence With Stream
25.jpg



Stream 27, Downstream View From Head of Stream.jpg



Stream 28, Upstream View.jpg



Stream 29, Downstream View.jpg



Stream 3, Upstream View.jpg



Stream 30, Upstream View.jpg



Stream 31, Downstream View.jpg



Stream 32, Upstream View.jpg



Stream 33, Upstream View.jpg



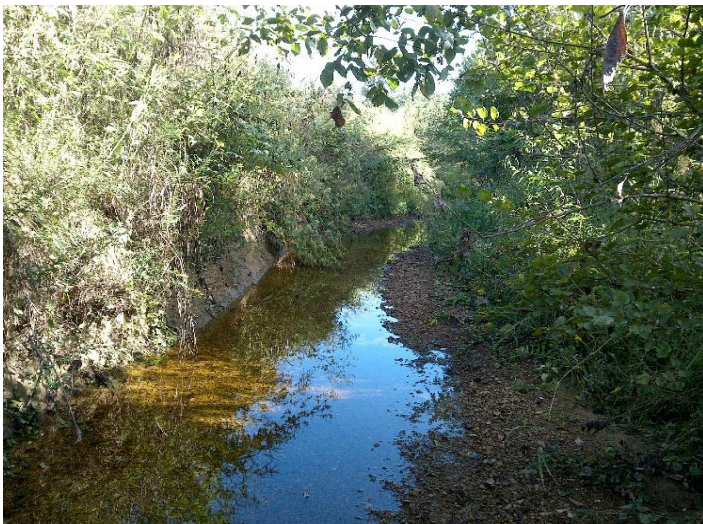
Stream 34, Upstream View.jpg



Stream 35, Humphries Creek Upstream View.jpg



Stream 36, Bayou Creek.jpg



Stream 37, Humphries Creek.jpg



Stream 38, Humphries Creek Upstream View.jpg



Stream 4, Downstream View.jpg



Stream 5, Downstream View.jpg



Stream 6, Upstream View.jpg



Stream 7, Downstream View From South Side of Road
Crossing.jpg



Stream 8, Downstream View.jpg



Stream 9, Upstream View.jpg



Wetland A.jpg



Wetland B.jpg



Wetland C.jpg



Wetland D.jpg



Wetland E, Facing East from Western End.jpg



Wetland F.jpg



Wetland G.jpg



Wetland H.jpg



Wetland I.jpg



Wetland J.jpg



Wetland K.jpg



Wetland L.jpg



Wetland M.jpg



Wetland N, Facing East from Confluence with Stream 25.jpg



Wetland O.jpg



Blackstripe Topminnow



Blackstripe topminnow



Bluegill



Creek Chub



Gambusia



Green Sunfish



Pirate Perch



Slough darter



Spotted Bass



Stoneroller



Western creek chubsucker



Yellow Bullhead



Yellow Bullhead

APPENDIX E

FIELD DATA

Macroinvertebrate Collection Check Sheet for Low-Gradient Streams

Date: 5-29-16 Time: 3-4pm Project No: KY18-005 Project Name: US60 Ballard Co
Collector(s) Initials: BR/PM Station ID: Station 1 Lat: 37.079710 Long: -88.943030

☒ Collected during the headwater sampling period (March 1 – May 31) (Headwaters = $<5 \text{ mi}^2$).

☐ Collected during the wadeable sampling period (May 1 – September 30) (Wadeable = $>5 \text{ mi}^2$ and $<200 \text{ mi}^2$).

Stream Conditions (Check precipitation before going. If a rainfall of at least 1 inch within a 24 hour period has occurred within 2 weeks of planned sampling event, then sampling shall be delayed until the 2 week requirement can be met.)

☒ Clear with Normal flow
☐ Turbid or High flow. (If so, do not sample!)
☐ No flow in riffles. (If so, do not sample!)

Stream Reach

☒ 100 meters – 300 meters. How long? 100 meters
Number of runs in stream reach: 3 (at least 3)
Number of pools in stream reach: 3 (at least 3)

20 Jab Multi-Habitat Method

Vegetated Banks/Root Mats

☒ Vegetative Bank/Root Mat Jabs (How many? 8) (At least 1 in run and 2 from 2 separate pools)

Submerged Vegetation

☐ Submerged Vegetation Jabs (How many? N/A) (At least 1 in run and 2 from 2 separate pools)

Snags/Woody Debris

☒ Snag/Woody Debris Jabs (How many? 4) (At least 1 in run and 2 from 2 separate pools)

Cobble/Gravel

☒ Cobble/Gravel Kicks (How many? 4)

Silt/Sand/Fine Gravel

☒ Sand/Silt/Fine Gravel Jabs (How many? 2) (At least 1 in run and 2 from 2 separate pools)

Leaf Packs

☒ Leaf Pack Picks (How many? 2) (At least 1 in run and 2 from 2 separate pools)

Total Number of Jabs/Kicks/Picks 20 (Should be 20 for the 20 jab method)

Field Measurements: 5.5 DO 23.5 Temperature 7.1 pH 234 Conductivity

Comments:

66.1%

Turb = 27.3

Low Gradient Bioassessment Stream Visit Sheet

STREAM NAME: <u>UT Humphrey Creek</u>		LOCATION: <u>@ US 60 Ballard Co.</u>																																				
STATION #: <u>Station 1</u>		COUNTY: <u>Ballard</u>	PROGRAM: <u>KY 18-005</u>																																			
INVESTIGATORS: <u>BR/AM</u>		DATE: <u>5-29-18</u>	TIME Start: <u>1:00 pm</u> Finish: <u>4:00 pm CST</u>																																			
Verify Site LAT/LONG vs GPS <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A																																						
<table border="1"> <tr> <th colspan="3">Reach</th> </tr> <tr> <th>Station</th> <th>Downstream</th> <th>Upstream</th> </tr> <tr> <td>LAT <u>37.079710</u></td> <td><u>37.079571</u></td> <td><u>37.079844</u></td> </tr> <tr> <td>LONG <u>-88.943030</u></td> <td><u>-88.943404</u></td> <td><u>-88.942704</u></td> </tr> </table>				Reach			Station	Downstream	Upstream	LAT <u>37.079710</u>	<u>37.079571</u>	<u>37.079844</u>	LONG <u>-88.943030</u>	<u>-88.943404</u>	<u>-88.942704</u>																							
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WEATHER Has there been a scouring rain in the last 14 days? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Now <input type="checkbox"/> Past 24 hours <input checked="" type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input type="checkbox"/> Clear/sunny <input checked="" type="checkbox"/> Cloudy		LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use) <input type="checkbox"/> Surface Mining <input type="checkbox"/> Deep Mining <input type="checkbox"/> Oil Wells <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Residential <input type="checkbox"/> Construction <input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Row Crops <input type="checkbox"/> Forest <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Silviculture <input type="checkbox"/> Urban Runoff/Storm Sewers																																				
INSTREAM FEATURES Stream Width <u>25</u> ft Maximum Depth <u>1.5</u> ft Reach Length <u>100</u> m Riffle/Run/Pool Sequence (No. Sampled in Reach) <input checked="" type="checkbox"/> Riffle <u>3</u> <input type="checkbox"/> Run <u>3</u> <input type="checkbox"/> Pool <u>0</u>		HYDRAULIC STRUCTURES <input type="checkbox"/> Dams <input type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other:	STREAM FLOW <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> High <input checked="" type="checkbox"/> Normal																																			
RIPARIAN VEGETATION Dominant Type: <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Herbaceous <input type="checkbox"/> Grasses <input type="checkbox"/> Shrubs Number of strata <u>3</u> Dom. Tree/Shrub Taxa <u>Box 216</u>		CHANNEL ALTERATIONS <input type="checkbox"/> Dredging <input type="checkbox"/> Channelization <input type="checkbox"/> Full <input type="checkbox"/> Partial																																				
P-CHEM Instrument Used: <u>see check list</u> Date Calibrated: <u>5-29-18</u> Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond _____ Turb _____																																						
Sample Collection Verification Algae Sample: <input type="checkbox"/> QualMHC <input type="checkbox"/> Other <input type="checkbox"/> Visual Assessment Lead Collector: _____ Fish <input type="checkbox"/> BPEF <input type="checkbox"/> Seine <input type="checkbox"/> Other Time: BPEF Seine Lead Collector: _____ Habitat <input checked="" type="checkbox"/> RBP <input type="checkbox"/> Substrate <input type="checkbox"/> Other: Lead Collector: <u>B. Remley</u> Invertebrates <input type="checkbox"/> 1m ² <input type="checkbox"/> Qual <input type="checkbox"/> Other: Lead Collector: <u>B. Remley</u> <input checked="" type="checkbox"/> 20 Jab (#Jabs: Cobble <u>4</u> Snags <u>4</u> Veg Banks <u>8</u> Sand <u>2</u> Macrophytes _____ Other <u>2</u>) Lat/Long _____ Tissue: No. of Samples collected _____ Sp: _____ Lead Collector: _____ Water Chem <input type="checkbox"/> Acid/Alk <input type="checkbox"/> Bulk <input type="checkbox"/> Nutrients <input type="checkbox"/> Metals <input type="checkbox"/> Low Hg Lead Collector: _____ <input type="checkbox"/> Herbicides <input type="checkbox"/> Pesticides <input type="checkbox"/> Ortho P <input type="checkbox"/> Other:																																						
Duplicate Samples Taken:																																						
Substrate Characterization <table border="1"> <tr> <th>Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.</th> <th>Riffle <u>0</u> %</th> <th>Run <u>40</u> %</th> <th>Pool <u>60</u> %</th> <th>Reach Total</th> </tr> <tr> <td>Silt/Clay (<0.06 mm)</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Sand (0.06 – 2 mm)</td> <td></td> <td><u>30</u></td> <td><u>70</u></td> <td></td> </tr> <tr> <td>Gravel (2-64 mm)</td> <td></td> <td><u>40</u></td> <td><u>30</u></td> <td></td> </tr> <tr> <td>Cobble (64 – 256 mm)</td> <td></td> <td><u>30</u></td> <td></td> <td></td> </tr> <tr> <td>Boulders (>256 mm)</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Bedrock</td> <td></td> <td></td> <td></td> <td></td> </tr> </table>				Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>0</u> %	Run <u>40</u> %	Pool <u>60</u> %	Reach Total	Silt/Clay (<0.06 mm)					Sand (0.06 – 2 mm)		<u>30</u>	<u>70</u>		Gravel (2-64 mm)		<u>40</u>	<u>30</u>		Cobble (64 – 256 mm)		<u>30</u>			Boulders (>256 mm)					Bedrock				
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>0</u> %	Run <u>40</u> %	Pool <u>60</u> %	Reach Total																																		
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Cobble (64 – 256 mm)		<u>30</u>																																				
Boulders (>256 mm)																																						
Bedrock																																						

NOTES/COMMENTS:

SITE NOT SAMPLED:

- ☐ Land owner denial ☐ Dry ☐ Too deep/Impounded
☐ Site not found/Secluded ☐ Unsafe
☐ Other (indicate under comments)

RBP Low Gradient Habitat

Habitat Parameter SCORE	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1. Epifaunal Substrate/ Available Cover Score 13	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new and transient).					30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).					10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					Less than 10% stable habitat. lack of habitat is obvious; substrate unstable or lacking					
2. Pool Substrate Characterization Score 16	Mixture of substrate materials. with gravel and firm sand prevalent; root mats and submerged vegetation common.					Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.					All mud or clay or sand bottom; little or no root mat; no submerged vegetation.					Hard-pan clay or bedrock; no root mat or vegetation.					
3. Pool Variability Score 10	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.					Majority of pools large-deep; very few shallow.					Shallow pools much more prevalent than deep pools.					Majority of pools small-shallow or pools absent					
4. Sediment Deposition Score 11	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.					Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected, slight deposition in pools.					Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.					Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.					
5. Channel Flow Status Score 10	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.					Water fills >75% of the available channel; or <25% of channel substrate is exposed.					Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.					Very little water in channel and mostly present as standing pools.					
6. Channel Alteration Bridge abutment Score 14	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (>20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.					
7. Channel Sinuosity Score 8	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.					The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.					The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.					Channel straight; waterway has been channelized for a long distance.					
Left/Right Bank	10 9					8 7 6					5 4 3					2 1 0					
8. Bank Stability LB 5 RB 5	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas, "raw" areas frequent along straight sections and bends, obvious bank sloughing; 60-100% of bank has erosional scars.					
9. Vegetative Protection LB 3 RB 3	More than 90% of the stream bank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the stream bank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the stream bank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the stream bank surfaces covered by vegetation; disruption of stream bank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
10. Riparian Vegetative Zone Width LB 5 RB 2	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.					

Total Score

105

NOTES/COMMENTS:

sta 1

Macroinvertebrate Collection Check Sheet for Low-Gradient Streams

Date: 5-29-18 Time: 4-5 Project No: KV18-005 Project Name: US60 Ballard Co.
Collector(s) Initials: BK/PM Station ID: station 2 Lat: 37.070671 Long: -88.846452

☒ Collected during the headwater sampling period (March 1 – May 31) (Headwaters = $<5 \text{ mi}^2$).

☐ Collected during the wadeable sampling period (May 1 – September 30) (Wadeable = $>5 \text{ mi}^2$ and $<200 \text{ mi}^2$).

Stream Conditions (Check precipitation before going. If a rainfall of at least 1 inch within a 24 hour period has occurred within 2 weeks of planned sampling event, then sampling shall be delayed until the 2 week requirement can be met.)

☒ Clear with Normal flow
☐ Turbid or High flow. (If so, do not sample!)
☐ No flow in riffles. (If so, do not sample!)

Stream Reach

☒ 100 meters – 300 meters. How long? 150 meters
Number of runs in stream reach: 4 (at least 3)
Number of pools in stream reach: 4 (at least 3)

20 Jab Multi-Habitat Method

Vegetated Banks/Root Mats

☒ Vegetative Bank/Root Mat Jabs (How many? 4) (At least 1 in run and 2 from 2 separate pools)

Submerged Vegetation

☒ Submerged Vegetation Jabs (How many? 2) (At least 1 in run and 2 from 2 separate pools)

Snags/Woody Debris

☒ Snag/Woody Debris Jabs (How many? 2) (At least 1 in run and 2 from 2 separate pools)

Cobble/Gravel

☒ Cobble/Gravel Kicks (How many? 4)

Silt/Sand/Fine Gravel

☒ Sand/Silt/Fine Gravel Jabs (How many? 4) (At least 1 in run and 2 from 2 separate pools)

Leaf Packs

☒ Leaf Pack Picks (How many? 4) (At least 1 in run and 2 from 2 separate pools)

Total Number of Jabs/Kicks/Picks 20 (Should be 20 for the 20 jab method)

Field Measurements: 6.6 DO 27.7 Temperature 7.3 pH 230 Conductivity

Comments:

79.2%
turb 29.3
incised stream, unstable substrates

Low Gradient Bioassessment Stream Visit Sheet

STREAM NAME: <u>Bayou Creek</u>		LOCATION: <u>@ US 60</u>	
STATION #: <u>Station 2</u>		COUNTY: <u>McKracken</u>	PROGRAM: <u>KY 18-005</u>
INVESTIGATORS: <u>BR/EM</u>		DATE: <u>5-29-18</u>	TIME (24hr) Start: <u>4:00</u> Finish: <u>4:50 CST</u>
Verify Site LAT/LONG vs GPS <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A			
Reach			
Station		Downstream	Upstream
LAT	<u>37.07067</u>	<u>37.070861</u>	<u>37.070284</u>
LONG	<u>-88.846452</u>	<u>-88.846201</u>	<u>-88.846631</u>
WEATHER		CANOPY COVER:	
Has there been a scouring rain in the last 14 days? <input type="checkbox"/> Yes <input type="checkbox"/> No Now: <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input type="checkbox"/> Clear/sunny <input checked="" type="checkbox"/> Cloudy Past 24 hours: <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input type="checkbox"/> Clear/sunny <input checked="" type="checkbox"/> Cloudy		<input type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)	
LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use):		STREAM TYPE:	
<input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input checked="" type="checkbox"/> Commercial <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers <input checked="" type="checkbox"/> Residential		<input type="checkbox"/> Perennial <input type="checkbox"/> Ephemeral <input checked="" type="checkbox"/> Intermittent	
INSTREAM FEATURES		HYDRAULIC STRUCTURES	STREAM FLOW
Stream Width <u>10</u> ft Maximum Depth <u>1</u> ft Reach Length <u>150</u> m Riffle/Run/Pool Sequence (No. Sampled in Reach) <u>1</u> Riffle <u>4</u> Run <u>4</u> Pool		<input type="checkbox"/> Dams <input type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other:	<input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> High <input checked="" type="checkbox"/> Normal
RIPARIAN VEGETATION		CHANNEL ALTERATIONS	
Dominant Type: <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Herbaceous <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Shrubs Number of strata <u>3</u> Dom. Tree/Shrub Taxa: <u>Box Elder, Mulberry</u>		<input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial	
P-CHEM Instrument Used: <u>see check list</u> Date Calibrated: <u>5-29-18</u>			
Temp(°C) _____ D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond. _____ Turb. _____			
Sample Collection Verification			
Algae	Sample: <input type="checkbox"/> QualMHC <input type="checkbox"/> Other <input type="checkbox"/> Visual Assessment	Lead Collector:	
Fish	<input type="checkbox"/> BPEF <input type="checkbox"/> Seine <input type="checkbox"/> Other Time: BPEF Seine	Lead Collector:	
Habitat	<input checked="" type="checkbox"/> RBP <input type="checkbox"/> Substrate <input type="checkbox"/> Other:	Lead Collector: <u>B. Renwick</u>	
Invertebrates	<input type="checkbox"/> 1m ² <input type="checkbox"/> Qual <input type="checkbox"/> Other: <input checked="" type="checkbox"/> 20 Jab (#Jabs: Cobble _____ Snags _____ Veg. Banks _____ Sand _____ Macrophytes _____ Other _____)	Lead Collector: <u>B. Renwick</u>	
Tissue:	No. of Samples collected _____ Sp.:	Lead Collector:	
Water Chem	<input type="checkbox"/> Acid/Alk <input type="checkbox"/> Bulk <input type="checkbox"/> Nutrients <input type="checkbox"/> Metals <input type="checkbox"/> Low Hg <input type="checkbox"/> Herbicides <input type="checkbox"/> Pesticides <input type="checkbox"/> Ortho P <input type="checkbox"/> Other:	Lead Collector:	
Duplicate Samples Taken:			
Substrate Characterization			
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>N/A</u> %	Run <u>40</u> %	Pool <u>60</u> %
			Reach Total
Silt/Clay (<0.06 mm)			<u>30</u>
Sand (0.06 - 2 mm)		<u>30</u>	<u>50</u>
Gravel (2-64 mm)		<u>60</u>	<u>20</u>
Cobble (64 - 256 mm)		<u>10</u>	
Boulders (>256 mm)			
Bedrock			

NOTES/COMMENTS:

No landowner permission on south side US60

SITE NOT SAMPLED:

- ☐ Land owner denial ☐ Dry ☐ Too deep/Impounded
☐ Site not found/Secluded ☐ Unsafe
☐ Other (indicate under comments)

RBP Low Gradient Habitat

Habitat Parameter SCORE	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new and transient).					30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).					10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.					
Score 11																					
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.					Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.					All mud or clay or sand bottom; little or no root mat; no submerged vegetation.					Hard-pan clay or bedrock; no root mat or vegetation.					
Score 9																					
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.					Majority of pools large-deep; very few shallow.					Shallow pools much more prevalent than deep pools.					Majority of pools small-shallow or pools absent.					
Score 9																					
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.					Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.					Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.					Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.					
Score 10																					
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.					Water fills >75% of the available channel; or <25% of channel substrate is exposed.					Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.					Very little water in channel and mostly present as standing pools.					
Score 12																					
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (>20 yr.) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.					
Score 12																					
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.					The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.					The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.					Channel straight: waterway has been channelized for a long distance.					
Score 3																					
Left/Right Bank	10 9					8 7 6					5 4 3					2 1 0					
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
LB 2																					
RB 3																					
9. Vegetative Protection	More than 90% of the stream bank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the stream bank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the stream bank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the stream bank surfaces covered by vegetation; disruption of stream bank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
LB 2																					
RB 3																					
10. Riparian Vegetative Zone Width	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.					
LB 1																					
RB 2																					

Total Score

79

NOTES/COMMENTS:

Station 2

Macroinvertebrate Collection Check Sheet for Low-Gradient Streams

Date: 5-29-16 Time: _____ Project No: Ky 16-005 Project Name: US60 Ballard Co.
Collector(s) Initials: BR/PM Station ID: Station 3 Lat: 37.077016 Long: -88.898236

☒ Collected during the headwater sampling period (March 1 – May 31) (Headwaters = $<5 \text{ mi}^2$).

_____ Collected during the wadeable sampling period (May 1 – September 30) (Wadeable = $>5 \text{ mi}^2$ and $<200 \text{ mi}^2$).

Stream Conditions (Check precipitation before going. If a rainfall of at least 1 inch within a 24 hour period has occurred within 2 weeks of planned sampling event, then sampling shall be delayed until the 2 week requirement can be met.)

☒ Clear with Normal flow
_____ Turbid or High flow. (If so, do not sample!)
_____ No flow in riffles. (If so, do not sample!)

Stream Reach

☒ 100 meters – 300 meters. How long? 200 meters
Number of runs in stream reach: 5 (at least 3)
Number of pools in stream reach: _____ (at least 3)

20 Jab Multi-Habitat Method

Vegetated Banks/Root Mats

_____ Vegetative Bank/Root Mat Jabs (How many? 4) (At least 1 in run and 2 from 2 separate pools)

Submerged Vegetation

_____ Submerged Vegetation Jabs (How many? 4) (At least 1 in run and 2 from 2 separate pools)

Snags/Woody Debris

_____ Snag/Woody Debris Jabs (How many? 2) (At least 1 in run and 2 from 2 separate pools)

Cobble/Gravel

_____ Cobble/Gravel Kicks (How many? 4)

Silt/Sand/Fine Gravel

_____ Sand/Silt/Fine Gravel Jabs (How many? 2) (At least 1 in run and 2 from 2 separate pools)

Leaf Packs

_____ Leaf Pack Picks (How many? 4) (At least 1 in run and 2 from 2 separate pools)

Total Number of Jabs/Kicks/Picks 20 (Should be 20 for the 20 jab method)

Field Measurements: 6.20 DO 23.64 Temperature 7.22 pH 0.200 Conductivity

Comments: 75.3% Turb 36.4

Low Gradient Bioassessment Stream Visit Sheet

STREAM NAME:		LOCATION: @ Future us 60		
STATION #: Station 3		COUNTY: Ballard	PROGRAM: PROJECT: Ky18-005	
INVESTIGATORS: BR/RY		DATE: 5/29/18	TIME Start: 5:00 Finish: 6:00 CST	
Verify Site LAT/LONG vs GPS <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A				
Station		Reach		
Downstream		Upstream		
LAT	37.07706	37.076657	37.077465	
LONG	-88.898236	-88.898462	-88.898041	
WEATHER		LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use):		
Has there been a scouring rain in the last 14 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Now: <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input checked="" type="checkbox"/> Clear/sunny <input checked="" type="checkbox"/> Cloudy Past 24 hours: <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input checked="" type="checkbox"/> Clear/sunny <input checked="" type="checkbox"/> Cloudy		<input type="checkbox"/> Surface Mining <input type="checkbox"/> Deep Mining <input type="checkbox"/> Oil Wells <input type="checkbox"/> Land Disposal <input type="checkbox"/> Residential <input type="checkbox"/> Construction <input type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input checked="" type="checkbox"/> Row Crops <input type="checkbox"/> Forest <input checked="" type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Silviculture <input type="checkbox"/> Urban Runoff/Storm Sewers		
INSTREAM FEATURES		RIPARIAN VEGETATION		
Stream Width: 10 ft Maximum Depth: 15 ft Reach Length: 270 m Riffle/Run/Pool Sequence (No. Sampled in Reach) — Riffle 5 Run 5 Pool		Dominate Type: <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Herbaceous <input type="checkbox"/> Grasses <input type="checkbox"/> Shrubs Number of strata: 3 Dom. Tree/Shrub Taxa: Elm/mulberry		
HYDRAULIC STRUCTURES		CHANNEL ALTERATIONS		
<input type="checkbox"/> Dams <input type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other:		<input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization <input type="checkbox"/> Full <input type="checkbox"/> Partial		
STREAM FLOW				
<input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> High <input checked="" type="checkbox"/> Normal				
P-CHEM Instrument Used: see checklist Date Calibrated: 5-29-18				
Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond _____ Turb. _____				
Sample Collection Verification				
Algae Sample: <input type="checkbox"/> QualMHC <input type="checkbox"/> Other <input type="checkbox"/> Visual Assessment Lead Collector:				
Fish <input type="checkbox"/> BPEF <input type="checkbox"/> Seine <input type="checkbox"/> Other Time: BPEF Seine Lead Collector:				
Habitat <input checked="" type="checkbox"/> RBP <input type="checkbox"/> Substrate <input type="checkbox"/> Other: Lead Collector: B. Renner				
Invertebrates <input type="checkbox"/> 1m² <input type="checkbox"/> Qual <input type="checkbox"/> Other: Lead Collector: B. Renner				
<input checked="" type="checkbox"/> 20 Jab (#Jabs: Cobble _____ Snags _____ Veg. Banks _____ Sand _____ Macrophytes _____ Other _____)				
Tissue: No. of Samples collected _____ Sp: _____ Lead Collector:				
Water Chem <input type="checkbox"/> Acid/Alk <input type="checkbox"/> Bulk <input type="checkbox"/> Nutrients <input type="checkbox"/> Metals <input type="checkbox"/> Low Hg Lead Collector:				
<input type="checkbox"/> Herbicides <input type="checkbox"/> Pesticides <input type="checkbox"/> Ortho P <input type="checkbox"/> Other:				
Duplicate Samples Taken:				
Substrate Characterization				
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle _____ %	Run 40 %	Pool 60 %	Reach Total
Silt/Clay (<0.06 mm)				
Sand (0.06 – 2 mm)		30	70	
Gravel (2-64 mm)		70	70	
Cobble (64 – 256 mm)				
Boulders (>256 mm)				
Bedrock				

NOTES/COMMENTS:

SITE NOT SAMPLED:

- ☐ Land owner denial ☐ Dry ☐ Too deep/Impounded
☐ Site not found/Secluded ☐ Unsafe
☐ Other (indicate under comments)

RBP Low Gradient Habitat

Habitat Parameter SCORE	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1. Epifaunal Substrate/ Available Cover Score 11	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new and transient).					30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).					10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.					
2. Pool Substrate Characterization Score 16	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.					Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.					All mud or clay or sand bottom; little or no root mat; no submerged vegetation.					Hard-pan clay or bedrock; no root mat or vegetation.					
3. Pool Variability 10	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.					Majority of pools large-deep; very few shallow.					Shallow pools much more prevalent than deep pools.					Majority of pools small-shallow or pools absent.					
4. Sediment Deposition Score 12	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.					Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.					Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.					Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.					
5. Channel Flow Status Score 13	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.					Water fills >75% of the available channel; or <25% of channel substrate is exposed.					Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.					Very little water in channel and mostly present as standing pools.					
6. Channel Alteration → 20/yr Score 11	Channelization or dredging absent or minimal; stream with normal pattern					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (>20 yr.) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.					
7. Channel Sinuosity Score 6	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.					The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.					The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.					Channel straight; waterway has been channelized for a long distance.					
Left/Right Bank	10 9					8 7 6					5 4 3					2 1 0					
8. Bank Stability LB 4 RB 5	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
9. Vegetative Protection LB 5 RB 5	More than 90% of the stream bank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the stream bank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the stream bank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the stream bank surfaces covered by vegetation; disruption of stream bank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
10. Riparian Vegetative Zone Width LB 1 RB 1	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.					

Total Score

100

NOTES/COMMENTS:

Station 3

Macroinvertebrate Collection Check Sheet for Low-Gradient Streams

Date: 5-29-18 Time: 6-7pm CST Project No: KY18-005 Project Name: US 60 Bz/land C
Collector(s) Initials: BR/EM Station ID: station 4 Lat: 37.078927 Long: -88.921960

☒ Collected during the headwater sampling period (March 1 – May 31) (Headwaters = $<5 \text{ mi}^2$).

☐ Collected during the wadeable sampling period (May 1 – September 30) (Wadeable = $>5 \text{ mi}^2$ and $<200 \text{ mi}^2$).

Stream Conditions (Check precipitation before going. If a rainfall of at least 1 inch within a 24 hour period has occurred within 2 weeks of planned sampling event, then sampling shall be delayed until the 2 week requirement can be met.)

☒ Clear with Normal flow
☐ Turbid or High flow. (If so, do not sample!)
☐ No flow in riffles. (If so, do not sample!)

Stream Reach

☒ 100 meters – 300 meters. How long? 150 meters
Number of runs in stream reach: 5 (at least 3)
Number of pools in stream reach: 3 (at least 3)

20 Jab Multi-Habitat Method

Vegetated Banks/Root Mats

☒ Vegetative Bank/Root Mat Jabs (How many? 2) (At least 1 in run and 2 from 2 separate pools)

Submerged Vegetation

☒ Submerged Vegetation Jabs (How many? 0) (At least 1 in run and 2 from 2 separate pools)

Snags/Woody Debris

☒ Snag/Woody Debris Jabs (How many? 2) (At least 1 in run and 2 from 2 separate pools)

Cobble/Gravel

☒ Cobble/Gravel Kicks (How many? 4)

Silt/Sand/Fine Gravel

☒ Sand/Silt/Fine Gravel Jabs (How many? 4) (At least 1 in run and 2 from 2 separate pools)

Leaf Packs

☒ Leaf Pack Picks (How many? 8) (At least 1 in run and 2 from 2 separate pools)

Total Number of Jabs/Kicks/Picks 20 (Should be 20 for the 20 jab method)

Field Measurements: 10.64 DO 33.82 Temperature 6.74 pH 0.223 Conductivity

Comments: 124.1% Turb 35.6

Low Gradient Bioassessment Stream Visit Sheet

STREAM NAME: <u>UT 10NT Humphrey Creek</u>			LOCATION: <u>@ 4560</u>																																					
STATION #: <u>Station 4</u>			COUNTY: <u>Ballard</u>		PROGRAM: <u>KY18-005</u>																																			
INVESTIGATORS: <u>BR/RM</u>			DATE: <u>5-29-18</u>	TIME (24hr): <u>6:00 am</u>	Start: <u>6:00 am</u>																																			
Verify Site LAT/LONG vs GPS <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A			Finish: <u>7:00 pm CST</u>																																					
<table border="1"> <thead> <tr> <th colspan="3">Reach</th> </tr> <tr> <th>Station</th> <th>Downstream</th> <th>Upstream</th> </tr> </thead> <tbody> <tr> <td>LAT <u>37.078427</u></td> <td><u>37.079485</u></td> <td><u>37.078478</u></td> </tr> <tr> <td>LONG <u>-88.921960</u></td> <td><u>-88.922010</u></td> <td><u>-88.922036</u></td> </tr> </tbody> </table>						Reach			Station	Downstream	Upstream	LAT <u>37.078427</u>	<u>37.079485</u>	<u>37.078478</u>	LONG <u>-88.921960</u>	<u>-88.922010</u>	<u>-88.922036</u>																							
Reach																																								
Station	Downstream	Upstream																																						
LAT <u>37.078427</u>	<u>37.079485</u>	<u>37.078478</u>																																						
LONG <u>-88.921960</u>	<u>-88.922010</u>	<u>-88.922036</u>																																						
WEATHER Has there been a scouring rain in the last 14 days? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Now: <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input type="checkbox"/> Clear/sunny <input checked="" type="checkbox"/> Cloudy Past 24 hours: <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input type="checkbox"/> Clear/sunny <input checked="" type="checkbox"/> Cloudy			LOCAL WATERSHED FEATURES (Predominant Surrounding Land Use): <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers <input type="checkbox"/> Residential																																					
INSTREAM FEATURES Stream Width <u>10</u> ft Maximum Depth <u>0.5</u> ft Reach Length <u>150</u> m Riffle/Run/Pool Sequence (No. Sampled in Reach) <u>1</u> Riffle <u>5</u> Run <u>5</u> Pool			HYDRAULIC STRUCTURES <input type="checkbox"/> Dams <input type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other: STREAM FLOW <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input checked="" type="checkbox"/> Low <input type="checkbox"/> High <input checked="" type="checkbox"/> Normal																																					
RIPARIAN VEGETATION Dominate Type: <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Herbaceous <input type="checkbox"/> Grasses <input type="checkbox"/> Shrubs Number of strata <u>3</u> Dom. Tree/Shrub Taxa <u>Am. Elm</u>			CHANNEL ALTERATIONS <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial <u>>20 years old</u>																																					
P-CHEM Instrument Used: <u>See Checklist</u> Date Calibrated: <u>5-29-18</u> Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond _____ Turb _____																																								
Sample Collection Verification Algae Sample: <input type="checkbox"/> QualMHC <input type="checkbox"/> Other <input type="checkbox"/> Visual Assessment Lead Collector: Fish <input type="checkbox"/> BPEF <input type="checkbox"/> Seine <input type="checkbox"/> Other Time: BPEF Seine Lead Collector: Habitat <input checked="" type="checkbox"/> RBP <input type="checkbox"/> Substrate <input type="checkbox"/> Other Lead Collector: <u>B. Rankin</u> Invertebrates <input type="checkbox"/> Jar <input type="checkbox"/> Qual <input type="checkbox"/> Other: <input checked="" type="checkbox"/> 20 Jab (#Jabs: Cobble <u>4</u> Snags <u>2</u> Veg. Banks <u>2</u> Sand <u>4</u> Macrophytes <u>-</u> Other <u>8</u> Lead Collector: <u>B. Rankin</u> Tissue: No. of Samples collected _____ Sp: _____ Lead Collector: Water Chem <input type="checkbox"/> Acid/Alk <input type="checkbox"/> Bulk <input type="checkbox"/> Nutrients <input type="checkbox"/> Metals <input type="checkbox"/> Low Hg <input type="checkbox"/> Herbicides <input type="checkbox"/> Pesticides <input type="checkbox"/> Ortho P <input type="checkbox"/> Other: _____ Lead Collector:																																								
Duplicate Samples Taken:																																								
Substrate Characterization <table border="1"> <thead> <tr> <th>Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.</th> <th>Riffle <u>10</u> %</th> <th>Run <u>30</u> %</th> <th>Pool <u>70</u> %</th> <th>Reach Total</th> </tr> </thead> <tbody> <tr> <td>Silt/Clay (<0.06 mm)</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Sand (0.06 – 2 mm)</td> <td></td> <td><u>30</u></td> <td><u>50</u></td> <td></td> </tr> <tr> <td>Gravel (2-64 mm)</td> <td></td> <td><u>70</u></td> <td><u>50</u></td> <td></td> </tr> <tr> <td>Cobble (64 – 256 mm)</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Boulders (>256 mm)</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Bedrock</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>						Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>10</u> %	Run <u>30</u> %	Pool <u>70</u> %	Reach Total	Silt/Clay (<0.06 mm)					Sand (0.06 – 2 mm)		<u>30</u>	<u>50</u>		Gravel (2-64 mm)		<u>70</u>	<u>50</u>		Cobble (64 – 256 mm)					Boulders (>256 mm)					Bedrock				
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Bedrock																																								

NOTES/COMMENTS:

No Fish

SITE NOT SAMPLED:

- ☐ Land owner denial ☐ Dry ☐ Too deep/Impounded
☐ Site not found/Secluded ☐ Unsafe
☐ Other (indicate under comments)

RBP Low Gradient Habitat

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new and transient).					30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).					10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.					
Score 9																					
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.					Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.					All mud or clay or sand bottom; little or no root mat; no submerged vegetation.					Hard-pan clay or bedrock; no root mat or vegetation.					
Score 15																					
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.					Majority of pools large-deep; very few shallow.					Shallow pools much more prevalent than deep pools.					Majority of pools small-shallow or pools absent.					
Score 8																					
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.					Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.					Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.					Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.					
Score 10																					
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.					Water fills >75% of the available channel; or <25% of channel substrate is exposed.					Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.					Very little water in channel and mostly present as standing pools.					
Score 8																					
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (>20 yr.) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. In stream habitat greatly altered or removed entirely.					
Score 12																					
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)					The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.					The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.					Channel straight; waterway has been channelized for a long distance.					
Score 6																					
Left/Right Bank	10 9					8 7 6					5 4 3					2 1 0					
8. Bank Stability	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas. "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
LB 2																					
RB 2																					
9. Vegetative Protection	More than 90% of the stream bank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the stream bank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the stream bank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the stream bank surfaces covered by vegetation; disruption of stream bank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
LB 2																					
RB 2																					
10. Riparian Vegetative Zone Width	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.					
LB 3																					
RB 2																					

Total Score

NOTES/COMMENTS:

81

Station 4

Macroinvertebrate Sample Chain of Custody Project Information Sheet

Client Name: OK4 Project Administrator: M. Force Project Number: KY18-005 Due Date: 7/30/18

Sampling Site Location: US60 County: Ballard/McCracken State: KY

System Type: Headwater EcoRegion: MVIR Total Number of Samples: 4 Total Number of Containers: 4

Reporting Requirements: ☒ Laboratory Data Sheet; ☐ Excel Spreadsheet; ☒ MBI Calculations via ☐ e-Submittal; ☐ Hardcopy; ☒ Both

Samples Relinquished By: Ant Ramsey Date/Time: 5/30/18 10:30 Sample Received By: 5-30-18/10:30 Date/Time: Jammin Jester

Samples Relinquished By: _____ Date/Time: _____ Sample Received By: _____ Date/Time: _____

Comments/Special Instructions: Low Gradient streams, 20-Jab collection method

Sample Reference ID	Qualitative or Quantitative	Collected By	Collection Date	Sample Type	Preservative	# of Containers Per Sample	Analysis Required (KDOW Protocol, ID Level; etc.)
Station 1	Quant	BR/KM	5-29-18	20-Jab	Ethanol	1	KDOW - Low Gradient
Station 2	↓	↓	↓	↓	↓	↓	
Station 3	↓	↓	↓	↓	↓	↓	
Station 4	↓	↓	↓	↓	↓	↓	

- Continue on Reverse for More Samples -

System Type: Headwater Stream; Wadeable Stream; Large River; Lotic; Other _____

EcoRegion: Bluegrass; Mountain; Pennyroyal; Mississippi Valley-Interior River Lowlands; Other _____

Sample Type: KN KickNet; TK Traveling Kick; MH Multihabitat; S Surber; HD Hester-Dendy Multiplate; HDD HD Deep; HDS HD Shallow; OT Other _____; NA Not Available

MacLIMS: Client Setup/Login By _____ Date _____; Reported By _____ Date _____; Invoiced By _____ Date _____ 5/20/10

THIRD ROCK CONSULTANTS, LLC
FISH SURVEY FIELD DATA SHEET PAGE 1 OF 2

Project No: KY18-005 Name: US 60 Date(s): 9-12-18
 Stream Name: UT Humphrey Creek Station ID: Sta 1
 County: Ballard State: KY River Basin: Ohio River
 Stream Class: _____ Latitude: 37.079710 Longitude: -88.94303
 Investigator(s): B. Penley / J. Storm Method: Backpack + seine
 Sampling Duration _____ Start: 0 sec Finish: 1220 sec
 Stream Width (in meters) _____ Max: 8 m Mean: 5 m

	Species	Released	Voucher	Total	Notes
1	Stoneroller	168	0	168	
2	Creek chub	74	0	74	
3	Black stripe	18	0	18	
4	Yellow Bullhead	8	0	8	
5	Green Sunfish	8	0	8	
6	Spotted bass	1	0	1	
7	Pirate perch	1	0	1	
8	Bluegill	4	0	4	
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

Continue on additional sheet if necessary.

Temp 20.8 pH 6.9 Flow 0.01
 DO/H. 4.1/46.8 Cond 252

THIRD ROCK CONSULTANTS, LLC
FISH SURVEY FIELD DATA SHEET PAGE 1 OF 2

Project No: KY18-005 Name: US 60 Date(s): 9-12-18
Stream Name: Bayou Creek Station ID: Sta 2
County: McCracken State: KY River Basin: _____
Stream Class: _____ Latitude: 37.070671 Longitude: -88.846452
Investigator(s): B. Romley / J. Storm Method: Backpack + seine
Sampling Duration _____ Start: 0 sec Finish: 1012 sec
Stream Width (in meters) _____ Max: 7 m Mean: 5 m

	Species	Released	Voucher	Total	Notes
1	Bluegill	6		6	
2	Green Sunfish	55		55	
3	Gambusia	44		44	
4	Creek Chub	19		19	
5	Stoneroller	18		18	
6	Blackstripe Topminnow	16		16	
7	Juv Centrarchidae	68		68	
8	Yellow bullhead	1		1	
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

Continue on additional sheet if necessary.

temp 22.3 pH 7.1 turb 0.1
DO 4.4 4.8/56.4 cond 279 Flow 0.01

THIRD ROCK CONSULTANTS, LLC
FISH SURVEY FIELD DATA SHEET PAGE 1 OF 2

Project No: Ky 18-005 Name: US60 Date(s): 9-13-18
 Stream Name: UT Humphry Creek Station ID: Sta 3
 County: Ballard State: Ky River Basin: _____
 Stream Class: _____ Latitude: 37.077016 Longitude: -88.898236
 Investigator(s): B. Remley/J. Storm Method: Backpack + Seine
 Sampling Duration Start: 00 sec Finish: 1133 sec
 Stream Width (in meters) Max: 6 m Mean: 5 m

	Species	Released	Voucher	Total	Notes
1	Blackstripe topminnow	52	0	52	
2	Cambusia	43	0	43	
3	Creek chub	137	0	137	
4	Green sunfish	1	0	1	
5	Spotted bass	1	0	1	
6	Blue gill	2	0	2	
7	Starcrocker	80	0	80	
8	Western Creek chubsucker	26	0	26	
9	Slough darter	1	0	1	
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

Continue on additional sheet if necessary.

Temp 20.4 PH 7.1
DO 1.7 7.3 82.0%

Cond 350
Turb 0.6
Fluv 0.06

THIRD ROCK CONSULTANTS, LLC
FISH SURVEY FIELD DATA SHEET PAGE 1 OF 2

Project No: KY18-005 Name: US 60 Date(s): 9-13-18
 Stream Name: Wt Humphrey Creek Station ID: Sta 4
 County: Ballard State: Ky River Basin: Ohio River
 Stream Class: _____ Latitude: 37.078927 Longitude: -88.921960
 Investigator(s): B Renley / J. Storm Method: N/A
 Sampling Duration _____ Start: N/A Finish: N/A
 Stream Width (in meters) _____ Max: 5 Mean: 3

	Species	Released	Voucher	Total	Notes
1	N/A - no water				
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

Continue on additional sheet if necessary.

THIRD ROCK CONSULTANTS, LLC

FOUSER ENVIRONMENTAL SERVICES LABORATORY CHAIN-OF-CUSTODY

Project Name ¹ :	US60			Container Size / Preservation			In Situ Measurements						
Project No. ¹ :	KY18-005			1 litre	8 ounce	8 ounce							
Prime Consultant:	QK4			H ₂ SO ₄			HNO ₃						
Turnaround:	10 Days			Requested Analysis ²									
EDDs Required ¹ :	Yes			Acidity, Alkalinity,	Chloride, CO ₂ , DO, PH,	Sulfate, Orthophosphate	Ammonia Nitrogen	Iron, Hardness	Color	Turbidity (NTU)	Air/Water Temperature (°C)	Specific Conductance (µS/cm)	Stream Discharge (cfs)
EDDs to:	Bert Remley at bremley@thirdrockconsultants.com												
Invoice to:	Accounts Payable at bweatherford@thirdrockconsultants.com												
Questions to:	Bert Remley at bremley@thirdrockconsultants.com												
Lab ID	Site ID	Date	Time	Matrix ³	Type	Filtered							
	Station 2	9-12-18	1500	SW	Grab	Y / <input checked="" type="radio"/> N	✓	✓	✓	Tannic	0.1	28/22.3	279 0.01
	Station 1	9-12-18	1700	SW	Grab	Y / <input checked="" type="radio"/> N	✓	✓	✓	0.1 to clear	0.0	26/20.8	252 0.01
	Station 3	9-13-18	0830	SW	Grab	Y / <input checked="" type="radio"/> N	✓	✓	✓	Tannic	0.0	26/20.4	350 0.06
				SW	Grab	Y / N							
				SW	Grab	Y / N							
				SW	Grab	Y / N							

¹ Project name, No. and weather event must appear on EDD and invoice; ² 40CFR Part 136 Methodology Required; ³ Surface Water;

Field Notes:

Relinquished by: Lamnis Foster

Received by: Lynn Ellis FOR LAB

Temp upon Relinquishment: 20°C

Additional documentation attached? Y / ☒ N If yes, describe:

Upon relinquishment, samples properly preserved, bottles intact, seals intact, etc? Y / N If no, explain:

Date: 9-14-18

Time: 10:03AM

Date: 9-14-18

Time: 10:03

REACH	Stream I	PROJECT	KY18-005	DATE	2/13/2019	LAT	37.078616	LONG	-88.952552
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	3.0	Perennial			
Depth (Ft)	1.0	Ephemeral	X		
Reach (Ft)		Intermittent			

[illegible]

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	8				
RB Score	8				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	5				
RB Score	5				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	1				
RB Score	5				
Total Score	97				

REMARKS / NOTES:

REACH	Stream 2	PROJECT	KY 18-005	DATE	2/13/2014	LAT	37.078137	LONG	-88.953406
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	3.0	Perennial			
Depth (Ft)	0.5	Ephemeral	X		
Reach (Ft)		Intermittent			

[illegible]

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	8				
RB Score	8				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	5				
RB Score	5				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	6				
RB Score	2				
Total Score	70				

REMARKS / NOTES:

REACH	Stream 3	PROJECT	KY18-005	DATE	2/13/2019	LAT	37.079110	LONG	-88.944367
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	10.0	Perennial	X		
Depth (Ft)	2.0	Ephemeral			
Reach (Ft)		Intermittent			

HABITAT PARAMETER	CONDITION CATEGORY																			
	OPTIMAL					SUBOPTIMAL					MARGINAL					POOR				
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
1. Epifaunal Substrate / Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.)					30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).					10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.				
Score	9																			
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.					Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.					All mud or clay or sand bottom; little or no root mat; no submerged vegetation.					Hard-pan clay or bedrock; no root mat or vegetation.				
Score	8																			
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.					Majority of pools large-deep; very few shallow.					Shallow pools much more prevalent than deep pools.					Majority of pools small-shallow or pools absent.				
Score	10																			
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.					Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.					Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.					Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.				
Score	6																			
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.					Water fills > 75% of the available channel; or <25% of channel substrate is exposed.					Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.					Very little water in channel and mostly present as standing pools.				
Score	12																			
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.				
Score	13																			
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note – channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)					The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.					The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.					Channel straight; waterway has been channelized for a long distance.				
Score	7																			

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	9				
RB Score	7				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	8				
RB Score	8				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	9				
RB Score	10				
Total Score	116				

REMARKS / NOTES:

8. Bank Stability		OPTIMAL		SUBOPTIMAL		MARGINAL		POOR		
		10	9	8	7	6	5	4	3	2
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.		Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.		Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.		Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.		
LB Score	2									
RB Score	3									
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.		70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.		50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.		Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
LB Score	1									
RB Score	3									
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.		Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.		Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.		Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.		
LB Score	1									
RB Score	1									
Total Score	74									

REMARKS / NOTES:

REACH	Stream 5	PROJECT	KY18-005	DATE	2/13/2019	LAT	37.079297	LONG	-88.905196
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	10.0	Perennial			
Depth (Ft)	1.0	Ephemeral			
Reach (Ft)		Intermittent	X		

[illegible]

8. Bank Stability		OPTIMAL		SUBOPTIMAL		MARGINAL		POOR		
		10	9	8	7	6	5	4	3	2
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.		Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.		Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.		Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.		
LB Score	2									
RB Score	3									
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.		70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.		50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.		Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
LB Score	1									
RB Score	2									
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.		Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.		Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.		Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.		
LB Score	1									
RB Score	1									
Total Score	86									

REMARKS / NOTES:

REACH	Stream 6	PROJECT	KY18-005	DATE	2/13/2019	LAT	37.086033	LONG	-88.899979
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	6.0	Perennial			
Depth (Ft)	1.0	Ephemeral			
Reach (Ft)		Intermittent	X		

[illegible]

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	6				
RB Score	6				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	2				
RB Score	2				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	5				
RB Score	5				
Total Score	87				

REMARKS / NOTES:

REACH	Stream 7	PROJECT	KY18-005	DATE	2/13/2019	LAT	37.084839	LONG	-88.895111
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	15.0	Perennial	X		
Depth (Ft)	2.0	Ephemeral			
Reach (Ft)		Intermittent			

[illegible]

8. Bank Stability		OPTIMAL		SUBOPTIMAL		MARGINAL		POOR		
		10	9	8	7	6	5	4	3	2
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.		Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.		Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.		Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.		
LB Score	4									
RB Score	4									
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.		70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.		50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.		Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
LB Score	4									
RB Score	4									
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.		Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.		Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.		Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.		
LB Score	4									
RB Score	6									
Total Score	105									

REMARKS / NOTES:

REACH	Stream 8	PROJECT	KY18-005	DATE	2/13/2019	LAT	37.082832	LONG	-88.889358
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	15.0	Perennial			
Depth (Ft)	1.0	Ephemeral			
Reach (Ft)		Intermittent	X		

[illegible]

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	7				
RB Score	7				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	6				
RB Score	6				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	1				
RB Score	6				
Total Score	106				

REMARKS / NOTES:

REACH	Stream 9	PROJECT	KY18-005	DATE	2/13/2019	LAT	37.081937	LONG	-88.886762
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	10.0	Perennial	X		
Depth (Ft)	1.5	Ephemeral			
Reach (Ft)		Intermittent			

[illegible]

8. Bank Stability		OPTIMAL		SUBOPTIMAL		MARGINAL		POOR		
		10	9	8	7	6	5	4	3	2
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.		Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.		Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.		Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.		
LB Score	7									
RB Score	7									
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.		70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.		50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.		Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
LB Score	8									
RB Score	8									
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.		Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.		Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.		Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.		
LB Score	1									
RB Score	1									
Total Score	113									

REMARKS / NOTES:

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	9				
RB Score	10				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	3				
RB Score	2				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	1				
RB Score	0				
Total Score	84				

REMARKS / NOTES:

REACH	<u>Stream 11</u>	PROJECT	<u>KY18-005</u>	DATE	<u>2/14/2019</u>	LAT	<u>37.074802</u>	LONG	<u>-88.861661</u>
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	5.0	Perennial			
Depth (Ft)	0.5	Ephemeral			
Reach (Ft)		Intermittent	X		

[illegible]

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	2				
RB Score	3				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	5				
RB Score	5				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	6				
RB Score	6				
Total Score	99				

REMARKS / NOTES:

REACH	Stream 12	PROJECT	KY18-005	DATE	2/13/2019	LAT	37.071460	LONG	-88.850619
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	12.0	Perennial	X		
Depth (Ft)	1.5	Ephemeral			
Reach (Ft)		Intermittent			

[illegible]

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	8				
RB Score	9				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	6				
RB Score	6				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	2				
RB Score	6				
Total Score	111				

REMARKS / NOTES:

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	8				
RB Score	8				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	7				
RB Score	7				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	8				
RB Score	8				
Total Score	103				

REMARKS / NOTES:

REACH	Stream 14	PROJECT	KY18-005	DATE	2/14/2019	LAT	37.085189	LONG	-88.927794
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	1.0	Perennial			
Depth (Ft)	0.3	Ephemeral	X		
Reach (Ft)		Intermittent	X		

[illegible]

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	10				
RB Score	10				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	7				
RB Score	7				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	6				
RB Score	9				
Total Score	107				

REMARKS / NOTES:

8. Bank Stability		OPTIMAL		SUBOPTIMAL		MARGINAL		POOR			
		10	9	8	7	6	5	4	3	2	1
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.		Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.		Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.		Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.			
LB Score	I										
RB Score	I										
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.		70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.		50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.		Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.			
LB Score	7										
RB Score	7										
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.		Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.		Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.		Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.			
LB Score	7										
RB Score	6										
Total Score	86										

REMARKS / NOTES:

Starts at seep in hillside.

8. Bank Stability		OPTIMAL		SUBOPTIMAL		MARGINAL		POOR		
		10	9	8	7	6	5	4	3	2
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.		Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.		Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.		Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.		
LB Score	8									
RB Score	5									
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.		70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.		50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.		Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
LB Score	8									
RB Score	5									
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.		Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.		Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.		Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.		
LB Score	9									
RB Score	7									
Total Score	125									

REMARKS / NOTES:

REACH	<u>Stream 17</u>	PROJECT	<u>KY18-005</u>	DATE	<u>2/14/2019</u>	LAT	<u>37.085217</u>	LONG	<u>-88.925217</u>
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	2.0	Perennial			
Depth (Ft)	1.0	Ephemeral			
Reach (Ft)		Intermittent	X		

[illegible]

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	7				
RB Score	7				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	8				
RB Score	8				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	5				
RB Score	5				
Total Score	119				

REMARKS / NOTES:

REACH	Stream 18	PROJECT	KY18-005	DATE	2/14/2019	LAT	37.085570	LONG	-88.924058
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	1.0	Perennial			
Depth (Ft)	0.5	Ephemeral			
Reach (Ft)		Intermittent	X		

[illegible]

8. Bank Stability		OPTIMAL		SUBOPTIMAL		MARGINAL		POOR		
		10	9	8	7	6	5	4	3	2
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.		Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.		Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.		Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.		
LB Score	10									
RB Score	10									
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.		70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.		50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.		Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
LB Score	8									
RB Score	8									
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.		Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.		Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.		Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.		
LB Score	1									
RB Score	6									
Total Score	100									

REMARKS / NOTES:

REACH	Stream 19	PROJECT	KY18-005	DATE	2/14/2019	LAT	37.085533	LONG	-88.920623
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	1.0	Perennial			
Depth (Ft)	0.3	Ephemeral	X		
Reach (Ft)		Intermittent			

[illegible]

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	4				
RB Score	4				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	5				
RB Score	5				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	5				
RB Score	5				
Total Score	89				

REMARKS / NOTES:

THIRD ROCK CONSULTANTS, LLC
STREAM HABITAT ASSESSMENT (LOW GRADIENT)

REACH Stream 20 **PROJECT** KY18-005 **DATE** 2/14/2019 **LAT** 37.085423 **LONG** -88.915003

INVESTIGATOR(S) J. Storm, R. McGregor **COWARDIN CLASS** R6 **WATERSHED** Middle Humphrey Creek

STREAM SIZE: **STREAM TYPE:** **IMAGE ID #:** **IMAGE DESCRIPTION:**

Width (Ft) 1.0 Perennial _____

Depth (Ft) 0.5 Ephemeral X _____

Reach (Ft) _____ Intermittent _____

HABITAT PARAMETER	CONDITION CATEGORY																			
	OPTIMAL					SUBOPTIMAL					MARGINAL					POOR				
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
1. Epifaunal Substrate / Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.)					30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).					10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.				
Score	9																			
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.					Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.					All mud or clay or sand bottom; little or no root mat; no submerged vegetation.					Hard-pan clay or bedrock; no root mat or vegetation.				
Score	10																			
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.					Majority of pools large-deep; very few shallow.					Shallow pools much more prevalent than deep pools.					Majority of pools small-shallow or pools absent.				
Score	7																			
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.					Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.					Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.					Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.				
Score	15																			
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.					Water fills > 75% of the available channel; or <25% of channel substrate is exposed.					Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.					Very little water in channel and mostly present as standing pools.				
Score	10																			
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.				
Score	11																			
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note – channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)					The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.					The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.					Channel straight; waterway has been channelized for a long distance.				
Score	10																			

8. Bank Stability		OPTIMAL		SUBOPTIMAL		MARGINAL		POOR		
		10	9	8	7	6	5	4	3	2
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.		Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.		Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.		Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.		
LB Score	10									
RB Score	10									
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.		70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.		50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.		Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
LB Score	9									
RB Score	9									
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.		Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.		Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.		Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.		
LB Score	6									
RB Score	6									
Total Score	122									

REMARKS / NOTES:

THIRD ROCK CONSULTANTS, LLC
STREAM HABITAT ASSESSMENT (LOW GRADIENT)

REACH Stream 21 **PROJECT** KY18-005 **DATE** 2/14/2019 **LAT** 37.085397 **LONG** -88.918820

INVESTIGATOR(S) J. Storm, R. McGregor **COWARDIN CLASS** R6 **WATERSHED** Middle Humphrey Creek

Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	0.5	Perennial			
Depth (Ft)	0.3	Ephemeral	X		
Reach (Ft)		Intermittent			

HABITAT PARAMETER	CONDITION CATEGORY																			
	OPTIMAL					SUBOPTIMAL					MARGINAL					POOR				
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
1. Epifaunal Substrate / Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.)					30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).					10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.				
Score	5																			
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.					Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.					All mud or clay or sand bottom; little or no root mat; no submerged vegetation.					Hard-pan clay or bedrock; no root mat or vegetation.				
Score	2																			
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.					Majority of pools large-deep; very few shallow.					Shallow pools much more prevalent than deep pools.					Majority of pools small-shallow or pools absent.				
Score	1																			
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.					Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.					Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.					Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.				
Score	15																			
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.					Water fills > 75% of the available channel; or <25% of channel substrate is exposed.					Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.					Very little water in channel and mostly present as standing pools.				
Score	11																			
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.				
Score	20																			
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note – channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)					The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.					The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.					Channel straight; waterway has been channelized for a long distance.				
Score	8																			

8. Bank Stability		OPTIMAL		SUBOPTIMAL		MARGINAL		POOR		
		10	9	8	7	6	5	4	3	2
LB Score RB Score		10	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.				
		10								
9. Vegetative Protection		8	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.				
		8								
10. Riparian Vegetative Zone Width		10	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.				
		8								
Total Score		116								

REMARKS / NOTES:

Stream is isolated

REACH	Stream 22	PROJECT	KY18-005	DATE	2/15/2019	LAT	37.083776	LONG	-88.934333
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	15.0	Perennial			
Depth (Ft)	1.0	Ephemeral			
Reach (Ft)		Intermittent	X		

HABITAT PARAMETER	CONDITION CATEGORY																			
	OPTIMAL					SUBOPTIMAL					MARGINAL					POOR				
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
1. Epifaunal Substrate / Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.)					30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).					10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.				
Score	9																			
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.					Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.					All mud or clay or sand bottom; little or no root mat; no submerged vegetation.					Hard-pan clay or bedrock; no root mat or vegetation.				
Score	6																			
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.					Majority of pools large-deep; very few shallow.					Shallow pools much more prevalent than deep pools.					Majority of pools small-shallow or pools absent.				
Score	6																			
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.					Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.					Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.					Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.				
Score	10																			
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.					Water fills > 75% of the available channel; or <25% of channel substrate is exposed.					Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.					Very little water in channel and mostly present as standing pools.				
Score	15																			
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.				
Score	10																			
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note – channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)					The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.					The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.					Channel straight; waterway has been channelized for a long distance.				
Score	12																			

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	4				
RB Score	5				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	7				
RB Score	7				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	10				
RB Score	5				
Total Score	106				

REMARKS / NOTES:

REACH	Stream 23	PROJECT	KY18-005	DATE	2/15/2019	LAT	37.083147	LONG	-88.936285
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	1.5	Perennial			
Depth (Ft)	0.5	Ephemeral			
Reach (Ft)		Intermittent	X		

[illegible]

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	8				
RB Score	8				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	5				
RB Score	5				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	5				
RB Score	5				
Total Score	97				

REMARKS / NOTES:

REACH	Stream 24	PROJECT	KY18-005	DATE	2/15/2019	LAT	37.082875	LONG	-88.938038
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	5.0	Perennial			
Depth (Ft)	1.0	Ephemeral			
Reach (Ft)		Intermittent	X		

HABITAT PARAMETER	CONDITION CATEGORY																			
	OPTIMAL					SUBOPTIMAL					MARGINAL					POOR				
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
1. Epifaunal Substrate / Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.)					30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).					10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.				
Score	14																			
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.					Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.					All mud or clay or sand bottom; little or no root mat; no submerged vegetation.					Hard-pan clay or bedrock; no root mat or vegetation.				
Score	12																			
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.					Majority of pools large-deep; very few shallow.					Shallow pools much more prevalent than deep pools.					Majority of pools small-shallow or pools absent.				
Score	8																			
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.					Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.					Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.					Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.				
Score	13																			
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.					Water fills > 75% of the available channel; or <25% of channel substrate is exposed.					Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.					Very little water in channel and mostly present as standing pools.				
Score	15																			
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.				
Score	16																			
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note – channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)					The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.					The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.					Channel straight; waterway has been channelized for a long distance.				
Score	10																			

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	9				
RB Score	8				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	8				
RB Score	9				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	10				
RB Score	10				
Total Score	142				

REMARKS / NOTES:

8. Bank Stability		OPTIMAL		SUBOPTIMAL		MARGINAL		POOR		
		10	9	8	7	6	5	4	3	2
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.		Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.		Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.		Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.		
LB Score	9									
RB Score	9									
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.		70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.		50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.		Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
LB Score	8									
RB Score	8									
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.		Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.		Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.		Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.		
LB Score	10									
RB Score	9									
Total Score	125									

REMARKS / NOTES:

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	9				
RB Score	10				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	3				
RB Score	3				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	2				
RB Score	4				
Total Score	100				

REMARKS / NOTES:

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	10				
RB Score	10				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	2				
RB Score	2				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	2				
RB Score	2				
Total Score	91				

REMARKS / NOTES:

REACH	Stream 28	PROJECT	KY18-005	DATE	2/15/2019	LAT	37.081570	LONG	-88.943086
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	3.5	Perennial			
Depth (Ft)	1.0	Ephemeral			
Reach (Ft)		Intermittent	X		

[illegible]

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	9				
RB Score	9				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	5				
RB Score	5				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	5				
RB Score	8				
Total Score	111				

REMARKS / NOTES:

REACH	Stream 29	PROJECT	KY18-005	DATE	2/15/2019	LAT	37.077006	LONG	-88.931299
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	5.0	Perennial			
Depth (Ft)	1.0	Ephemeral			
Reach (Ft)		Intermittent	X		

HABITAT PARAMETER	CONDITION CATEGORY																			
	OPTIMAL					SUBOPTIMAL					MARGINAL					POOR				
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
1. Epifaunal Substrate / Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.)					30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).					10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.				
Score	15																			
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.					Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.					All mud or clay or sand bottom; little or no root mat; no submerged vegetation.					Hard-pan clay or bedrock; no root mat or vegetation.				
Score	15																			
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.					Majority of pools large-deep; very few shallow.					Shallow pools much more prevalent than deep pools.					Majority of pools small-shallow or pools absent.				
Score	10																			
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.					Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.					Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.					Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.				
Score	12																			
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.					Water fills > 75% of the available channel; or <25% of channel substrate is exposed.					Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.					Very little water in channel and mostly present as standing pools.				
Score	16																			
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.				
Score	13																			
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note – channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)					The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.					The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.					Channel straight; waterway has been channelized for a long distance.				
Score	10																			

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	9				
RB Score	9				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	8				
RB Score	8				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	5				
RB Score	5				
Total Score	135				

REMARKS / NOTES:

REACH	Stream 30	PROJECT	KY18-005	DATE	2/15/2019	LAT	37.077423	LONG	-88.921771
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	1.0	Perennial			
Depth (Ft)	0.5	Ephemeral	X		
Reach (Ft)		Intermittent			

HABITAT PARAMETER	CONDITION CATEGORY																			
	OPTIMAL					SUBOPTIMAL					MARGINAL					POOR				
	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
1. Epifaunal Substrate / Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient.)					30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).					10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.				
Score	8																			
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.					Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.					All mud or clay or sand bottom; little or no root mat; no submerged vegetation.					Hard-pan clay or bedrock; no root mat or vegetation.				
Score	8																			
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.					Majority of pools large-deep; very few shallow.					Shallow pools much more prevalent than deep pools.					Majority of pools small-shallow or pools absent.				
Score	3																			
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.					Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.					Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.					Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.				
Score	15																			
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.					Water fills > 75% of the available channel; or <25% of channel substrate is exposed.					Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.					Very little water in channel and mostly present as standing pools.				
Score	5																			
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.				
Score	16																			
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note – channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)					The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.					The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.					Channel straight; waterway has been channelized for a long distance.				
Score	12																			

8. Bank Stability		OPTIMAL		SUBOPTIMAL		MARGINAL		POOR		
		10	9	8	7	6	5	4	3	2
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.		Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.		Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.		Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.		
LB Score	10									
RB Score	10									
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.		70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.		50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.		Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
LB Score	8									
RB Score	8									
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.		Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.		Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.		Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.		
LB Score	7									
RB Score	7									
Total Score	117									

REMARKS / NOTES:

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	8				
RB Score	9				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	5				
RB Score	5				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	8				
RB Score	8				
Total Score	121				

REMARKS / NOTES:

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	9				
RB Score	9				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	5				
RB Score	5				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	2				
RB Score	3				
Total Score	89				

REMARKS / NOTES:

REACH	Stream 33	PROJECT	KY18-005	DATE	2/15/2019	LAT	37.076066	LONG	-88.871497
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	1.5	Perennial			
Depth (Ft)	0.5	Ephemeral	X		
Reach (Ft)		Intermittent			

[illegible]

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	9				
RB Score	9				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	2				
RB Score	2				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	0				
RB Score	2				
Total Score	73				

REMARKS / NOTES:

REACH	Stream 34	PROJECT	KY18-005	DATE	2/15/2019	LAT	37.071507	LONG	-88.851372
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	1.0	Perennial			
Depth (Ft)	0.5	Ephemeral	X		
Reach (Ft)		Intermittent			

[illegible]

8. Bank Stability		OPTIMAL	SUBOPTIMAL	MARGINAL	POOR
		10 9	8 7 6	5 4 3	2 1 0
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
LB Score	9				
RB Score	9				
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
LB Score	2				
RB Score	2				
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
LB Score	0				
RB Score	0				
Total Score	65				

REMARKS / NOTES:

REACH	Stream 35	PROJECT	KY18-005	DATE	5/29/2018	LAT	37.079710	LONG	-88.943030
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	25.0	Perennial	X		
Depth (Ft)	1.5	Ephemeral			
Reach (Ft)		Intermittent			

[illegible]

8. Bank Stability		OPTIMAL		SUBOPTIMAL		MARGINAL		POOR		
		10	9	8	7	6	5	4	3	2
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.		Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.		Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.		Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.		
LB Score	5									
RB Score	5									
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.		70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.		50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.		Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
LB Score	3									
RB Score	3									
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.		Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.		Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.		Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.		
LB Score	5									
RB Score	2									
Total Score	105									

REMARKS / NOTES:

RBP completed during macro collection effort for Station 1. I have relabeled it as Stream 35.

8. Bank Stability		OPTIMAL		SUBOPTIMAL		MARGINAL		POOR			
		10	9	8	7	6	5	4	3	2	1
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.		Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.		Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.		Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.			
LB Score	2										
RB Score	3										
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.		70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.		50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.		Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.			
LB Score	2										
RB Score	3										
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.		Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.		Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.		Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.			
LB Score	1										
RB Score	2										
Total Score	79										

REMARKS / NOTES:

RBP completed during macro collection at Station 2. I've renamed it Stream 36.

REACH	Stream 37	PROJECT	KY18-005	DATE	5/29/2018	LAT	37.077016	LONG	-88.898236
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	1.0	Perennial	X		
Depth (Ft)	1.5	Ephemeral			
Reach (Ft)	~200	Intermittent			

[illegible]

8. Bank Stability		OPTIMAL		SUBOPTIMAL		MARGINAL		POOR		
		10	9	8	7	6	5	4	3	2
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.		Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.		Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.		Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.		
LB Score	4									
RB Score	5									
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.		70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.		50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.		Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
LB Score	5									
RB Score	5									
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.		Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.		Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.		Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.		
LB Score	1									
RB Score	1									
Total Score	100									

REMARKS / NOTES:

RBP completed during macro collection at Station 3. I've renamed it Stream 37.

REACH	Stream 38	PROJECT	KY18-005	DATE	5/29/2018	LAT	37.078927	LONG	-88.921960
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Stream Size:		Stream Type:		Image ID #:	Image Description:
Width (Ft)	10.0	Perennial			
Depth (Ft)	0.5	Ephemeral			
Reach (Ft)	~150	Intermittent	X		

[illegible]

8. Bank Stability		OPTIMAL		SUBOPTIMAL		MARGINAL		POOR		
		10	9	8	7	6	5	4	3	2
		Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems.		Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.		Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.		Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.		
LB Score	2									
RB Score	2									
9. Vegetative Protection		More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.		70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.		50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.		Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.		
LB Score	2									
RB Score	2									
10. Riparian Vegetative Zone Width		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.		Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.		Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.		Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.		
LB Score	3									
RB Score	2									
Total Score	81									

REMARKS / NOTES:

RBP completed during macro collection at Station 4. I've renamed it Stream 38.

THIRD ROCK CONSULTANTS, LLC
WETLAND DETERMINATION - ATLANTIC AND GULF COAST PLAIN REGION

Project Name: US 60 Improvements Project No: KY18-005 Date: 2/13/18
 Applicant/Owner: QK4 State: KY Site ID: Wetland A
 Investigator(s): James Storm and Ryan McGregor City, County, Range: Kevil, Ballard
 Landform (hillslope, terrace, etc.): Roadside ditch Local Relief (concave, convex, none): Concave Slope (%): <1
 Subregion (LRR or MLRA): P/134 Lat: 37.078285 Long: -88.953813 Datum: NAD83
 Soil Map Unit Name: Falaya - Collins complex NWI Classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No ✓ (If no, explain in remarks.)
 Are vegetation soil or hydrology significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No
 Are vegetation soil or hydrology ✓ naturally problematic? (If needed, explain any answers in "Remarks.")

SUMMARY OF FINDINGS

Hydrophytic Vegetation Present?	Yes <u>✓</u>	No <u> </u>	
Hydric Soil Present?	Yes <u>✓</u>	No <u> </u>	
Wetland Hydrology Present?	Yes <u>✓</u>	No <u> </u>	Is the sampled area within a wetland? Yes <u>✓</u> No <u> </u>

Remarks:

Heavy recent rains.

WETLAND HYDROLOGY INDICATORS

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply)		Secondary Indicators (minimum of two required)
<u>✓</u> Surface Water (A1)	<u>✓</u> Water-Stained Leaves (B9)	<u> </u> Surface Soil Cracks (B6)
<u> </u> High Water Table (A2)	<u> </u> Aquatic Fauna (B13)	<u> </u> Sparsely Vegetated Concave Surface (B8)
<u>✓</u> Saturation (A3)	<u> </u> Marl Deposits (B15) (LRR U)	<u>✓</u> Drainage Patterns (B10)
<u> </u> Water Marks (B1)	<u> </u> Hydrogen Sulfide Odor (C1)	<u> </u> Moss Trim Lines (B16)
<u>✓</u> Sediment Deposits (B2)	<u> </u> Oxidized Rhizospheres on Living Roots (C3)	<u> </u> Dry-Season Water Table (C2)
<u> </u> Drift Deposits (B3)	<u> </u> Presence of Reduced Iron (C4)	<u> </u> Crayfish Burrows (C8)
<u> </u> Algal Mat or Crust (B4)	<u> </u> Recent Iron Reduction in Tilled Soils (C6)	<u>✓</u> Saturation Visible on Aerial Imagery (C9)
<u> </u> Iron Deposits (B5)	<u> </u> Thin Muck Surface (C7)	<u> </u> Geomorphic Position (D2)
<u> </u> Inundation Visible on Aerial Imagery (B7)	<u> </u> Other (Explain in Remarks)	<u> </u> Shallow Aquitard (D3)
		<u> </u> FAC-Neutral Test (D5)
		<u> </u> Sphagnum Moss (D8) (LRR T, U)

Field Observations:

Surface Water Present?	Yes <u>✓</u>	No <u> </u>	Depth (inches): <u>2</u>	
Water Table Present?	Yes <u> </u>	No <u>✓</u>	Depth (inches): <u> </u>	
Saturation Present: (includes capillary fringe)	Yes <u>✓</u>	No <u> </u>	Depth (inches): <u>0</u>	Wetland Hydrology Present? Yes <u>✓</u> No <u> </u>

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Forested. Connected to Stream I

VEGETATION (Four Strata) – Use scientific names of plants.

Tree Stratum (Plot Size: 30)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test Worksheet:	
1. Liquidambar styraciflua	10	✓	FAC	No. of dominant species that are OBL, FACW, or FAC:	<u>7</u> (A)
2. Fraxinus pennsylvanica	35	✓	FACW	Total No. of dominant species across all strata:	<u>8</u> (B)
3. Salix nigra	5		OBL	% of dominant species that Are OBL, FACW, or FAC	<u>87.5</u> (A/B)
4.					
5.					
6.					
8.					
<u>50</u> = Total Cover 50 % of Total Cover: <u>25</u> 20% of Total Cover: <u>10</u>				Prevalence Index Worksheet	
Sapling/Shrub Stratum (Plot size: 15)				Total % Cover of: _____ Multiply By: _____	
1. Acer rubrum	5	✓	FAC	OBL Species <u>5</u>	X 1 = <u>5</u>
2. Fraxinus pennsylvanica	15	✓	FACW	FACW Species <u>65</u>	X 2 = <u>130</u>
3.				FAC Species <u>17</u>	X 3 = <u>51</u>
4.				FACU Species <u>2</u>	X 4 = <u>8</u>
5.				UPL Species _____	X 5 = _____
6.				Totals (A) <u>89</u>	(B) <u>194</u>
7.				Prevalence Index = B/A or <u>2.18</u>	
8.					
<u>20</u> = Total Cover 50 % of Total Cover: <u>10</u> 20% of Total Cover: <u>4</u>				Hydrophytic Vegetation Indicators:	
Herb Stratum (Plot size: 5)				<input type="checkbox"/> 1 Rapid Test for Hydrophytic Vegetation	
1. Juncus sp	10	✓	FACW	<input checked="" type="checkbox"/> 2 Dominance Test is > 50%	
2. Carex sp	5	✓	FACW	<input checked="" type="checkbox"/> 3 Prevalence Index is ≤ 3.0 ¹	
3.				<input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)	
4.				¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
<u>15</u> = Total Cover 50 % of Total Cover: <u>7.5</u> 20% of Total Cover: <u>3</u>				Definition of Four Vegetation Strata:	
Woody Vine Stratum (Plot size: 5)				Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or More in diameter at breast height (DBH), regardless of Height.	
1. Smilax rotundifolia	2	✓	FAC	Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft. (1 m) tall.	
2. Lonicera japonica	2	✓	FACW	Herb – All herbaceous (non-woody) plants, regardless of Size, and woody plants less than 3.28 ft. tall.	
3.				Woody Vine – All woody vines greater than 3.28 ft. in height.	
4.					
5.					
<u>4</u> = Total Cover 50 % of Total Cover: <u>2</u> 20% of Total Cover: <u>0.8</u>				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Remarks: (Include photo numbers here or on separate sheet. If observed, list morphological adaptations below.)					

Wetland Determination – Atlantic and Gulf Coast Plain Region, Page 3 of 3

THIRD ROCK CONSULTANTS, LLC
WETLAND DETERMINATION - ATLANTIC AND GULF COAST PLAIN REGION

Project Name: US 60 Improvements Project No: KY18-005 Date: 2/13/19
 Applicant/Owner: QK4 State: KY Site ID: Wetland B
 Investigator(s): James Storm and Ryan McGregor City, County, Range: Kevil, Ballard
 Landform (hillslope, terrace, etc.): Roadside ditch Local Relief (concave, convex, none): Concave Slope (%): <2
 Subregion (LRR or MLRA): P/134 Lat: 37.079260 Long: -88.950344 Datum: NAD83
 Soil Map Unit Name: Falaya - Collins complex NWI Classification: NA
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes No ✓ (If no, explain in remarks.)
 Are vegetation soil or hydrology significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ✓
 Are vegetation soil or hydrology ✓ naturally problematic? (If needed, explain any answers in "Remarks.")

SUMMARY OF FINDINGS

Hydrophytic Vegetation Present?	Yes <u>✓</u>	No <u> </u>	
Hydric Soil Present?	Yes <u>✓</u>	No <u> </u>	
Wetland Hydrology Present?	Yes <u>✓</u>	No <u> </u>	Is the sampled area within a wetland? Yes <u>✓</u> No <u> </u>

Remarks:

Recent heavy rains.

WETLAND HYDROLOGY INDICATORS

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply)	Secondary Indicators (minimum of two required)
<input checked="" type="checkbox"/> Surface Water (A1) <input checked="" type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)
<input checked="" type="checkbox"/> Saturation (A3) <input type="checkbox"/> Marl Deposits (B15) (LRR U)	<input checked="" type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Moss Trim Lines (B16)
<input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Dry-Season Water Table (C2)
<input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Presence of Reduced Iron (C4)	<input checked="" type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Thin Muck Surface (C7)	<input checked="" type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)
	<input type="checkbox"/> FAC-Neutral Test (D5)
	<input type="checkbox"/> Sphagnum Moss (D8) (LRR T, U)

Field Observations:

Surface Water Present?	Yes <u>✓</u>	No <u> </u>	Depth (inches): <u>1</u>	
Water Table Present?	Yes <u> </u>	No <u>✓</u>	Depth (inches): <u> </u>	
Saturation Present: (includes capillary fringe)	Yes <u>✓</u>	No <u> </u>	Depth (inches): <u>0</u>	Wetland Hydrology Present? Yes <u>✓</u> No <u> </u>

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Forested. Wetland ditch bound by road berm and berm of abandoned rail line. Water held between two berms. Wetland is providing hydrology to stream I, which flows off site to the north.

VEGETATION (Four Strata) – Use scientific names of plants.

Tree Stratum (Plot Size: 30)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test Worksheet: No. of dominant species that are OBL, FACW, or FAC: _____ (A) Total No. of dominant species across all strata: _____ (B) % of dominant species that Are OBL, FACW, or FAC _____ (A/B)
1. Liquidambar styraciflua	30	✓	FAC	
2. Acer rubrum	20	✓	FAC	
3. Fraxinus pennsylvanica	25	✓	FACW	
4.				
5.				
6.				
8.				
_____ 75 = Total Cover 50 % of Total Cover: <u>37.5</u> 20% of Total Cover: <u>15</u> Sapling/Shrub Stratum (Plot size: 15)				Prevalence Index Worksheet Total % Cover of: _____ Multiply By: _____ OBL Species <u>15</u> X 1 = <u>15</u> FACW Species <u>30</u> X 2 = <u>60</u> FAC Species <u>95</u> X 3 = <u>285</u> FACU Species <u>10</u> X 4 = <u>40</u> UPL Species _____ X 5 = _____ Totals (A) <u>150</u> (B) <u>400</u> Prevalence Index = B/A or <u>2.67</u>
1. Celtis occidentalis	10	✓	FACU	
2. Ulmus americana	10	✓	FAC	
3. Acer rubrum	20	✓	FAC	
4.				
5.				
6.				
7.				
_____ 40 = Total Cover 50 % of Total Cover: <u>20</u> 20% of Total Cover: <u>8</u> Herb Stratum (Plot size: 5)				Hydrophytic Vegetation Indicators: _____ 1 Rapid Test for Hydrophytic Vegetation ✓ 2 Dominance Test is > 50% ✓ 3 Prevalence Index is ≤ 3.0 ¹ _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
1. Carex sp	5	✓	FACW	
2. Rumex crispus	5	✓	FAC	
3. Glyceria striata	15	✓	OBL	
4.				
5.				
6.				
7.				
_____ 25 = Total Cover 50 % of Total Cover: <u>12.5</u> 20% of Total Cover: <u>5</u> Woody Vine Stratum (Plot size: 5)				Definition of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or More in diameter at breast height (DBH), regardless of Height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft. (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of Size, and woody plants less than 3.28 ft. tall. Woody Vine – All woody vines greater than 3.28 ft. in height.
1.				
2.				
3.				
4.				
5.				
_____ = Total Cover 50 % of Total Cover: _____ 20% of Total Cover: _____				
Hydrophytic Vegetation Present? Yes <u>✓</u> No _____				
Remarks: (Include photo numbers here or on separate sheet. If observed, list morphological adaptations below.)				

Wetland Determination – Atlantic and Gulf Coast Plain Region, Page 3 of 3

THIRD ROCK CONSULTANTS, LLC
WETLAND DETERMINATION - ATLANTIC AND GULF COAST PLAIN REGION

Project Name: US 60 Improvements Project No: KY18-005 Date: 2/13/19
 Applicant/Owner: QK4 State: KY Site ID: Wetland C
 Investigator(s): James Storm and Ryan McGregor City, County, Range: Kevil, Ballard
 Landform (hillslope, terrace, etc.): Roadside ditch Local Relief (concave, convex, none): Flat Slope (%): <1
 Subregion (LRR or MLRA): P/134 Lat: 37.071010 Long: -88.849422 Datum: NAD83
 Soil Map Unit Name: Grenada silt loam NWI Classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No ✓ (If no, explain in remarks.)
 Are vegetation soil or hydrology significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No
 Are vegetation soil or hydrology ✓ naturally problematic? (If needed, explain any answers in "Remarks.")

SUMMARY OF FINDINGS

Hydrophytic Vegetation Present?	Yes <u>✓</u>	No <u> </u>	
Hydric Soil Present?	Yes <u>✓</u>	No <u> </u>	
Wetland Hydrology Present?	Yes <u>✓</u>	No <u> </u>	Is the sampled area within a wetland? Yes <u>✓</u> No <u> </u>

Remarks:

Recent heavy rains.

WETLAND HYDROLOGY INDICATORS

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply)		Secondary Indicators (minimum of two required)
<u>✓</u> Surface Water (A1)	<u> </u> Water-Stained Leaves (B9)	<u> </u> Surface Soil Cracks (B6)
<u> </u> High Water Table (A2)	<u> </u> Aquatic Fauna (B13)	<u> </u> Sparsely Vegetated Concave Surface (B8)
<u>✓</u> Saturation (A3)	<u> </u> Marl Deposits (B15) (LRR U)	<u> </u> Drainage Patterns (B10)
<u> </u> Water Marks (B1)	<u> </u> Hydrogen Sulfide Odor (C1)	<u> </u> Moss Trim Lines (B16)
<u> </u> Sediment Deposits (B2)	<u>✓</u> Oxidized Rhizospheres on Living Roots (C3)	<u> </u> Dry-Season Water Table (C2)
<u> </u> Drift Deposits (B3)	<u> </u> Presence of Reduced Iron (C4)	<u> </u> Crayfish Burrows (C8)
<u> </u> Algal Mat or Crust (B4)	<u> </u> Recent Iron Reduction in Tilled Soils (C6)	<u>✓</u> Saturation Visible on Aerial Imagery (C9)
<u> </u> Iron Deposits (B5)	<u> </u> Thin Muck Surface (C7)	<u> </u> Geomorphic Position (D2)
<u> </u> Inundation Visible on Aerial Imagery (B7)	<u> </u> Other (Explain in Remarks)	<u> </u> Shallow Aquitard (D3)
		<u> </u> FAC-Neutral Test (D5)
		<u> </u> Sphagnum Moss (D8) (LRR T, U)

Field Observations:

Surface Water Present?	Yes <u>✓</u>	No <u> </u>	Depth (inches): <u>1</u>	
Water Table Present?	Yes <u> </u>	No <u>✓</u>	Depth (inches): <u> </u>	
Saturation Present: (includes capillary fringe)	Yes <u>✓</u>	No <u> </u>	Depth (inches): <u>0</u>	Wetland Hydrology Present? Yes <u>✓</u> No <u> </u>

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Emergent. Isolated

VEGETATION (Four Strata) – Use scientific names of plants.

Tree Stratum (Plot Size: 30)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test Worksheet: No. of dominant species that are OBL, FACW, or FAC: <u>1</u> (A) Total No. of dominant species across all strata: <u>1</u> (B) % of dominant species that Are OBL, FACW, or FAC <u>100</u> (A/B)
1.				
2.				
3.				
4.				
5.				
6.				
8.				
_____ = Total Cover 50 % of Total Cover: _____ 20% of Total Cover: _____ Sapling/Shrub Stratum (Plot size: 15)				Prevalence Index Worksheet Total % Cover of: _____ Multiply By: _____ OBL Species _____ X 1 = _____ FACW Species <u>75</u> X 2 = <u>150</u> FAC Species <u>10</u> X 3 = <u>30</u> FACU Species _____ X 4 = _____ UPL Species _____ X 5 = _____ Totals (A) <u>85</u> (B) <u>180</u> Prevalence Index = B/A or <u>2.12</u>
1.				
2.				
3.				
4.				
5.				
6.				
7.				
_____ = Total Cover 50 % of Total Cover: _____ 20% of Total Cover: _____ Herb Stratum (Plot size: 5)				Hydrophytic Vegetation Indicators: _____ 1 Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 Dominance Test is > 50% <input checked="" type="checkbox"/> 3 Prevalence Index is ≤ 3.0 ¹ _____ Problematic Hydrophytic Vegetation ¹ (Explain)
1. Carex sp	75	✓	FACW	
2. Festuca arundinacea	10		FAC	
3.				
4.				
5.				
6.				
7.				
_____ = Total Cover 50 % of Total Cover: <u>42.5</u> 20% of Total Cover: <u>17</u> Woody Vine Stratum (Plot size: 5)				Definition of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or More in diameter at breast height (DBH), regardless of Height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft. (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of Size, and woody plants less than 3.28 ft. tall. Woody Vine – All woody vines greater than 3.28 ft. in height. Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____
1.				
2.				
3.				
4.				
5.				
_____ = Total Cover 50 % of Total Cover: _____ 20% of Total Cover: _____				
50 % of Total Cover: _____ 20% of Total Cover: _____				
Remarks: (Include photo numbers here or on separate sheet. If observed, list morphological adaptations below.)				

Wetland Determination – Atlantic and Gulf Coast Plain Region, Page 3 of 3

THIRD ROCK CONSULTANTS, LLC
WETLAND DETERMINATION - ATLANTIC AND GULF COAST PLAIN REGION

Project Name: US 60 Improvements Project No: KY18-005 Date: 2/14/19
 Applicant/Owner: QK4 State: KY Site ID: Wetland D
 Investigator(s): James Storm and Ryan McGregor City, County, Range: Kevil, Ballard
 Landform (hillslope, terrace, etc.): Roadside terrace Local Relief (concave, convex, none): Concave Slope (%): <1
 Subregion (LRR or MLRA): P/134 Lat: 37.085439 Long: -88.898479 Datum: NAD83
 Soil Map Unit Name: Grenada silt loam NWI Classification: NA

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No (If no, explain in remarks.)
 Are vegetation soil or hydrology significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No
 Are vegetation soil or hydrology naturally problematic? (If needed, explain any answers in "Remarks.")

SUMMARY OF FINDINGS

Hydrophytic Vegetation Present?	Yes <u>✓</u>	No <u> </u>	
Hydric Soil Present?	Yes <u>✓</u>	No <u> </u>	
Wetland Hydrology Present?	Yes <u>✓</u>	No <u> </u>	Is the sampled area within a wetland? Yes <u>✓</u> No <u> </u>

Remarks:

WETLAND HYDROLOGY INDICATORS

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply)		Secondary Indicators (minimum of two required)
<input checked="" type="checkbox"/> Surface Water (A1) <input type="checkbox"/> High Water Table (A2) <input checked="" type="checkbox"/> Saturation (A3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input checked="" type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13) <input type="checkbox"/> Marl Deposits (B15) (LRR U) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input checked="" type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> FAC-Neutral Test (D5) <input type="checkbox"/> Sphagnum Moss (D8) (LRR T, U)

Field Observations:

Surface Water Present?	Yes <u>✓</u>	No <u> </u>	Depth (inches): <u>1</u>	
Water Table Present?	Yes <u> </u>	No <u>✓</u>	Depth (inches): <u>0</u>	
Saturation Present: (includes capillary fringe)	Yes <u>✓</u>	No <u> </u>	Depth (inches): <u>0</u>	Wetland Hydrology Present? Yes <u>✓</u> No <u> </u>

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Forested. Isolated

VEGETATION (Four Strata) – Use scientific names of plants.

Tree Stratum (Plot Size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. <i>Acer rubrum</i>	30	✓	FAC
2. <i>Ulmus americana</i>	10	✓	FAC
3.			
4.			
5.			
6.			
8.			
40 = Total Cover 50 % of Total Cover: 20 20% of Total Cover: 8			
Sapling/Shrub Stratum (Plot size: 15)	Absolute % Cover	Dominant Species?	Indicator Status
1. <i>Acer rubrum</i>	10	✓	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
10 = Total Cover 50 % of Total Cover: 5 20% of Total Cover: 2			
Herb Stratum (Plot size: 5)	Absolute % Cover	Dominant Species?	Indicator Status
1. <i>Glyceria striata</i>	40	✓	OBL
2. <i>Carex sp</i>	2		FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
42 = Total Cover 50 % of Total Cover: 21 20% of Total Cover: 8.4			
Woody Vine Stratum (Plot size: 5)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
_____ = Total Cover 50 % of Total Cover: _____ 20% of Total Cover: _____			

Dominance Test Worksheet:

No. of dominant species that are OBL, FACW, or FAC: 4 (A)

Total No. of dominant species across all strata: 4 (B)

% of dominant species that Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of: _____ Multiply By: _____

OBL Species	<u>40</u>	X 1 =	<u>40</u>
FACW Species	<u>2</u>	X 2 =	<u>4</u>
FAC Species	<u>50</u>	X 3 =	<u>150</u>
FACU Species		X 4 =	
UPL Species		X 5 =	
Totals (A)	<u>92</u>	(B)	<u>194</u>

Prevalence Index = B/A or 2.10

Hydrophytic Vegetation Indicators:

 1 Rapid Test for Hydrophytic Vegetation

✓ 2 Dominance Test is > 50%

✓ 3 Prevalence Index is ≤ 3.0¹

 Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definition of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or More in diameter at breast height (DBH), regardless of Height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft. (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of Size, and woody plants less than 3.28 ft. tall.

Woody Vine – All woody vines greater than 3.28 ft. in height.

Hydrophytic Vegetation Present? Yes ✓ No

Remarks: (Include photo numbers here or on separate sheet. If observed, list morphological adaptations below.)

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-14	10 YR 6/2	60	10 YR 5/6	40	C	M	Clay loam	

Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand GrainsLocation: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

Histosol (A1)

Polyvalue Below Surface (S8) (LRR S, T, U)

Histic Epipedon (A2)

Thin Dark Surface (S9) (LRR S, T, U)

Black Histic (A3)

Loamy Mucky Mineral (F1) (LRR O)

Hydrogen Sulfide (A4)

Loamy Gleyed Matrix (F2)

Stratified Layers (A5)

✓ Depleted Matrix (F3)

Organic Bodies (A6) (LRR P, T, U)

Redox Dark Surface (F6)

5 cm Mucky Mineral (A7) (LRR P, T, U)

Depleted Dark Surface (F7)

Muck Presence (A8) (LRR U)

Redox Depressions (F8)

1 cm Muck (A9) (LRR P, T)

Marl (F10) (LRR U)

Depleted Below Dark Surface (A11)

Depleted Ochric (F11) (MLRA I5I)

Thick Dark Surface (A12)

Iron-Manganese Masses (F12) (LRR O, P, T)

Coast Prairie Redox (A16)(MLRA I50A)

Umbric Surface (F13) (LRR P, T, U)

Sandy Mucky Mineral (S1) (LRR O, S)

Delta Ochric (F17) (MLRA I5I)

Sandy Gleyed Matrix (S4)

Reduced Vertic (F18) (MLRA I50A, I50B)

Sandy Redox (S5)

Piedmont Floodplain Soils (F19) (MLRA I49A)

Stripped Matrix (S6)

Anomalous Bright Loamy Soils (F20) (MLRA I49A, I53C, I53D)

Dark Surface (S7) (LRR P, S, T, U)

Indicators for Problematic Hydric Soils³:

1 cm Muck (A9) (LRR O)

2 cm Muck (A10) (LRR S)

Reduced Vertic (F18)

(Outside MLRA I50A,B)

Piedmont Floodplain Soils (F19)(LRR P,S,T)

Anomalous Bright Loamy Soils (F20)

(MLRA I53B)

Red Parent Material (TF2)

Very Shallow Dark Surface (TF12)

Other (Explain in Remarks)

Restrictive Layer (if observed):

Type:

Depth (inches):

Hydric Soil Present?

Yes

✓

No

Remarks:

THIRD ROCK CONSULTANTS, LLC
WETLAND DETERMINATION - ATLANTIC AND GULF COAST PLAIN REGION

Project Name: US 60 Improvements Project No: KY18-005 Date: 2/14/19
 Applicant/Owner: QK4 State: KY Site ID: Wetland E
 Investigator(s): James Storm and Ryan McGregor City, County, Range: Kevil, Ballard
 Landform (hillslope, terrace, etc.): Excavated slough Local Relief (concave, convex, none): Concave Slope (%): <1
 Subregion (LRR or MLRA): P/134 Lat: 37.084789 Long: -88.930702 Datum: NAD83
 Soil Map Unit Name: Loring Purchase complex NWI Classification: NA
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No (If no, explain in remarks.)
 Are vegetation soil or hydrology significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No
 Are vegetation soil or hydrology naturally problematic? (If needed, explain any answers in "Remarks.")

SUMMARY OF FINDINGS

Hydrophytic Vegetation Present?	Yes <u>✓</u>	No <u> </u>	
Hydric Soil Present?	Yes <u>✓</u>	No <u> </u>	
Wetland Hydrology Present?	Yes <u>✓</u>	No <u> </u>	Is the sampled area within a wetland? Yes <u>✓</u> No <u> </u>

Remarks:

WETLAND HYDROLOGY INDICATORS

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply)		Secondary Indicators (minimum of two required)
<input checked="" type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)
<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15) (LRR U)	<input type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Moss Trim Lines (B16)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Dry-Season Water Table (C2)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input checked="" type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input checked="" type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input checked="" type="checkbox"/> Geomorphic Position (D2)
<input checked="" type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)
		<input type="checkbox"/> FAC-Neutral Test (D5)
		<input type="checkbox"/> Sphagnum Moss (D8) (LRR T, U)

Field Observations:

Surface Water Present? Yes ✓ No Depth (inches): >3 feet
 Water Table Present? Yes No ✓ Depth (inches):
 Saturation Present: Yes ✓ No Depth (inches): 0 Wetland Hydrology Present? Yes ✓ No
 (includes capillary fringe)

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Forested. Isolated. Large pool of indeterminate depth.

VEGETATION (Four Strata) – Use scientific names of plants.

Tree Stratum (Plot Size: 30)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test Worksheet: No. of dominant species that are OBL, FACW, or FAC: <u>2</u> (A) Total No. of dominant species across all strata: <u>2</u> (B) % of dominant species that Are OBL, FACW, or FAC <u>100</u> (A/B)
1. Fraxinus pennsylvanica	15	✓	FACW	
2.				Prevalence Index Worksheet Total % Cover of: _____ Multiply By: _____ OBL Species _____ X 1 = _____ FACW Species <u>15</u> X 2 = <u>30</u> FAC Species <u>10</u> X 3 = <u>30</u> FACU Species _____ X 4 = _____ UPL Species _____ X 5 = _____ Totals (A) <u>25</u> (B) <u>60</u> Prevalence Index = B/A or <u>2.4</u>
3.				
4.				
5.				
6.				
8.				
_____ = Total Cover 50 % of Total Cover: <u>7.5</u> 20% of Total Cover: <u>3</u> Sapling/Shrub Stratum (Plot size: 15)				
1. Acer negundo	10	✓	FAC	Hydrophytic Vegetation Indicators: _____ 1 Rapid Test for Hydrophytic Vegetation ✓ 2 Dominance Test is > 50% ✓ 3 Prevalence Index is ≤ 3.0 ¹ _____ Problematic Hydrophytic Vegetation ¹ (Explain)
2.				
3.				
4.				
5.				¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
6.				
7.				
8.				
_____ = Total Cover 50 % of Total Cover: <u>5</u> 20% of Total Cover: <u>2</u> Herb Stratum (Plot size: 5)				
1.				Definition of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or More in diameter at breast height (DBH), regardless of Height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft. (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of Size, and woody plants less than 3.28 ft. tall. Woody Vine – All woody vines greater than 3.28 ft. in height.
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
_____ = Total Cover 50 % of Total Cover: _____ 20% of Total Cover: _____ Woody Vine Stratum (Plot size: 5)				
1.				Hydrophytic Vegetation Present? Yes <u>✓</u> No _____
2.				
3.				
4.				
5.				
_____ = Total Cover 50 % of Total Cover: _____ 20% of Total Cover: _____				

Remarks: (Include photo numbers here or on separate sheet. If observed, list morphological adaptations below.)

Wetland Determination – Atlantic and Gulf Coast Plain Region, Page 3 of 3

THIRD ROCK CONSULTANTS, LLC
WETLAND DETERMINATION - ATLANTIC AND GULF COAST PLAIN REGION

Project Name: US 60 Improvements Project No: KY18-005 Date: 2/14/19
 Applicant/Owner: QK4 State: KY Site ID: Wetland F
 Investigator(s): James Storm and Ryan McGregor City, County, Range: Kevil, Ballard
 Landform (hillslope, terrace, etc.): Bottomland Local Relief (concave, convex, none): Concave Slope (%): < 1
 Subregion (LRR or MLRA): P/134 Lat: 37.085056 Long: -88.927952 Datum: _____
 Soil Map Unit Name: Loring-Purchase Complex NWI Classification: N/A
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in remarks.)
 Are vegetation _____ soil _____ or hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____
 Are vegetation _____ soil _____ or hydrology _____ naturally problematic? (If needed, explain any answers in "Remarks.")

SUMMARY OF FINDINGS

Hydrophytic Vegetation Present?	Yes <u>✓</u>	No _____	
Hydric Soil Present?	Yes <u>✓</u>	No _____	
Wetland Hydrology Present?	Yes <u>✓</u>	No _____	Is the sampled area within a wetland? Yes <u>✓</u> No _____

Remarks:

WETLAND HYDROLOGY INDICATORS

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply)		Secondary Indicators (minimum of two required)
<input checked="" type="checkbox"/> Surface Water (A1)	<input checked="" type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)
<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15) (LRR U)	<input checked="" type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Moss Trim Lines (B16)
<input checked="" type="checkbox"/> Sediment Deposits (B2)	<input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Dry-Season Water Table (C2)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input checked="" type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)
		<input type="checkbox"/> FAC-Neutral Test (D5)
		<input type="checkbox"/> Sphagnum Moss (D8) (LRR T, U)

Field Observations:

Surface Water Present?	Yes <u>✓</u>	No _____	Depth (inches): <u>1</u>	
Water Table Present?	Yes _____	No <u>✓</u>	Depth (inches): _____	
Saturation Present: (includes capillary fringe)	Yes <u>✓</u>	No _____	Depth (inches): <u>0</u>	Wetland Hydrology Present? Yes <u>✓</u> No _____

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Forested, connected to adjacent stream.

VEGETATION (Four Strata) – Use scientific names of plants.

Tree Stratum (Plot Size: 30)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test Worksheet: No. of dominant species that are OBL, FACW, or FAC: <u>4</u> (A) Total No. of dominant species across all strata: <u>6</u> (B) % of dominant species that Are OBL, FACW, or FAC: <u>66.6</u> (A/B)
1. Acer rubrum	30	✓	FAC	
2. Celtis occidentalis	10	✓	FACU	
3.				
4.				
5.				
6.				
8.				
40 = Total Cover 50 % of Total Cover: <u>20</u> 20% of Total Cover: <u>8</u>				Prevalence Index Worksheet Total % Cover of: _____ Multiply By: _____ OBL Species <u>3</u> X 1 = <u>3</u> FACW Species <u>17</u> X 2 = <u>34</u> FAC Species <u>35</u> X 3 = <u>105</u> FACU Species <u>20</u> X 4 = <u>80</u> UPL Species _____ X 5 = _____ Totals (A) <u>75</u> (B) <u>222</u> Prevalence Index = B/A or <u>2.96</u>
Sapling/Shrub Stratum (Plot size: 15)				
1. Celtis occidentalis	10	✓	FACU	
2. Acer rubrum	5		FAC	
3. Fraxinus pennsylvanica	15	✓	FACW	
4.				
5.				
6.				
30 = Total Cover 50 % of Total Cover: <u>15</u> 20% of Total Cover: <u>6</u>				Hydrophytic Vegetation Indicators: _____ 1 Rapid Test for Hydrophytic Vegetation ✓ 2 Dominance Test is > 50% ✓ 3 Prevalence Index is ≤ 3.0 ¹ _____ Problematic Hydrophytic Vegetation ¹ (Explain)
Herb Stratum (Plot size: 5)				
1. symphyotrichum lanceolatum	2	✓	FACW	
2. Rorippa palustris	3	✓	OBL	
3.				
4.				
5.				
6.				
5 = Total Cover 50 % of Total Cover: <u>2.5</u> 20% of Total Cover: <u>1</u>				Definition of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or More in diameter at breast height (DBH), regardless of Height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft. (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of Size, and woody plants less than 3.28 ft. tall. Woody Vine – All woody vines greater than 3.28 ft. in height.
Woody Vine Stratum (Plot size:)				
1.				
2.				
3.				
4.				
5.				
_____ = Total Cover 50 % of Total Cover: _____ 20% of Total Cover: _____				
Hydrophytic Vegetation Present? Yes <u>✓</u> No _____				
Remarks: (Include photo numbers here or on separate sheet. If observed, list morphological adaptations below.)				

Wetland Determination – Atlantic and Gulf Coast Plain Region, Page 3 of 3

THIRD ROCK CONSULTANTS, LLC
WETLAND DETERMINATION - ATLANTIC AND GULF COAST PLAIN REGION

Project Name: US 60 Improvements Project No: KY18-005 Date: 2/14/19
 Applicant/Owner: QK4 State: KY Site ID: Wetland G
 Investigator(s): James Storm and Ryan McGregor City, County, Range: Kevil, Ballard
 Landform (hillslope, terrace, etc.): Floodplain Local Relief (concave, convex, none): Concave Slope (%): < 1
 Subregion (LRR or MLRA): P/134 Lat: 37.085580 Long: -88.927186 Datum: _____
 Soil Map Unit Name: Falaya-Colling Complex NWI Classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in remarks.)
 Are vegetation _____ soil _____ or hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____
 Are vegetation _____ soil _____ or hydrology _____ naturally problematic? (If needed, explain any answers in "Remarks.")

SUMMARY OF FINDINGS

Hydrophytic Vegetation Present?	Yes <u>✓</u>	No _____	
Hydric Soil Present?	Yes <u>✓</u>	No _____	
Wetland Hydrology Present?	Yes <u>✓</u>	No _____	Is the sampled area within a wetland? Yes <u>✓</u> No _____

Remarks:

WETLAND HYDROLOGY INDICATORS

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply)		Secondary Indicators (minimum of two required)
<input checked="" type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)
<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15) (LRR U)	<input checked="" type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Moss Trim Lines (B16)
<input type="checkbox"/> Sediment Deposits (B2)	<input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Dry-Season Water Table (C2)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input checked="" type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input checked="" type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)
		<input checked="" type="checkbox"/> FAC-Neutral Test (D5)
		<input type="checkbox"/> Sphagnum Moss (D8) (LRR T, U)

Field Observations:

Surface Water Present?	Yes <u>✓</u>	No _____	Depth (inches): <u>2</u>	
Water Table Present?	Yes _____	No <u>✓</u>	Depth (inches): _____	
Saturation Present: (includes capillary fringe)	Yes <u>✓</u>	No _____	Depth (inches): <u>0</u>	Wetland Hydrology Present? Yes <u>✓</u> No _____

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Forested, located in floodplain of stream 16.

VEGETATION (Four Strata) – Use scientific names of plants.

Tree Stratum (Plot Size: 30)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test Worksheet: No. of dominant species that are OBL, FACW, or FAC: <u>5</u> (A) Total No. of dominant species across all strata: <u>5</u> (B) % of dominant species that Are OBL, FACW, or FAC: <u>100</u> (A/B)
1. <i>Platanus occidentalis</i>	40	✓	FACW	
2. <i>Acer negundo</i>	20	✓	FAC	
3. <i>Acer rubrum</i>	20	✓	FAC	
4.				
5.				
6.				
8.				
80 = Total Cover 50 % of Total Cover: <u>40</u> 20% of Total Cover: <u>16</u>				Prevalence Index Worksheet Total % Cover of: _____ Multiply By: _____ OBL Species _____ X 1 = _____ FACW Species <u>40</u> X 2 = <u>80</u> FAC Species <u>75</u> X 3 = <u>225</u> FACU Species _____ X 4 = _____ UPL Species _____ X 5 = _____ Totals (A) <u>115</u> (B) <u>305</u> Prevalence Index = B/A or <u>2.65</u>
Sapling/Shrub Stratum (Plot size: 15)				
1. <i>Acer negundo</i>	25	✓	FAC	
2. <i>Acer rubrum</i>	10	✓	FAC	
3.				
4.				
5.				
6.				
7.				
8.				
35 = Total Cover 50 % of Total Cover: <u>17.5</u> 20% of Total Cover: <u>7</u>				Hydrophytic Vegetation Indicators: _____ 1 Rapid Test for Hydrophytic Vegetation ✓ 2 Dominance Test is > 50% ✓ 3 Prevalence Index is ≤ 3.0 ¹ _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
Herb Stratum (Plot size: 5)				
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
_____ = Total Cover 50 % of Total Cover: _____ 20% of Total Cover: <u>1</u>				Definition of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or More in diameter at breast height (DBH), regardless of Height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft. (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of Size, and woody plants less than 3.28 ft. tall. Woody Vine – All woody vines greater than 3.28 ft. in height.
Woody Vine Stratum (Plot size: 5)				
1.				
2.				
3.				
4.				
5.				
_____ = Total Cover 50 % of Total Cover: _____ 20% of Total Cover: _____				Hydrophytic Vegetation Present? Yes <u>✓</u> No _____
Remarks: (Include photo numbers here or on separate sheet. If observed, list morphological adaptations below.)				

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-6	10YR 6/2	60	10YR 6/6	40	C	M	Clay Loam	
6-14	2.5Y 6/1	80	10YR 6/6	20	C	M	Clay Loam	
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains							² Location: PL=Pore Lining, M=Matrix	
Hydric Soil Indicators:			Indicators for Problematic Hydric Soils³:					
<input type="checkbox"/>	Histosol (A1)		<input type="checkbox"/>	Polyvalue Below Surface (S8) (LRR S, T, U)		<input type="checkbox"/>	1 cm Muck (A9) (LRR O)	
<input type="checkbox"/>	Histic Epipedon (A2)		<input type="checkbox"/>	Thin Dark Surface (S9) (LRR S, T, U)		<input type="checkbox"/>	2 cm Muck (A10) (LRR S)	
<input type="checkbox"/>	Black Histic (A3)		<input type="checkbox"/>	Loamy Mucky Mineral (F1) (LRR O)		<input type="checkbox"/>	Reduced Vertic (F18)	
<input type="checkbox"/>	Hydrogen Sulfide (A4)		<input type="checkbox"/>	Loamy Gleyed Matrix (F2)		<input type="checkbox"/>	(Outside MLRA 150A,B)	
<input type="checkbox"/>	Stratified Layers (A5)		<input checked="" type="checkbox"/>	Depleted Matrix (F3)		<input type="checkbox"/>	Piedmont Floodplain Soils (F19) (LRR P,S,T)	
<input type="checkbox"/>	Organic Bodies (A6) (LRR P, T, U)		<input type="checkbox"/>	Redox Dark Surface (F6)		<input type="checkbox"/>	Anomalous Bright Loamy Soils (F20)	
<input type="checkbox"/>	5 cm Mucky Mineral (A7) (LRR P, T, U)		<input type="checkbox"/>	Depleted Dark Surface (F7)		<input type="checkbox"/>	(MLRA 153B)	
<input type="checkbox"/>	Muck Presence (A8) (LRR U)		<input type="checkbox"/>	Redox Depressions (F8)		<input type="checkbox"/>	Red Parent Material (TF2)	
<input type="checkbox"/>	1 cm Muck (A9) (LRR P, T)		<input type="checkbox"/>	Marl (F10) (LRR U)		<input type="checkbox"/>	Very Shallow Dark Surface (TF12)	
<input type="checkbox"/>	Depleted Below Dark Surface (A11)		<input type="checkbox"/>	Depleted Ochric (F11) (MLRA 151)		<input type="checkbox"/>	Other (Explain in Remarks)	
<input type="checkbox"/>	Thick Dark Surface (A12)		<input type="checkbox"/>	Iron-Manganese Masses (F12) (LRR O, P, T)		³ Indicators of hydrophytic vegetation and wetland hydrology must be present.		
<input type="checkbox"/>	Coast Prairie Redox (A16) (MLRA 150A)		<input type="checkbox"/>	Umbric Surface (F13) (LRR P, T, U)				
<input type="checkbox"/>	Sandy Mucky Mineral (S1) (LRR O, S)		<input type="checkbox"/>	Delta Ochric (F17) (MLRA 151)				
<input type="checkbox"/>	Sandy Gleyed Matrix (S4)		<input type="checkbox"/>	Reduced Vertic (F18) (MLRA 150A, 150B)				
<input type="checkbox"/>	Sandy Redox (S5)		<input type="checkbox"/>	Piedmont Floodplain Soils (F19) (MLRA 149A)				
<input type="checkbox"/>	Stripped Matrix (S6)		<input type="checkbox"/>	Anomalous Bright Loamy Soils (F20) (MLRA 149A, 153C, 153D)				
<input type="checkbox"/>	Dark Surface (S7) (LRR P, S, T, U)							
Restrictive Layer (if observed):								
Type: _____					Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>			
Depth (inches): _____								
Remarks:								

THIRD ROCK CONSULTANTS, LLC
WETLAND DETERMINATION - ATLANTIC AND GULF COAST PLAIN REGION

Project Name: US 60 Improvements Project No: KY18-005 Date: 2/14/19
 Applicant/Owner: QK4 State: KY Site ID: Wetland H
 Investigator(s): James Storm and Ryan McGregor City, County, Range: Kevil, Ballard
 Landform (hillslope, terrace, etc.): Toe of berm Local Relief (concave, convex, none): Flat Slope (%): < 1
 Subregion (LRR or MLRA): P/134 Lat: 37.085565 Long: -88.924875 Datum: _____
 Soil Map Unit Name: Falaya-Collins Complex NWI Classification: N/A
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in remarks.)
 Are vegetation _____ soil _____ or hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____
 Are vegetation _____ soil _____ or hydrology _____ naturally problematic? (If needed, explain any answers in "Remarks.")

SUMMARY OF FINDINGS

Hydrophytic Vegetation Present?	Yes <u>✓</u>	No _____	
Hydric Soil Present?	Yes <u>✓</u>	No _____	
Wetland Hydrology Present?	Yes <u>✓</u>	No _____	Is the sampled area within a wetland? Yes <u>✓</u> No _____

Remarks:

WETLAND HYDROLOGY INDICATORS

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply)		Secondary Indicators (minimum of two required)
<input checked="" type="checkbox"/> Surface Water (A1)	<input checked="" type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)
<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15) (LRR U)	<input checked="" type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Moss Trim Lines (B16)
<input type="checkbox"/> Sediment Deposits (B2)	<input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Dry-Season Water Table (C2)
<input checked="" type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input checked="" type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input checked="" type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)
		<input type="checkbox"/> FAC-Neutral Test (D5)
		<input type="checkbox"/> Sphagnum Moss (D8) (LRR T, U)

Field Observations:

Surface Water Present?	Yes <u>✓</u>	No _____	Depth (inches):	<u>1</u>	
Water Table Present?	Yes _____	No <u>✓</u>	Depth (inches):	_____	
Saturation Present: (includes capillary fringe)	Yes <u>✓</u>	No _____	Depth (inches):	<u>0</u>	Wetland Hydrology Present? Yes <u>✓</u> No _____

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Forested, Connected to stream 16.

VEGETATION (Four Strata) – Use scientific names of plants.

Tree Stratum (Plot Size: 30)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test Worksheet:	
1. <i>Celtis occidentalis</i>	20	✓	FACU	No. of dominant species that are OBL, FACW, or FAC:	3 (A)
2. <i>Ulmus americana</i>	5		FAC	Total No. of dominant species across all strata:	4 (B)
3. <i>Fraxinus pennsylvanica</i>	20	✓	FACW	% of dominant species that Are OBL, FACW, or FAC	75 (A/B)
4. <i>Populus deltoides</i>	5		FAC		
5. <i>Acer rubrum</i>	15	✓	FAC		
6.					
8.					
65 = Total Cover 50 % of Total Cover: 32.5 20% of Total Cover: 13				Prevalence Index Worksheet	
Sapling/Shrub Stratum (Plot size: 15)				Total % Cover of: Multiply By:	
1. <i>Acer rubrum</i>	10	✓	FAC	OBL Species	X 1 =
2.				FACW Species	20 X 2 = 40
3.				FAC Species	35 X 3 = 105
4.				FACU Species	20 X 4 = 80
5.				UPL Species	X 5 =
6.				Totals (A)	75 (B) 225
7.				Prevalence Index = B/A or 3.0	
8.				Hydrophytic Vegetation Indicators:	
10 = Total Cover 50 % of Total Cover: 5 20% of Total Cover: 2				<input type="checkbox"/> 1 Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 Dominance Test is > 50% <input checked="" type="checkbox"/> 3 Prevalence Index is ≤ 3.0 ¹ <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)	
Herb Stratum (Plot size: 5)				¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
1.				Definition of Four Vegetation Strata:	
2.				Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or More in diameter at breast height (DBH), regardless of Height.	
3.				Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft. (1 m) tall.	
4.				Herb – All herbaceous (non-woody) plants, regardless of Size, and woody plants less than 3.28 ft. tall.	
5.				Woody Vine – All woody vines greater than 3.28 ft. in height.	
6.					
7.					
8.					
9.					
10.					
11.					
12.					
= Total Cover 50 % of Total Cover: 20% of Total Cover: 1					
Woody Vine Stratum (Plot size: 5)					
1.				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
2.					
3.					
4.					
5.					
= Total Cover 50 % of Total Cover: 20% of Total Cover:					
Remarks: (Include photo numbers here or on separate sheet. If observed, list morphological adaptations below.)					

Wetland Determination – Atlantic and Gulf Coast Plain Region, Page 3 of 3

THIRD ROCK CONSULTANTS, LLC
WETLAND DETERMINATION - ATLANTIC AND GULF COAST PLAIN REGION

Project Name: US 60 Improvements Project No: KY18-005 Date: 2/14/19
 Applicant/Owner: QK4 State: KY Site ID: Wetland I
 Investigator(s): James Storm and Ryan McGregor City, County, Range: Kevil, Ballard
 Landform (hillslope, terrace, etc.): Toe of berm Local Relief (concave, convex, none): Concave Slope (%): < 1
 Subregion (LRR or MLRA): P/134 Lat: 37.085320 Long: -88.916488 Datum: _____
 Soil Map Unit Name: Grenada Silt Loam NWI Classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in remarks.)
 Are vegetation _____ soil _____ or hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____
 Are vegetation _____ soil _____ or hydrology _____ naturally problematic? (If needed, explain any answers in "Remarks.")

SUMMARY OF FINDINGS

Hydrophytic Vegetation Present?	Yes <u>✓</u>	No _____	
Hydric Soil Present?	Yes <u>✓</u>	No _____	
Wetland Hydrology Present?	Yes <u>✓</u>	No _____	Is the sampled area within a wetland? Yes <u>✓</u> No _____

Remarks:

WETLAND HYDROLOGY INDICATORS

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply)		Secondary Indicators (minimum of two required)
<input checked="" type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)
<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15) (LRR U)	<input checked="" type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Moss Trim Lines (B16)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Dry-Season Water Table (C2)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input checked="" type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input checked="" type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)
		<input type="checkbox"/> FAC-Neutral Test (D5)
		<input type="checkbox"/> Sphagnum Moss (D8) (LRR T, U)

Field Observations:

Surface Water Present?	Yes <u>✓</u>	No _____	Depth (inches): <u>6</u>	
Water Table Present?	Yes _____	No <u>✓</u>	Depth (inches): _____	
Saturation Present: (includes capillary fringe)	Yes <u>✓</u>	No _____	Depth (inches): <u>0</u>	Wetland Hydrology Present? Yes <u>✓</u> No _____

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Forested, isolated.

VEGETATION (Four Strata) – Use scientific names of plants.

Tree Stratum (Plot Size: 30)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test Worksheet:	
1. Liquidambar styraciflua	30	✓	FAC	No. of dominant species that are OBL, FACW, or FAC:	4 (A)
2. Celtis occidentalis	5		FACU	Total No. of dominant species across all strata:	4 (B)
3. Acer rubrum	20	✓	FAC	% of dominant species that Are OBL, FACW, or FAC	100 (A/B)
4.					
5.					
6.					
8.					
55 = Total Cover 50 % of Total Cover: 27.5 20% of Total Cover: 11				Prevalence Index Worksheet	
Sapling/Shrub Stratum (Plot size: 15)				Total % Cover of: Multiply By:	
1. Acer rubrum	10	✓	FAC	OBL Species	X 1 =
2.				FACW Species	8 X 2 = 16
3.				FAC Species	60 X 3 = 180
4.				FACU Species	5 X 4 = 20
5.				UPL Species	X 5 =
6.				Totals (A)	73 (B) 216
7.				Prevalence Index = B/A or 2.96	
8.				Hydrophytic Vegetation Indicators:	
10 = Total Cover				1 Rapid Test for Hydrophytic Vegetation	
50 % of Total Cover: 5 20% of Total Cover: 2				✓ 2 Dominance Test is > 50%	
Herb Stratum (Plot size: 5)				✓ 3 Prevalence Index is ≤ 3.0 ¹	
1. symphyotrichum lanceolatum	8	✓	FACW	Problematic Hydrophytic Vegetation ¹ (Explain)	
2.				¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
3.				Definition of Four Vegetation Strata:	
4.				Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or More in diameter at breast height (DBH), regardless of Height.	
5.				Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft. (1 m) tall.	
6.				Herb – All herbaceous (non-woody) plants, regardless of Size, and woody plants less than 3.28 ft. tall.	
7.				Woody Vine – All woody vines greater than 3.28 ft. in height.	
8.					
9.					
10.					
11.					
12.					
8 = Total Cover					
50 % of Total Cover: 4 20% of Total Cover: 1.6					
Woody Vine Stratum (Plot size:)					
1.					
2.				Hydrophytic Vegetation Present? Yes ✓ No	
3.					
4.					
5.					
= Total Cover					
50 % of Total Cover: 20% of Total Cover:					
Remarks: (Include photo numbers here or on separate sheet. If observed, list morphological adaptations below.)					

Wetland Determination – Atlantic and Gulf Coast Plain Region, Page 3 of 3

THIRD ROCK CONSULTANTS, LLC
WETLAND DETERMINATION - ATLANTIC AND GULF COAST PLAIN REGION

Project Name: US 60 Improvements Project No: KY18-005 Date: 2/14/19
 Applicant/Owner: QK4 State: KY Site ID: Wetland I
 Investigator(s): James Storm and Ryan McGregor City, County, Range: Kevil, Ballard
 Landform (hillslope, terrace, etc.): Toe of berm Local Relief (concave, convex, none): Concave Slope (%): < 1
 Subregion (LRR or MLRA): P/134 Lat: 37.085367 Long: -88.917291 Datum: _____
 Soil Map Unit Name: Grenada Silt Loam NWI Classification: N/A
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in remarks.)
 Are vegetation _____ soil _____ or hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____
 Are vegetation _____ soil _____ or hydrology _____ naturally problematic? (If needed, explain any answers in "Remarks.")

SUMMARY OF FINDINGS

Hydrophytic Vegetation Present?	Yes <u>✓</u>	No _____	
Hydric Soil Present?	Yes <u>✓</u>	No _____	
Wetland Hydrology Present?	Yes <u>✓</u>	No _____	Is the sampled area within a wetland? Yes <u>✓</u> No _____

Remarks:

WETLAND HYDROLOGY INDICATORS

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply)		Secondary Indicators (minimum of two required)
<input checked="" type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)
<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15) (LRR U)	<input checked="" type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Moss Trim Lines (B16)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Dry-Season Water Table (C2)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input checked="" type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input checked="" type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)
		<input type="checkbox"/> FAC-Neutral Test (D5)
		<input type="checkbox"/> Sphagnum Moss (D8) (LRR T, U)

Field Observations:

Surface Water Present?	Yes <u>✓</u>	No _____	Depth (inches): <u>3</u>	
Water Table Present?	Yes _____	No <u>✓</u>	Depth (inches): _____	
Saturation Present: (includes capillary fringe)	Yes <u>✓</u>	No _____	Depth (inches): <u>0</u>	Wetland Hydrology Present? Yes <u>✓</u> No _____

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Forested, isolated. Wetland is connected to stream 21 but stream 21 doesn't have a downstream connection to another stream, therefore it is non-jurisdictional.

VEGETATION (Four Strata) – Use scientific names of plants.

Tree Stratum (Plot Size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Liquidambar styraciflua	40	✓	FAC
2. Acer rubrum	40	✓	FACU
3.			
4.			
5.			
6.			
8.			
80 = Total Cover 50 % of Total Cover: 40 20% of Total Cover: 16			
Sapling/Shrub Stratum (Plot size: 15)			
1. Acer rubrum	35	✓	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
35 = Total Cover 50 % of Total Cover: 17.5 20% of Total Cover: 7			
Herb Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover 50 % of Total Cover: 20% of Total Cover:			
Woody Vine Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
5.			
= Total Cover 50 % of Total Cover: 20% of Total Cover:			

Dominance Test Worksheet:

No. of dominant species that are OBL, FACW, or FAC: 3 (A)

Total No. of dominant species across all strata: 3 (B)

% of dominant species that Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of: 115 Multiply By: 3

OBL Species 115 X 1 = 115

FACW Species 115 X 2 = 230

FAC Species 115 X 3 = 345

FACU Species 115 X 4 = 460

UPL Species 115 X 5 = 575

Totals (A) 115 (B) 345

Prevalence Index = B/A or 3.0

Hydrophytic Vegetation Indicators:

1 Rapid Test for Hydrophytic Vegetation

✓ 2 Dominance Test is > 50%

✓ 3 Prevalence Index is ≤ 3.0¹

1 Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definition of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or More in diameter at breast height (DBH), regardless of Height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft. (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of Size, and woody plants less than 3.28 ft. tall.

Woody Vine – All woody vines greater than 3.28 ft. in height.

Hydrophytic Vegetation Present? Yes ✓ No

Remarks: (Include photo numbers here or on separate sheet. If observed, list morphological adaptations below.)

Wetland Determination – Atlantic and Gulf Coast Plain Region, Page 3 of 3

THIRD ROCK CONSULTANTS, LLC
WETLAND DETERMINATION - ATLANTIC AND GULF COAST PLAIN REGION

Project Name: US 60 Improvements Project No: KY18-005 Date: 2/14/19
 Applicant/Owner: QK4 State: KY Site ID: Wetland K
 Investigator(s): James Storm and Ryan McGregor City, County, Range: Kevil, Ballard
 Landform (hillslope, terrace, etc.): Toe of berm Local Relief (concave, convex, none): Concave Slope (%): < 1
 Subregion (LRR or MLRA): P/134 Lat: 37.085310 Long: -88.913949 Datum: _____
 Soil Map Unit Name: Grenada Silt Loam NWI Classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in remarks.)
 Are vegetation _____ soil _____ or hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____
 Are vegetation _____ soil _____ or hydrology _____ naturally problematic? (If needed, explain any answers in "Remarks.")

SUMMARY OF FINDINGS

Hydrophytic Vegetation Present?	Yes <u>✓</u>	No _____	
Hydric Soil Present?	Yes <u>✓</u>	No _____	
Wetland Hydrology Present?	Yes <u>✓</u>	No _____	Is the sampled area within a wetland? Yes <u>✓</u> No _____

Remarks:

WETLAND HYDROLOGY INDICATORS

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply)		Secondary Indicators (minimum of two required)
<input checked="" type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)
<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15) (LRR U)	<input type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Moss Trim Lines (B16)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Dry-Season Water Table (C2)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input checked="" type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)
		<input checked="" type="checkbox"/> FAC-Neutral Test (D5)
		<input type="checkbox"/> Sphagnum Moss (D8) (LRR T, U)

Field Observations:

Surface Water Present?	Yes <u>✓</u>	No _____	Depth (inches): <u>3</u>	
Water Table Present?	Yes _____	No <u>✓</u>	Depth (inches): _____	
Saturation Present: (includes capillary fringe)	Yes <u>✓</u>	No _____	Depth (inches): <u>0</u>	Wetland Hydrology Present? Yes <u>✓</u> No _____

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Forested, isolated.

VEGETATION (Four Strata) – Use scientific names of plants.

Tree Stratum (Plot Size: 30)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	25	✓	FAC
2.			
3.			
4.			
5.			
6.			
8.			
25 = Total Cover 50 % of Total Cover: 12.5 20% of Total Cover: 5			
Sapling/Shrub Stratum (Plot size: 15)			
1. Acer rubrum	5	✓	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
5 = Total Cover 50 % of Total Cover: 2.5 20% of Total Cover: 1			
Herb Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover 50 % of Total Cover: 20% of Total Cover:			
Woody Vine Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
5.			
= Total Cover 50 % of Total Cover: 20% of Total Cover:			

Dominance Test Worksheet:

No. of dominant species that are OBL, FACW, or FAC: 2 (A)

Total No. of dominant species across all strata: 2 (B)

% of dominant species that Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of: 25 Multiply By: 3

OBL Species 0 X 1 = 0

FACW Species 0 X 2 = 0

FAC Species 30 X 3 = 90

FACU Species 0 X 4 = 0

UPL Species 0 X 5 = 0

Totals (A) 30 (B) 90

Prevalence Index = B/A or 3.0

Hydrophytic Vegetation Indicators:

0 1 Rapid Test for Hydrophytic Vegetation

✓ 2 Dominance Test is > 50%

✓ 3 Prevalence Index is ≤ 3.0¹

0 Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definition of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or More in diameter at breast height (DBH), regardless of Height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft. (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of Size, and woody plants less than 3.28 ft. tall.

Woody Vine – All woody vines greater than 3.28 ft. in height.

Hydrophytic Vegetation Present? Yes ✓ No 0

Remarks: (Include photo numbers here or on separate sheet. If observed, list morphological adaptations below.)

Wetland Determination – Atlantic and Gulf Coast Plain Region, Page 3 of 3

THIRD ROCK CONSULTANTS, LLC
WETLAND DETERMINATION - ATLANTIC AND GULF COAST PLAIN REGION

Project Name: US 60 Improvements Project No: KY18-005 Date: 2/14/19
 Applicant/Owner: QK4 State: KY Site ID: Wetland L
 Investigator(s): James Storm and Ryan McGregor City, County, Range: Kevil, Ballard
 Landform (hillslope, terrace, etc.): Toe of berm Local Relief (concave, convex, none): Concave Slope (%): < 1
 Subregion (LRR or MLRA): P/134 Lat: 37.085310 Long: -88.913949 Datum: _____
 Soil Map Unit Name: Loring-Purchase Complex and Falaya-Collins Complex NWI Classification: N/A
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in remarks.)
 Are vegetation _____ soil _____ or hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____
 Are vegetation _____ soil _____ or hydrology _____ naturally problematic? (If needed, explain any answers in "Remarks.")

SUMMARY OF FINDINGS

Hydrophytic Vegetation Present?	Yes <u>✓</u>	No _____	
Hydric Soil Present?	Yes <u>✓</u>	No _____	
Wetland Hydrology Present?	Yes <u>✓</u>	No _____	Is the sampled area within a wetland? Yes <u>✓</u> No _____
Remarks:			

WETLAND HYDROLOGY INDICATORS

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply) <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <input checked="" type="checkbox"/> Surface Water (A1) <input type="checkbox"/> High Water Table (A2) <input checked="" type="checkbox"/> Saturation (A3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Iron Deposits (B5) <input checked="" type="checkbox"/> Inundation Visible on Aerial Imagery (B7) </td> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13) <input type="checkbox"/> Marl Deposits (B15) (LRR U) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Other (Explain in Remarks) </td> </tr> </table>				<input checked="" type="checkbox"/> Surface Water (A1) <input type="checkbox"/> High Water Table (A2) <input checked="" type="checkbox"/> Saturation (A3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Iron Deposits (B5) <input checked="" type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13) <input type="checkbox"/> Marl Deposits (B15) (LRR U) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Other (Explain in Remarks)	Secondary Indicators (minimum of two required) <table style="width: 100%; border: none;"> <tr><td><input type="checkbox"/> Surface Soil Cracks (B6)</td></tr> <tr><td><input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)</td></tr> <tr><td><input type="checkbox"/> Drainage Patterns (B10)</td></tr> <tr><td><input type="checkbox"/> Moss Trim Lines (B16)</td></tr> <tr><td><input type="checkbox"/> Dry-Season Water Table (C2)</td></tr> <tr><td><input checked="" type="checkbox"/> Crayfish Burrows (C8)</td></tr> <tr><td><input checked="" type="checkbox"/> Saturation Visible on Aerial Imagery (C9)</td></tr> <tr><td><input checked="" type="checkbox"/> Geomorphic Position (D2)</td></tr> <tr><td><input type="checkbox"/> Shallow Aquitard (D3)</td></tr> <tr><td><input checked="" type="checkbox"/> FAC-Neutral Test (D5)</td></tr> <tr><td><input type="checkbox"/> Sphagnum Moss (D8) (LRR T, U)</td></tr> </table>		<input type="checkbox"/> Surface Soil Cracks (B6)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)	<input type="checkbox"/> Drainage Patterns (B10)	<input type="checkbox"/> Moss Trim Lines (B16)	<input type="checkbox"/> Dry-Season Water Table (C2)	<input checked="" type="checkbox"/> Crayfish Burrows (C8)	<input checked="" type="checkbox"/> Saturation Visible on Aerial Imagery (C9)	<input checked="" type="checkbox"/> Geomorphic Position (D2)	<input type="checkbox"/> Shallow Aquitard (D3)	<input checked="" type="checkbox"/> FAC-Neutral Test (D5)	<input type="checkbox"/> Sphagnum Moss (D8) (LRR T, U)
<input checked="" type="checkbox"/> Surface Water (A1) <input type="checkbox"/> High Water Table (A2) <input checked="" type="checkbox"/> Saturation (A3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Iron Deposits (B5) <input checked="" type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13) <input type="checkbox"/> Marl Deposits (B15) (LRR U) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Other (Explain in Remarks)																	
<input type="checkbox"/> Surface Soil Cracks (B6)																		
<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)																		
<input type="checkbox"/> Drainage Patterns (B10)																		
<input type="checkbox"/> Moss Trim Lines (B16)																		
<input type="checkbox"/> Dry-Season Water Table (C2)																		
<input checked="" type="checkbox"/> Crayfish Burrows (C8)																		
<input checked="" type="checkbox"/> Saturation Visible on Aerial Imagery (C9)																		
<input checked="" type="checkbox"/> Geomorphic Position (D2)																		
<input type="checkbox"/> Shallow Aquitard (D3)																		
<input checked="" type="checkbox"/> FAC-Neutral Test (D5)																		
<input type="checkbox"/> Sphagnum Moss (D8) (LRR T, U)																		
Field Observations: Surface Water Present? Yes <u>✓</u> No _____ Depth (inches): <u>6</u> Water Table Present? Yes _____ No <u>✓</u> Depth (inches): _____ Saturation Present: Yes <u>✓</u> No _____ Depth (inches): <u>0</u> Wetland Hydrology Present? Yes <u>✓</u> No _____ (includes capillary fringe)																		
Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:																		
Remarks: Forested, in 100 year floodplain of stream 16.																		

VEGETATION (Four Strata) – Use scientific names of plants.

Tree Stratum (Plot Size: 30)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test Worksheet: No. of dominant species that are OBL, FACW, or FAC: <u>4</u> (A) Total No. of dominant species across all strata: <u>4</u> (B) % of dominant species that Are OBL, FACW, or FAC <u>100</u> (A/B)
1. <i>Quercus michauxii</i>	30	✓	FACW	
2. <i>Acer rubrum</i>	40	✓	FAC	
3. <i>Platanus occidentalis</i>	25	✓	FACW	
4.				
5.				
6.				
8.				
_____ = Total Cover 50 % of Total Cover: <u>47.5</u> 20% of Total Cover: <u>19</u>				Prevalence Index Worksheet Total % Cover of: _____ Multiply By: _____ OBL Species _____ X 1 = _____ FACW Species <u>55</u> X 2 = <u>110</u> FAC Species <u>50</u> X 3 = <u>150</u> FACU Species _____ X 4 = _____ UPL Species _____ X 5 = _____ Totals (A) <u>105</u> (B) <u>260</u> Prevalence Index = B/A or <u>2.48</u>
Sapling/Shrub Stratum (Plot size: 15)				
1. <i>Acer rubrum</i>	10	✓	FAC	
2.				
3.				
4.				
5.				
6.				
_____ = Total Cover 50 % of Total Cover: <u>5</u> 20% of Total Cover: <u>2</u>				Hydrophytic Vegetation Indicators: _____ 1 Rapid Test for Hydrophytic Vegetation ✓ 2 Dominance Test is > 50% ✓ 3 Prevalence Index is ≤ 3.0 ¹ _____ Problematic Hydrophytic Vegetation ¹ (Explain)
Herb Stratum (Plot size: 5)				
1.				
2.				
3.				
4.				
5.				
6.				
_____ = Total Cover 50 % of Total Cover: _____ 20% of Total Cover: _____				Definition of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or More in diameter at breast height (DBH), regardless of Height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft. (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of Size, and woody plants less than 3.28 ft. tall. Woody Vine – All woody vines greater than 3.28 ft. in height.
Woody Vine Stratum (Plot size: 5)				
1.				
2.				
3.				
4.				
5.				
_____ = Total Cover 50 % of Total Cover: _____ 20% of Total Cover: _____				
Hydrophytic Vegetation Present? Yes <u>✓</u> No _____				
Remarks: (Include photo numbers here or on separate sheet. If observed, list morphological adaptations below.)				

Wetland Determination – Atlantic and Gulf Coast Plain Region, Page 3 of 3

THIRD ROCK CONSULTANTS, LLC
WETLAND DETERMINATION - ATLANTIC AND GULF COAST PLAIN REGION

Project Name: US 60 Improvements Project No: KY18-005 Date: 2/15/19
 Applicant/Owner: QK4 State: KY Site ID: Wetland M
 Investigator(s): James Storm and Ryan McGregor City, County, Range: Kevil, Ballard
 Landform (hillslope, terrace, etc.): Depression in berm Local Relief (concave, convex, none): Concave Slope (%): < 1
 Subregion (LRR or MLRA): P/134 Lat: 37.082629 Long: -88.938548 Datum: _____
 Soil Map Unit Name: Falaya-Collins Complex NWI Classification: N/A
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in remarks.)
 Are vegetation _____ soil _____ or hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____
 Are vegetation _____ soil _____ or hydrology _____ naturally problematic? (If needed, explain any answers in "Remarks.")

SUMMARY OF FINDINGS

Hydrophytic Vegetation Present?	Yes <u>✓</u>	No _____	
Hydric Soil Present?	Yes <u>✓</u>	No _____	
Wetland Hydrology Present?	Yes <u>✓</u>	No _____	Is the sampled area within a wetland? Yes <u>✓</u> No _____

Remarks:

WETLAND HYDROLOGY INDICATORS

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply)		Secondary Indicators (minimum of two required)
<input checked="" type="checkbox"/> Surface Water (A1)	<input checked="" type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)
<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15) (LRR U)	<input type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Moss Trim Lines (B16)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Dry-Season Water Table (C2)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input checked="" type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)
		<input checked="" type="checkbox"/> FAC-Neutral Test (D5)
		<input type="checkbox"/> Sphagnum Moss (D8) (LRR T, U)

Field Observations:

Surface Water Present?	Yes <u>✓</u>	No _____	Depth (inches): <u>4</u>	
Water Table Present?	Yes _____	No <u>✓</u>	Depth (inches): _____	
Saturation Present: (includes capillary fringe)	Yes <u>✓</u>	No _____	Depth (inches): <u>0</u>	Wetland Hydrology Present? Yes <u>✓</u> No _____

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Scrub/Shrub, vernal pool, isolated.

VEGETATION (Four Strata) – Use scientific names of plants.

Tree Stratum (Plot Size: 5)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
8.			
_____ = Total Cover 50 % of Total Cover: _____ 20% of Total Cover: _____ Sapling/Shrub Stratum (Plot size: 5)			
1. Acer negundo	5	✓	FAC
2. Ulmus americana	5	✓	FAC
3.			
4.			
5.			
6.			
7.			
8.			
_____ = Total Cover 50 % of Total Cover: _____ 20% of Total Cover: _____ Herb Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
_____ = Total Cover 50 % of Total Cover: _____ 20% of Total Cover: _____ Woody Vine Stratum (Plot size: 5)			
1.			
2.			
3.			
4.			
5.			
_____ = Total Cover 50 % of Total Cover: _____ 20% of Total Cover: _____			

Dominance Test Worksheet:

No. of dominant species that are OBL, FACW, or FAC: 2 (A)

Total No. of dominant species across all strata: 2 (B)

% of dominant species that Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet

Total % Cover of: _____ Multiply By: _____

OBL Species _____ X 1 = _____

FACW Species _____ X 2 = _____

FAC Species 10 X 3 = 30

FACU Species _____ X 4 = _____

UPL Species _____ X 5 = _____

Totals (A) 10 (B) 30

Prevalence Index = B/A or 3.0

Hydrophytic Vegetation Indicators:

_____ 1 Rapid Test for Hydrophytic Vegetation

✓ 2 Dominance Test is > 50%

✓ 3 Prevalence Index is ≤ 3.0¹

_____ Problematic Hydrophytic Vegetation¹ (Explain)

¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definition of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or More in diameter at breast height (DBH), regardless of Height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft. (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of Size, and woody plants less than 3.28 ft. tall.

Woody Vine – All woody vines greater than 3.28 ft. in height.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks: (Include photo numbers here or on separate sheet. If observed, list morphological adaptations below.)

SOIL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-14	2.5Y 6/2	70	10YR 5/6	30	C	M	Clay Loam	
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains					² Location: PL=Pore Lining, M=Matrix			
Hydric Soil Indicators:			Indicators for Problematic Hydric Soils ³ :					
<input type="checkbox"/>	Histosol (A1)		<input type="checkbox"/>	Polyvalue Below Surface (S8) (LRR S, T, U)			<input type="checkbox"/>	1 cm Muck (A9) (LRR O)
<input type="checkbox"/>	Histic Epipedon (A2)		<input type="checkbox"/>	Thin Dark Surface (S9) (LRR S, T, U)			<input type="checkbox"/>	2 cm Muck (A10) (LRR S)
<input type="checkbox"/>	Black Histic (A3)		<input type="checkbox"/>	Loamy Mucky Mineral (F1) (LRR O)			<input type="checkbox"/>	Reduced Vertic (F18)
<input type="checkbox"/>	Hydrogen Sulfide (A4)		<input type="checkbox"/>	Loamy Gleyed Matrix (F2)			<input type="checkbox"/>	(Outside MLRA 150A,B)
<input type="checkbox"/>	Stratified Layers (A5)		<input checked="" type="checkbox"/>	Depleted Matrix (F3)			<input type="checkbox"/>	Piedmont Floodplain Soils (F19)(LRR P,S,T)
<input type="checkbox"/>	Organic Bodies (A6) (LRR P, T, U)		<input type="checkbox"/>	Redox Dark Surface (F6)			<input type="checkbox"/>	Anomalous Bright Loamy Soils (F20)
<input type="checkbox"/>	5 cm Mucky Mineral (A7) (LRR P, T, U)		<input type="checkbox"/>	Depleted Dark Surface (F7)			<input type="checkbox"/>	(MLRA 153B)
<input type="checkbox"/>	Muck Presence (A8) (LRR U)		<input type="checkbox"/>	Redox Depressions (F8)			<input type="checkbox"/>	Red Parent Material (TF2)
<input type="checkbox"/>	1 cm Muck (A9) (LRR P, T)		<input type="checkbox"/>	Marl (F10) (LRR U)			<input type="checkbox"/>	Very Shallow Dark Surface (TF12)
<input type="checkbox"/>	Depleted Below Dark Surface (A11)		<input type="checkbox"/>	Depleted Ochric (F11) (MLRA 151)			<input type="checkbox"/>	Other (Explain in Remarks)
<input type="checkbox"/>	Thick Dark Surface (A12)		<input type="checkbox"/>	Iron-Manganese Masses (F12) (LRR O, P, T)			³ Indicators of hydrophytic vegetation and wetland hydrology must be present.	
<input type="checkbox"/>	Coast Prairie Redox (A16)(MLRA 150A)		<input type="checkbox"/>	Umbric Surface (F13) (LRR P, T, U)				
<input type="checkbox"/>	Sandy Mucky Mineral (S1) (LRR O, S)		<input type="checkbox"/>	Delta Ochric (F17) (MLRA 151)				
<input type="checkbox"/>	Sandy Gleyed Matrix (S4)		<input type="checkbox"/>	Reduced Vertic (F18) (MLRA 150A, 150B)				
<input type="checkbox"/>	Sandy Redox (S5)		<input type="checkbox"/>	Piedmont Floodplain Soils (F19) (MLRA 149A)				
<input type="checkbox"/>	Stripped Matrix (S6)		<input type="checkbox"/>	Anomalous Bright Loamy Soils (F20) (MLRA 149A, 153C, 153D)				
<input type="checkbox"/>	Dark Surface (S7) (LRR P, S, T, U)							
Restrictive Layer (if observed):								
Type: _____					Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>			
Depth (inches): _____								
Remarks:								

THIRD ROCK CONSULTANTS, LLC
WETLAND DETERMINATION - ATLANTIC AND GULF COAST PLAIN REGION

Project Name: US 60 Improvements Project No: KY18-005 Date: 2/15/19
 Applicant/Owner: QK4 State: KY Site ID: Wetland N
 Investigator(s): James Storm and Ryan McGregor City, County, Range: Kevil, Ballard
 Landform (hillslope, terrace, etc.): Toe of berm Local Relief (concave, convex, none): Concave Slope (%): < 1
 Subregion (LRR or MLRA): P/134 Lat: 37.081821 Long: -88.942038 Datum: _____
 Soil Map Unit Name: Waverly Silt Loam NWI Classification: N/A
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in remarks.)
 Are vegetation _____ soil _____ or hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____
 Are vegetation _____ soil _____ or hydrology _____ naturally problematic? (If needed, explain any answers in "Remarks.")

SUMMARY OF FINDINGS

Hydrophytic Vegetation Present?	Yes <u>✓</u>	No _____	
Hydric Soil Present?	Yes <u>✓</u>	No _____	
Wetland Hydrology Present?	Yes <u>✓</u>	No _____	Is the sampled area within a wetland? Yes <u>✓</u> No _____

Remarks:

WETLAND HYDROLOGY INDICATORS

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply)		Secondary Indicators (minimum of two required)
<input checked="" type="checkbox"/> Surface Water (A1)	<input checked="" type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)
<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15) (LRR U)	<input checked="" type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Moss Trim Lines (B16)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Dry-Season Water Table (C2)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input checked="" type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)
		<input checked="" type="checkbox"/> FAC-Neutral Test (D5)
		<input type="checkbox"/> Sphagnum Moss (D8) (LRR T, U)

Field Observations:

Surface Water Present?	Yes <u>✓</u>	No _____	Depth (inches): <u>4</u>	
Water Table Present?	Yes _____	No <u>✓</u>	Depth (inches): _____	
Saturation Present: (includes capillary fringe)	Yes <u>✓</u>	No _____	Depth (inches): <u>0</u>	Wetland Hydrology Present? Yes <u>✓</u> No _____

Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Forested, Connected to jurisdictional stream S25 .

VEGETATION (Four Strata) – Use scientific names of plants.

Tree Stratum (Plot Size: 15)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test Worksheet: No. of dominant species that are OBL, FACW, or FAC: <u>4</u> (A) Total No. of dominant species across all strata: <u>4</u> (B) % of dominant species that Are OBL, FACW, or FAC: <u>100</u> (A/B) Prevalence Index Worksheet Total % Cover of: _____ Multiply By: _____ OBL Species _____ X 1 = _____ FACW Species _____ X 2 = _____ FAC Species <u>45</u> X 3 = <u>135</u> FACU Species _____ X 4 = _____ UPL Species _____ X 5 = _____ Totals (A) <u>45</u> (B) <u>135</u> Prevalence Index = B/A or <u>3.0</u>
1. Liquidambar styraciflua	20	✓	FAC	
2.				
3.				
4.				
5.				
6.				
8.				
_____ = Total Cover 50 % of Total Cover: <u>10</u> 20% of Total Cover: <u>4</u> Sapling/Shrub Stratum (Plot size: 15)				
1. Acer rubrum	15	✓	FAC	
2. Acer negundo	5	✓	FAC	
3. Ulmus americana	5	✓	FAC	
4.				
5.				
6.				
7.				
8.				
_____ = Total Cover 50 % of Total Cover: <u>12.5</u> 20% of Total Cover: <u>5</u> Herb Stratum (Plot size:)				
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
_____ = Total Cover 50 % of Total Cover: _____ 20% of Total Cover: _____ Woody Vine Stratum (Plot size:)				
1.				
2.				
3.				
4.				
5.				
_____ = Total Cover 50 % of Total Cover: _____ 20% of Total Cover: _____				
Remarks: (Include photo numbers here or on separate sheet. If observed, list morphological adaptations below.)				Hydrophytic Vegetation Indicators: _____ 1 Rapid Test for Hydrophytic Vegetation ✓ 2 Dominance Test is > 50% ✓ 3 Prevalence Index is ≤ 3.0 ¹ _____ Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic. Definition of Four Vegetation Strata: Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or More in diameter at breast height (DBH), regardless of Height. Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft. (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of Size, and woody plants less than 3.28 ft. tall. Woody Vine – All woody vines greater than 3.28 ft. in height. Hydrophytic Vegetation Present? Yes <u>✓</u> No _____

Wetland Determination – Atlantic and Gulf Coast Plain Region, Page 3 of 3

THIRD ROCK CONSULTANTS, LLC
WETLAND DETERMINATION - ATLANTIC AND GULF COAST PLAIN REGION

Project Name: US 60 Improvements Project No: KY18-005 Date: 2/15/19
 Applicant/Owner: QK4 State: KY Site ID: Wetland O
 Investigator(s): James Storm and Ryan McGregor City, County, Range: Kevil, Ballard
 Landform (hillslope, terrace, etc.): Floodplain Local Relief (concave, convex, none): Flat Slope (%): < 1
 Subregion (LRR or MLRA): P/134 Lat: 37.081863 Long: -88.942623 Datum: _____
 Soil Map Unit Name: Grenada Silt Loam NWI Classification: N/A
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in remarks.)
 Are vegetation _____ soil _____ or hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____
 Are vegetation _____ soil _____ or hydrology _____ naturally problematic? (If needed, explain any answers in "Remarks.")

SUMMARY OF FINDINGS

Hydrophytic Vegetation Present?	Yes <u>✓</u>	No _____	
Hydric Soil Present?	Yes <u>✓</u>	No _____	
Wetland Hydrology Present?	Yes <u>✓</u>	No _____	Is the sampled area within a wetland? Yes <u>✓</u> No _____
Remarks:			

WETLAND HYDROLOGY INDICATORS

<p>Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply)</p> <table style="width: 100%;"> <tr> <td><input type="checkbox"/> Surface Water (A1)</td> <td><input type="checkbox"/> Water-Stained Leaves (B9)</td> </tr> <tr> <td><input type="checkbox"/> High Water Table (A2)</td> <td><input type="checkbox"/> Aquatic Fauna (B13)</td> </tr> <tr> <td><input checked="" type="checkbox"/> Saturation (A3)</td> <td><input type="checkbox"/> Marl Deposits (B15) (LRR U)</td> </tr> <tr> <td><input type="checkbox"/> Water Marks (B1)</td> <td><input type="checkbox"/> Hydrogen Sulfide Odor (C1)</td> </tr> <tr> <td><input type="checkbox"/> Sediment Deposits (B2)</td> <td><input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)</td> </tr> <tr> <td><input type="checkbox"/> Drift Deposits (B3)</td> <td><input type="checkbox"/> Presence of Reduced Iron (C4)</td> </tr> <tr> <td><input type="checkbox"/> Algal Mat or Crust (B4)</td> <td><input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)</td> </tr> <tr> <td><input type="checkbox"/> Iron Deposits (B5)</td> <td><input type="checkbox"/> Thin Muck Surface (C7)</td> </tr> <tr> <td><input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)</td> <td><input type="checkbox"/> Other (Explain in Remarks)</td> </tr> </table>	<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15) (LRR U)	<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Sediment Deposits (B2)	<input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<p>Secondary Indicators (minimum of two required)</p> <table style="width: 100%;"> <tr><td><input type="checkbox"/> Surface Soil Cracks (B6)</td></tr> <tr><td><input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)</td></tr> <tr><td><input type="checkbox"/> Drainage Patterns (B10)</td></tr> <tr><td><input type="checkbox"/> Moss Trim Lines (B16)</td></tr> <tr><td><input type="checkbox"/> Dry-Season Water Table (C2)</td></tr> <tr><td><input checked="" type="checkbox"/> Crayfish Burrows (C8)</td></tr> <tr><td><input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)</td></tr> <tr><td><input checked="" type="checkbox"/> Geomorphic Position (D2)</td></tr> <tr><td><input type="checkbox"/> Shallow Aquitard (D3)</td></tr> <tr><td><input checked="" type="checkbox"/> FAC-Neutral Test (D5)</td></tr> <tr><td><input type="checkbox"/> Sphagnum Moss (D8) (LRR T, U)</td></tr> </table>	<input type="checkbox"/> Surface Soil Cracks (B6)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)	<input type="checkbox"/> Drainage Patterns (B10)	<input type="checkbox"/> Moss Trim Lines (B16)	<input type="checkbox"/> Dry-Season Water Table (C2)	<input checked="" type="checkbox"/> Crayfish Burrows (C8)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)	<input checked="" type="checkbox"/> Geomorphic Position (D2)	<input type="checkbox"/> Shallow Aquitard (D3)	<input checked="" type="checkbox"/> FAC-Neutral Test (D5)	<input type="checkbox"/> Sphagnum Moss (D8) (LRR T, U)
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)																													
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)																													
<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15) (LRR U)																													
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)																													
<input type="checkbox"/> Sediment Deposits (B2)	<input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)																													
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)																													
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)																													
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)																													
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)																													
<input type="checkbox"/> Surface Soil Cracks (B6)																														
<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)																														
<input type="checkbox"/> Drainage Patterns (B10)																														
<input type="checkbox"/> Moss Trim Lines (B16)																														
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<input checked="" type="checkbox"/> Geomorphic Position (D2)																														
<input type="checkbox"/> Shallow Aquitard (D3)																														
<input checked="" type="checkbox"/> FAC-Neutral Test (D5)																														
<input type="checkbox"/> Sphagnum Moss (D8) (LRR T, U)																														
<p>Field Observations:</p> <table style="width: 100%;"> <tr> <td>Surface Water Present?</td> <td>Yes _____ No <u>✓</u></td> <td>Depth (inches): _____</td> </tr> <tr> <td>Water Table Present?</td> <td>Yes _____ No <u>✓</u></td> <td>Depth (inches): _____</td> </tr> <tr> <td>Saturation Present: (includes capillary fringe)</td> <td>Yes <u>✓</u> No _____</td> <td>Depth (inches): _____</td> </tr> </table> <p style="text-align: right;">Wetland Hydrology Present? Yes <u>✓</u> No _____</p>		Surface Water Present?	Yes _____ No <u>✓</u>	Depth (inches): _____	Water Table Present?	Yes _____ No <u>✓</u>	Depth (inches): _____	Saturation Present: (includes capillary fringe)	Yes <u>✓</u> No _____	Depth (inches): _____																				
Surface Water Present?	Yes _____ No <u>✓</u>	Depth (inches): _____																												
Water Table Present?	Yes _____ No <u>✓</u>	Depth (inches): _____																												
Saturation Present: (includes capillary fringe)	Yes <u>✓</u> No _____	Depth (inches): _____																												
Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:																														
Remarks: Forested, located within the 100 year floodplain of S26.																														

VEGETATION (Four Strata) – Use scientific names of plants.

Tree Stratum (Plot Size: 30)	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test Worksheet:	
1. Fraxinus pennsylvanica	45	✓	FACW	No. of dominant species that are OBL, FACW, or FAC:	3 (A)
2. - Acer negundo	5		FAC	Total No. of dominant species across all strata:	3 (B)
3.				% of dominant species that Are OBL, FACW, or FAC	100 (A/B)
4.				Prevalence Index Worksheet	
5.				Total % Cover of: _____ Multiply By: _____	
6.				OBL Species	_____ X 1 = _____
8.				FACW Species	50 X 2 = 100
50 = Total Cover 50 % of Total Cover: 25 20 % of Total Cover: 10				FAC Species	15 X 3 = 45
Sapling/Shrub Stratum (Plot size: 15)				FACU Species	_____ X 4 = _____
1. Acer negundo	10	✓	FAC	UPL Species	_____ X 5 = _____
2.				Totals (A)	65 (B) 145
3.				Prevalence Index = B/A or 2.23	
4.				Hydrophytic Vegetation Indicators:	
5.				_____ 1 Rapid Test for Hydrophytic Vegetation	
6.				✓ 2 Dominance Test is > 50%	
7.				✓ 3 Prevalence Index is ≤ 3.0 ¹	
8.				_____ Problematic Hydrophytic Vegetation ¹ (Explain)	
10 = Total Cover 50 % of Total Cover: 5 20 % of Total Cover: 2				¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.	
Herb Stratum (Plot size: 5)				Definition of Four Vegetation Strata:	
1. symphyotrichum lanceolatum	5	✓	FACW	Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or More in diameter at breast height (DBH), regardless of Height.	
2.				Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft. (1 m) tall.	
3.				Herb – All herbaceous (non-woody) plants, regardless of Size, and woody plants less than 3.28 ft. tall.	
4.				Woody Vine – All woody vines greater than 3.28 ft. in height.	
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
5 = Total Cover 50 % of Total Cover: 2.5 20 % of Total Cover: 1				Hydrophytic Vegetation Present? Yes ✓ No _____	
Woody Vine Stratum (Plot size: 5)					
1.					
2.					
3.					
4.					
5.					
_____ = Total Cover 50 % of Total Cover: _____ 20 % of Total Cover: _____					
Remarks: (Include photo numbers here or on separate sheet. If observed, list morphological adaptations below.)					

SOIL

[illegible]

APPENDIX F

RESULTS AND DATA SETS

Third Rock Consultants, LLC
Benthic Macroinvertebrate Bench Sheet

Third Rock ID:	KY18-005
Water Body:	US60
Sample ID:	Station 1 QT
Collector:	RM
Sorter:	Tammie Fister
Taxonomist:	Bert Remley

Client Name:	QK4
State/County:	KY / Ballard / McCrackin
Collection Date:	5/29/2018
Sampling Method:	MH (20 Jab DipNet)
Sample Sorting:	Subsample
No. Grids of 30 Picked:	9
No. Organisms Picked:	300

[illegible]

Third Rock Consultants, LLC
Benthic Macroinvertebrate Bench Sheet

Third Rock ID:	KY18-005
Water Body:	US60
Sample ID:	Station 2 QT
Collector:	BR, RM
Sorter:	Tammie Fister
Taxonomist:	Bert Remley

Client Name:	QK4
State/County:	KY / Ballard / McCrackin
Collection Date:	5/29/2018
Sampling Method:	MH (20 Jab DipNet)
Sample Sorting:	Subsample
No. Grids of 30 Picked:	4
No. Organisms Picked:	311

[illegible]

Third Rock Consultants, LLC
Benthic Macroinvertebrate Bench Sheet

Third Rock ID:	KY18-005
Water Body:	US60
Sample ID:	Station 3 QT
Collector:	BR, RM
Sorter:	Tammie Fister
Taxonomist:	Bert Remley

Client Name:	QK4
State/County:	KY / Ballard / McCrackin
Collection Date:	5/29/2018
Sampling Method:	MH (20 Jab DipNet)
Sample Sorting:	Subsample
No. Grids of 30 Picked:	4
No. Organisms Picked:	298

[illegible]

Third Rock Consultants, LLC
Benthic Macroinvertebrate Bench Sheet

Third Rock ID:	KY18-005
Water Body:	US60
Sample ID:	Station 4 QT
Collector:	BR, RM
Sorter:	Tammie Fister
Taxonomist:	Bert Remley

Client Name:	QK4
State/County:	KY / Ballard / McCrackin
Collection Date:	5/29/2018
Sampling Method:	MH (20 Jab DipNet)
Sample Sorting:	Subsample
No. Grids of 30 Picked:	15
No. Organisms Picked:	299

Family or Taxon / Genus	No. Orgs.	Family or Taxon / Genus	No. Orgs.	Family or Taxon / Genus	No. Orgs.
ANNELIDA		PLECOPTERA		DIPTERA (CHIRONOMIDAE)	
Naididae (Immature)	1			Chironomus riparius gr	3
				Chironomus decorus gr	27
				Larsia sp	18
				Limnophyes sp	36
AMPHIPODA				Micropsectra sp	30
Crangonyx sp	4			Parametriocnemus sp	6
				Paraphaenocladius sp	4
				Paratendipes albimanus	6
ISOPODA				Phaenopsectra flavipes	3
Lirceus fontinalis	7			Polydora illinoense gr	15
DECAPODA					
		TRICHOPTERA			
EPEMEROPTERA					
				DIPTERA (OTHER)	
				Anopheles sp	1
				Culex sp	4
				Limonia sp	1
				Muscidae (Immature)	9
				Nemotelus sp	1
				Pericoma sp	15
				Sciomyzidae	4
				Tipula sp (Damaged)	1
		MEGALOPTERA		Tipulidae (Immature)	2
				MOLLUSCA	
ODONATA				Physella sp	100
		COLEOPTERA			
		Agabus (A) 1	1		
		Hydrochara (L) 1	1		
				OTHER TAXA	
				Pyralidae (Immature)	1
				Number of Individuals	301

2018 US 60 Macroinvertebrate Results
KY18-005

Sample ID	Taxa Name	Class	Order	Family	FFG	Tolerance	Clinger	Count
Station 1 QT	Chironomus decorus gr	Insecta	Diptera	Chironomidae	CG	9.6	FALSE	28
Station 1 QT	Dicrotendipes neomodestus	Insecta	Diptera	Chironomidae	CG	8.1	FALSE	16
Station 1 QT	Ablabesmyia sp	Insecta	Diptera	Chironomidae	PR	7.2	FALSE	4
Station 1 QT	Acerpenna sp	Insecta	Ephemeroptera	Baetidae	CG	5	FALSE	2
Station 1 QT	Procladius sp	Insecta	Diptera	Chironomidae	PR	9.1	FALSE	44
Station 1 QT	Polypedilum fallax gr	Insecta	Diptera	Chironomidae	SH	6.39	FALSE	4
Station 1 QT	Phaenopsectra flavipes	Insecta	Diptera	Chironomidae	SC	7.94	FALSE	20
Station 1 QT	Phaenopsectra obediens gp	Insecta	Diptera	Chironomidae	SC	6.8	FALSE	12
Station 1 QT	Paratendipes albimanus	Insecta	Diptera	Chironomidae	CG	9.2	TRUE	24
Station 1 QT	Tanytarsus sp	Insecta	Diptera	Chironomidae	CF	6.7	FALSE	12
Station 1 QT	Polypedilum illinoense gr	Insecta	Diptera	Chironomidae	SH	9	FALSE	64
Station 1 QT	Thienemanniella xena	Insecta	Diptera	Chironomidae	CG	5.9	FALSE	8
Station 1 QT	Parachironomus carinatus	Insecta	Diptera	Chironomidae	CG	9.42	FALSE	12
Station 1 QT	Gyraulus sp	Mollusca	Lymnophila	Planorbidae	SC	7.5	FALSE	2
Station 1 QT	Tanypus sp	Insecta	Diptera	Chironomidae	PR	9.19	FALSE	8
Station 1 QT	Limnophyes sp	Insecta	Diptera	Chironomidae	CG	7	FALSE	4
Station 1 QT	Physella sp	Mollusca	Basommatophora	Physidae	SC	8.84	FALSE	9
Station 1 QT	Pericoma sp	Insecta	Diptera	Psychodidae	CG	10	FALSE	3
Station 1 QT	Anopheles sp	Insecta	Diptera	Culicidae	CF	8.58	FALSE	2
Station 1 QT	Corixidae	Insecta	Hemiptera	Corixidae	PH	9	FALSE	1
Station 1 QT	Stenelmis sp	Insecta	Coleoptera	Elmidae	SC	5.1	TRUE	1
Station 1 QT	Argia sp	Insecta	Odonata	Coenagrionidae	PR	8.17	FALSE	1
Station 1 QT	Coenagrionidae	Insecta	Odonata	Coenagrionidae	PR	9	FALSE	1
Station 1 QT	Stenelmis sp	Insecta	Coleoptera	Elmidae	SC	5.1	TRUE	2
Station 1 QT	Hydrophilidae	Insecta	Coleoptera	Hydrophilidae	PR	6.3	FALSE	2
Station 1 QT	Cheumatopsyche sp	Insecta	Trichoptera	Hydropsychidae	CF	6.22	TRUE	5
Station 2 QT	Chironomus decorus gr	Insecta	Diptera	Chironomidae	CG	9.6	FALSE	28
Station 2 QT	Dicrotendipes neomodestus	Insecta	Diptera	Chironomidae	CG	8.1	FALSE	8
Station 2 QT	Phaenopsectra flavipes	Insecta	Diptera	Chironomidae	SC	7.94	FALSE	4
Station 2 QT	Polypedilum illinoense gr	Insecta	Diptera	Chironomidae	SH	9	FALSE	80
Station 2 QT	Limnophyes sp	Insecta	Diptera	Chironomidae	CG	7	FALSE	8
Station 2 QT	Larsia sp	Insecta	Diptera	Chironomidae	PR	9.3	FALSE	8
Station 2 QT	Simulium sp	Insecta	Diptera	Simuliidae	CF	4.4	TRUE	27
Station 2 QT	Thienemanniella xena	Insecta	Diptera	Chironomidae	CG	5.9	FALSE	4
Station 2 QT	Cricotopus bicinctus	Insecta	Diptera	Chironomidae	SH	8.54	FALSE	24
Station 2 QT	Ablabesmyia mallochi	Insecta	Diptera	Chironomidae	PR	7.19	FALSE	4
Station 2 QT	Caenis diminuta gr	Insecta	Ephemeroptera	Caenidae	CG	7.4	FALSE	1
Station 2 QT	Tropisternus sp	Insecta	Coleoptera	Hydrophilidae	CG	9.68	FALSE	1
Station 2 QT	Culex sp	Insecta	Diptera	Culicidae	CF	10	FALSE	1
Station 2 QT	Muscidae	Insecta	Diptera	Muscidae	PR	8	FALSE	1
Station 2 QT	Corixidae	Insecta	Hemiptera	Corixidae	PH	9	FALSE	1
Station 2 QT	Pericoma sp	Insecta	Diptera	Psychodidae	CG	10	FALSE	59
Station 2 QT	Physella sp	Mollusca	Basommatophora	Physidae	SC	8.84	FALSE	7
Station 2 QT	Rheocricotopus robacki	Insecta	Diptera	Chironomidae	CG	7.28	FALSE	28
Station 2 QT	Sciomyzidae	Insecta	Diptera	Sciomyzidae	PR	6	FALSE	2
Station 3 QT	Chironomus decorus gr	Insecta	Diptera	Chironomidae	CG	9.6	FALSE	15
Station 3 QT	Caecidotea sp	Malacostraca	Isopoda	Asellidae	CG	9.11	FALSE	15
Station 3 QT	Caenis sp	Insecta	Ephemeroptera	Caenidae	CG	7.41	FALSE	1
Station 3 QT	Dicrotendipes neomodestus	Insecta	Diptera	Chironomidae	CG	8.1	FALSE	35
Station 3 QT	Limnophyes sp	Insecta	Diptera	Chironomidae	CG	7	FALSE	15
Station 3 QT	Thienemanniella xena	Insecta	Diptera	Chironomidae	CG	5.9	FALSE	5
Station 3 QT	Nanocladius distinctus	Insecta	Diptera	Chironomidae	CG	7.2	FALSE	5
Station 3 QT	Cricotopus sylvestris gr	Insecta	Diptera	Chironomidae	SH	10	FALSE	10

2018 US 60 Macroinvertebrate Results
KY18-005

Sample ID	Taxa Name	Class	Order	Family	FFG	Tolerance	Clinger	Count
Station 3 QT	Cricotopus bicinctus	Insecta	Diptera	Chironomidae	SH	8.54	FALSE	55
Station 3 QT	Paratanytarsus sp	Insecta	Diptera	Chironomidae	CG	8.45	TRUE	5
Station 3 QT	Sciomyzidae	Insecta	Diptera	Sciomyzidae	PR	6	FALSE	1
Station 3 QT	Polypedilum illinoense gr	Insecta	Diptera	Chironomidae	SH	9	FALSE	120
Station 3 QT	Tanytarsus sp	Insecta	Diptera	Chironomidae	CF	6.7	FALSE	5
Station 3 QT	Pericoma sp	Insecta	Diptera	Psychodidae	CG	10	FALSE	4
Station 3 QT	Physella sp	Mollusca	Basommatophora	Physidae	SC	8.84	FALSE	2
Station 3 QT	Muscidae	Insecta	Diptera	Muscidae	PR	8	FALSE	2
Station 3 QT	Peltodytes sp	Insecta	Coleoptera	Haliplidae	PH	8.73	FALSE	1
Station 3 QT	Tropisternus sp	Insecta	Coleoptera	Hydrophilidae	CG	9.68	FALSE	1
Station 3 QT	Hydrophilidae	Insecta	Coleoptera	Hydrophilidae	PR	6.3	FALSE	5
Station 3 QT	Rheotanytarsus exiguus gr	Insecta	Diptera	Chironomidae	CF	6.4	TRUE	10
Station 4 QT	Physella sp	Mollusca	Basommatophora	Physidae	SC	8.84	FALSE	100
Station 4 QT	Paratendipes albimanus	Insecta	Diptera	Chironomidae	CG	9.2	TRUE	6
Station 4 QT	Chironomus decorus gr	Insecta	Diptera	Chironomidae	CG	9.6	FALSE	27
Station 4 QT	Limnophyes sp	Insecta	Diptera	Chironomidae	CG	7	FALSE	36
Station 4 QT	Phaenopsectra flavipes	Insecta	Diptera	Chironomidae	SC	7.94	FALSE	3
Station 4 QT	Polypedilum illinoense gr	Insecta	Diptera	Chironomidae	SH	9	FALSE	15
Station 4 QT	Parametriocnemus sp	Insecta	Diptera	Chironomidae	CG	3.65	FALSE	6
Station 4 QT	Micropsectra sp	Insecta	Diptera	Chironomidae	CG	1.52	FALSE	30
Station 4 QT	Paraphaenocladus sp	Insecta	Diptera	Chironomidae	CG	7	FALSE	4
Station 4 QT	Naididae	Oligochaeta	Haplotaxida	Naididae	CG	9.1	FALSE	1
Station 4 QT	Pyrilidae	Insecta	Lepidoptera	Pyrilidae	SH	8	FALSE	1
Station 4 QT	Crangonyx sp	Malacostraca	Amphipoda	Crangonyctidae	SH	8	FALSE	4
Station 4 QT	Larsia sp	Insecta	Diptera	Chironomidae	PR	9.3	FALSE	18
Station 4 QT	Pericoma sp	Insecta	Diptera	Psychodidae	CG	10	FALSE	15
Station 4 QT	Tipulidae	Insecta	Diptera	Tipulidae		5	FALSE	2
Station 4 QT	Limonia sp	Insecta	Diptera	Tipulidae	SC	9.64	FALSE	1
Station 4 QT	Muscidae	Insecta	Diptera	Muscidae	PR	8	FALSE	9
Station 4 QT	Nemotelus sp	Insecta	Diptera	Stratiomyidae	CG	10	FALSE	1
Station 4 QT	Sciomyzidae	Insecta	Diptera	Sciomyzidae	PR	6	FALSE	4
Station 4 QT	Tipula sp	Insecta	Diptera	Tipulidae	SH	7.33	FALSE	1
Station 4 QT	Culex sp	Insecta	Diptera	Culicidae	CF	10	FALSE	4
Station 4 QT	Lirceus fontinalis	Malacostraca	Isopoda	Asellidae	CG	7.85	FALSE	7
Station 4 QT	Agabus sp	Insecta	Coleoptera	Dytiscidae	PR	8.9	FALSE	1
Station 4 QT	Hydrochara sp	Insecta	Coleoptera	Hydrophilidae	PR	8.3	FALSE	1
Station 4 QT	Chironomus riparius gr	Insecta	Diptera	Chironomidae	CG	9.6	FALSE	3
Station 4 QT	Anopheles sp	Insecta	Diptera	Culicidae	CF	8.58	FALSE	1

US 60 2018						STATION			
Species	FG	T	FH	SS	BG	Station 1	Station 2	Station 3	Station 4
<i>Camptostoma anomalum</i> , stoneroller			X			168	18	80	NA
<i>Semotilus atromaculatus</i> , creek chub	O	T		P		74	19	137	NA
<i>Erimyzon oblongus</i> , western creek chubsucker	I		X	P				26	NA
<i>Ameiurus natalis</i> , yellow bullhead	O	T	X			8	1		NA
<i>Aphredoderus sayanus</i> , Pirate Perch	I		X			1			NA
<i>Fundulus notatus</i> , blackstripe topminnow	I		X			18	16	52	NA
<i>Gambusia affinis</i> , mosquitofish		T	X				44	43	NA
<i>Lepomis</i> sp., Juvenile sunfish	I		X	P			68		NA
<i>Lepomis cyanellus</i> , green sunfish		T	X	P		8	55	1	NA
<i>L. macrochirus</i> , bluegill		T	X			4	6	2	NA
<i>Microtendipes punctulatus</i> , spotted bass	C		X			1		1	NA
<i>Etherostoma gracile</i> , slough darter	I							1	NA
US 60 2018						STATION			
Metrics						Station 1	Station 2	Station 3	Station 4
Native Species Richness						8	8	9	NA
Darter, Madtom, Sculpin Richness						0	0	1	NA
Intolerant Species Richness						0	0	0	NA
Simple Lithophile Species Richness						0	0	0	NA
Proportion of Insectivore Individuals						7	37	23	NA
Proportion of Facultative Headwater Individuals						74	92	60	NA
Proportion of Tolerant Individuals						33	55	53	NA
Proportion of Omnivore Individuals						29	9	40	NA
Number of Individuals						282	227	343	NA
Drainage Area (mi ²)						3	0.95	1.72	0.18
Sampling Effort (seconds)						1,220	1,012	1,133	NA
Fish Capture/Sampling Effort						0.23	0.22	0.30	NA
IBI SCORE						39	56	48	NA
IBI CLASS / RATING						Fair	Good	Good	NA
IBI Classes: Very Poor (VP, 0-15), Poor (P, 16-31), Fair (F, 32-47), Good (G, 48-66), & Excellent (E, > 67)									
Feeding Guild (FG): C = Carnivore, I = Insectivore, O = Omnivore; Tolerance (T): I = Intolerant, T = Tolerant; FH = Facultative headwater individuals; Stream Size (SS): H = Headwater, P = Pioneer; Breeding Guild (BG): SL = Simple Lithophiles.									
STATIONS: Station 1 = Unamed Tributary to Humphrey Creek, Station 2 = Bayou Creek, Station 3 = Unamed Tributary to Humphry Creek, Station 4 = Unamed Tributary to Humphry Creek									

Laboratory / Consulting

Certificate of Analysis

Third Rock Consultants, LLC
Cory Bloyd
2526 Regency Road
Suite 180
Lexington, KY 40503

Project KY18-005 (US 60)
Entered By Lynn Ellis
Date Reported 10/1/2018
Date Received 9/14/2018
Date Approved 10/1/2018

Test	Method	Result	Qualifiers	Units	PQL	Date	Initials
969974-01	Station 2	9/12/18 15:00					
Iron	EPA 200.7	<0.2		mg/L	0.2	9/26/2018	KM
pH - Lab	SM 4500 H+B	7.25		S.U.		9/14/2018	AW
Hardness, Total	EPA 130.1	101		mg/L as CaC	25	9/17/2018	CT
Nitrogen, Ammonia	Hach 10205	<0.05		mg/L	0.05	9/14/2018	CT
Chloride	EPA 300.0	18		mg/L	1	9/28/2018	EW
Dissolved Oxygen	DOWSOP03014	6.2		mg/L		9/14/2018	AW
Acidity	SM 2310 B	<10		mg/L	10	9/25/2018	CT
Alkalinity	EPA 310.2	103		mg/L	10	9/17/2018	CT
Carbon Dioxide	SM 4500-CO2 D	88		mg/L		9/25/2018	CT
Orthophosphate	SM 4500 P-E	0.13		mg/L	0.125	9/14/2018	CT
Sulfate	EPA 300.0	9.0		mg/L		9/28/2018	EW
969974-02	Station 1	9/12/18 17:00					
Iron	EPA 200.7	<0.2		mg/L	0.2	9/26/2018	KM
pH - Lab	SM 4500 H+B	7.50		S.U.		9/14/2018	AW
Hardness, Total	EPA 130.1	87		mg/L as CaC	25	9/17/2018	CT
Nitrogen, Ammonia	Hach 10205	<0.05		mg/L	0.05	9/27/2018	CT
Chloride	EPA 300.0	15		mg/L	1	9/28/2018	EW
Dissolved Oxygen	DOWSOP03014	6.5		mg/L		9/14/2018	AW
Acidity	SM 2310 B	<10		mg/L	10	9/25/2018	CT
Alkalinity	EPA 310.2	91		mg/L	10	9/17/2018	CT
Carbon Dioxide	SM 4500-CO2 D	86		mg/L		9/25/2018	CT
Orthophosphate	SM 4500 P-E	0.17		mg/L	0.125	9/14/2018	CT
Sulfate	EPA 300.0	5.0		mg/L		9/28/2018	EW
969974-03	Station 3	9/13/18 08:30					
Iron	EPA 200.7	<0.2		mg/L	0.2	9/26/2018	KM





Fouser Environmental Services

165 Camden Avenue Versailles, KY 40383 Phone: 859-873-6211 Fax: 859-873-3715 Email: lab@fouser.com

Laboratory / Consulting

Certificate of Analysis

Third Rock Consultants, LLC
Cory Bloyd
2526 Regency Road
Suite 180
Lexington, KY 40503

Project KY18-005 (US 60)
Entered By Lynn Ellis
Date Reported 10/1/2018
Date Received 9/14/2018
Date Approved 10/1/2018

Test	Method	Result	Qualifiers	Units	PQL	Date	Initials
969974-03	Station 3	9/13/18 08:30					
pH - Lab	SM 4500 H+B	7.75		S.U.		9/14/2018	AW
Hardness, Total	EPA 130.1	68		mg/L as CaC	25	9/17/2018	CT
Nitrogen, Ammonia	Hach 10205	<0.05		mg/L	0.05	9/27/2018	CT
Chloride	EPA 300.0	49		mg/L	1	9/28/2018	EW
Dissolved Oxygen	DOWSOP03014	6.1		mg/L		9/14/2018	AW
Acidity	SM 2310 B	<10		mg/L	10	9/25/2018	CT
Alkalinity	EPA 310.2	66		mg/L	10	9/17/2018	CT
Carbon Dioxide	SM 4500-CO2 D	60		mg/L		9/25/2018	CT
Orthophosphate	SM 4500 P-E	0.79		mg/L	0.125	9/14/2018	CT
Sulfate	EPA 300.0	24		mg/L		9/28/2018	EW

Approved By

Ray Fouser, P.E.



969974-

THIRD ROCK CONSULTANTS, LLC

FOUSER ENVIRONMENTAL SERVICES LABORATORY CHAIN-OF-CUSTODY

Project Name ¹ :				US60				Container Size / Preservation			In Situ Measurements			
Project No. ¹ :				KY18-005				1 litre		8 ounce		8 ounce		
Prime Consultant:				OK4				H ₂ SO ₄		HNO ₃				
Turnaround:				10 Days				Requested Analysis ²						
EDDs Required ¹ :				Yes										
EDDs to:				Bert Remley at bremley@thirdrockconsultants.com										
Invoice to:				Accounts Payable at bweatherford@thirdrockconsultants.com										
Questions to:				Bert Remley at bremley@thirdrockconsultants.com										
Lab ID	Site ID	Date	Time	Matrix ³	Type	Filtered	Acidity, Alkalinity, Chloride, CO ₂ , DO, pH, Sulfate, Orthophosphate	Ammonia Nitrogen	Iron, Hardness	Color	Turbidity (NTU)	Air/Water Temperature (°C)	Specific Conductance (µS/cm)	Stream Discharge (cfs)
01	Station 2	9-12-18	1500	SW	Grab	Y / (N)	✓	✓	✓					
02	Station 1	9-12-18	1700	SW	Grab	Y / (N)	✓	✓	✓					
03	Station 3	9-13-18	0830	SW	Grab	Y / (N)	✓	✓	✓					
				SW	Grab	Y / N								
				SW	Grab	Y / N								
				SW	Grab	Y / N								

¹ Project name, No. and weather event must appear on EDD and invoice; ² 40CFR Part 136 Methodology Required; ³ Surface Water;

Field Notes:

Relinquished by:

Dannia Foster

Received by:

Hymel for LAB

Temp upon Relinquishment:

20c

Additional documentation attached? Y / (N) If yes, describe:

Upon relinquishment, samples properly preserved, bottles intact, seals intact, etc? Y / N If no, explain:

Northeast Hopkinsville Bypass KYTC Item 2-136

Fauna and Flora Data Set

Common Name	Species Name
Flora	
Barnyard grass	<i>Echinochloa crus-galli</i>
Black locust	<i>Robinia pseudoacacia</i>
Black willow	<i>Salix nigra</i>
Blackberry	<i>Rubus sp.</i>
Box elder	<i>Acer negundo</i>
Common ragweed	<i>Ambrosia artemisiifolia</i>
Crown vetch	<i>Securigera varia</i>
Curly dock	<i>Rumex crispus</i>
Eastern cottonwood	<i>Populus deltoides</i>
Eastern redcedar	<i>Juniperus virginiana</i>
Elm	<i>Ulmus sp.</i>
Fescue	<i>Festuca arundinaceae</i>
Green ash	<i>Fraxinus pennsylvanica</i>
Greenbrier	<i>Smilax sp.</i>
Hackberry	<i>Celtis occidentalis</i>
Henbit	<i>Lamium amplexicaule</i>
Japanese honeysuckle	<i>Lonicera japonica</i>
Johnson grass	<i>Sorghum halepense</i>
Multiflora rose	<i>Rosa multiflora</i>
Paper birch	<i>Betula papyrifera</i>
Privet	<i>Ligustrum vulgare</i>
Raspberry	<i>Rubus sp.</i>
Red maple	<i>Acer rubrum</i>
River birch	<i>Betula nigra</i>
Shagbark hickory	<i>Carya ovata</i>
Sugar maple	<i>Acer saccharum</i>
Sweetgum	<i>Liquidambar styraciflua</i>
Sycamore	<i>Platanus occidentalis</i>
White oak	<i>Quercus alba</i>
Wild black cherry	<i>Prunus serotina</i>
Wild garlic	<i>Allium vineale</i>
Winter creeper	<i>Euonymus fortunei</i>

Northest Hopkinsville Bypass KYTC Item 2-136

Fauna and Flora Data Set

Common Name	Species Name
Fauna	
American crow	<i>Corvus brachyrhynchos</i>
American toad	<i>Anaxyrus americanus</i>
Black-capped chickadee	<i>Poecile atricapillus</i>
Broad-winged hawk	<i>Buteo platypterus</i>
Coyote	<i>Canis latrans</i>
Eastern cottontail	<i>Sylvilagus floridanus</i>
Eastern gray squirrel	<i>Sciurus carolinensis</i>
Green frog	<i>Rana clamitans</i>
Groundhog	<i>Marmota monax</i>
Northern bobwhite	<i>Colinus virginianus</i>
Northern cardinal	<i>Cardinalis cardinalis</i>
Raccoon	<i>Procyon lotor</i>
Red-winged blackbird	<i>Agelaius phoeniceus</i>
Tufted titmouse	<i>Baeolophus bicolor</i>
White-tailed deer	<i>Odocoileus virginianus</i>