

APPENDIX A - HISTORY OF ALTERNATIVES

APPENDIX A: HISTORY OF BUILD ALTERNATIVES

The Project has a long history dating back to the later 1980s, including the development and screening of a number of alternatives during early planning activities. This appendix describes how the Project was identified as a corridor to address north/south travel in the Springfield/Greene County region. It also addresses a range of potential Build Alternatives. Additional documentation regarding Greene County Highway Department (GCHD) studies and County actions regarding the alternatives development process is available upon request.

A.1 Kansas Extension Build Alternatives

Various Kansas Extension Build Alternatives were examined as part of previous studies over the past 30 years. The alternatives and the reasons why they were either discarded from further analysis or retained for further consideration are discussed in the following sections. The naming convention for the various alternatives represents the approximate year of evaluation and alternative number (e.g., Alternative 89-1 represents Alternative 1 analyzed in 1989).

A.1.1 Alternative 89-1

In 1984, the City of Springfield and Greene County recommended a major thoroughfare program for the City of Springfield and portions of Greene County. The program included a number of transportation projects as well as a plan to extend the Kansas Expressway alignment south of Republic Road, where it presently terminates. The 1984 recommendation was approved in 1987, with slight modifications in 1989. The plan provided for the Kansas Expressway to be extended straight south of Republic for approximately ¼-mile and then turn east to tie into Kansas Avenue slightly north of the intersection of Kansas Avenue and Weaver Road. This alignment was formally approved by the Greene County Commission in 1989 and platting was accomplished (Figure A-1). The Greene County Planning and Zoning Board also decided to further study the extension of Kansas Expressway south of Weaver Road to Plainview Road in 1989.

A.1.2 Alternative 89-2

In 1989, the City of Springfield Department of Community Development analyzed the feasibility of using Cox Road for the extension of the Kansas Expressway south of Republic Road (Figure A-1). In a December 4, 1989, letter to the Greene County Planning and Zoning Commission, the City identified a number of deficiencies for the Cox Road alignment. Upgrading Cox Road to a primary alternative would:

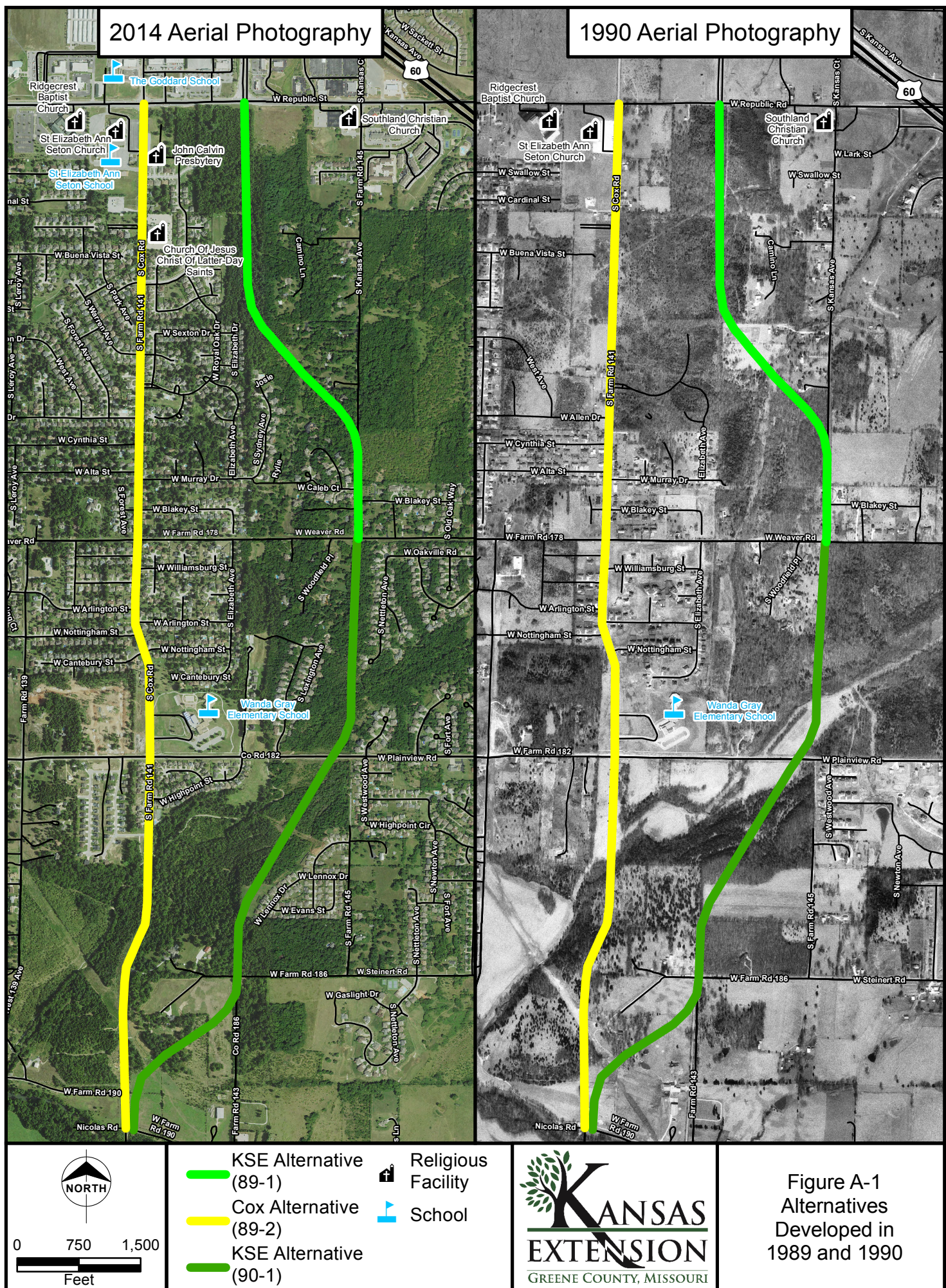
- Require the purchase of 23 houses and 11 vacant platted lots;

- Create a safety hazard and split existing neighborhoods with pedestrian traffic near the Wanda Gray Elementary School; and
- Make it difficult and cost prohibitive for building a future James River crossing west of U.S. 160. (Note that while this was a consideration at the time, with the improvement of Cox Road in approximately 2001-2002 a James River crossing was constructed along the Cox Road alignment.)

Given the issues identified with this alternative, City staff stated they could not support a Cox Road alignment. City staff recommended to continue utilizing the previously identified Kansas Avenue alignment with two alternatives; one would swing Kansas Expressway east to Kansas Avenue several hundred feet south of Republic Road, and the other would cross the northern portion of the tract south of Republic Road. City staff determined that Alternative 89-1 was consistent with the proposed corridor contained in the Transportation Plan adopted by the Springfield Area Transportation Study Organization, Springfield Planning and Zoning Commission, and Springfield City Council.

A.1.3 Alternative 90-1

On July 17, 1990, the Greene County Planning and Zoning Board unanimously approved the extension of the Kansas Expressway south of Weaver Road along an alignment principally through undeveloped land (Figure A-1).



A.1.4 Alternative 91-1

In 1991, a proposed route for the extension of Kansas Expressway from Republic to Weaver Road was developed. In 1993, an extension of Cox Road from Plainview Road to Farm Road 190 near the James River was compared to the Kansas Expressway Extension alternative (Figure A-1). At that time it appeared that a Cox Road extension would be substantially more economical to serve the developing area of Greene County. As such, it was recommended that Cox Road be adopted as the designated route for extension and improvement from the City limits to Farm Road 190 near the James River.

A.1.5 Alternatives 96-1, 96-2 and 96-3

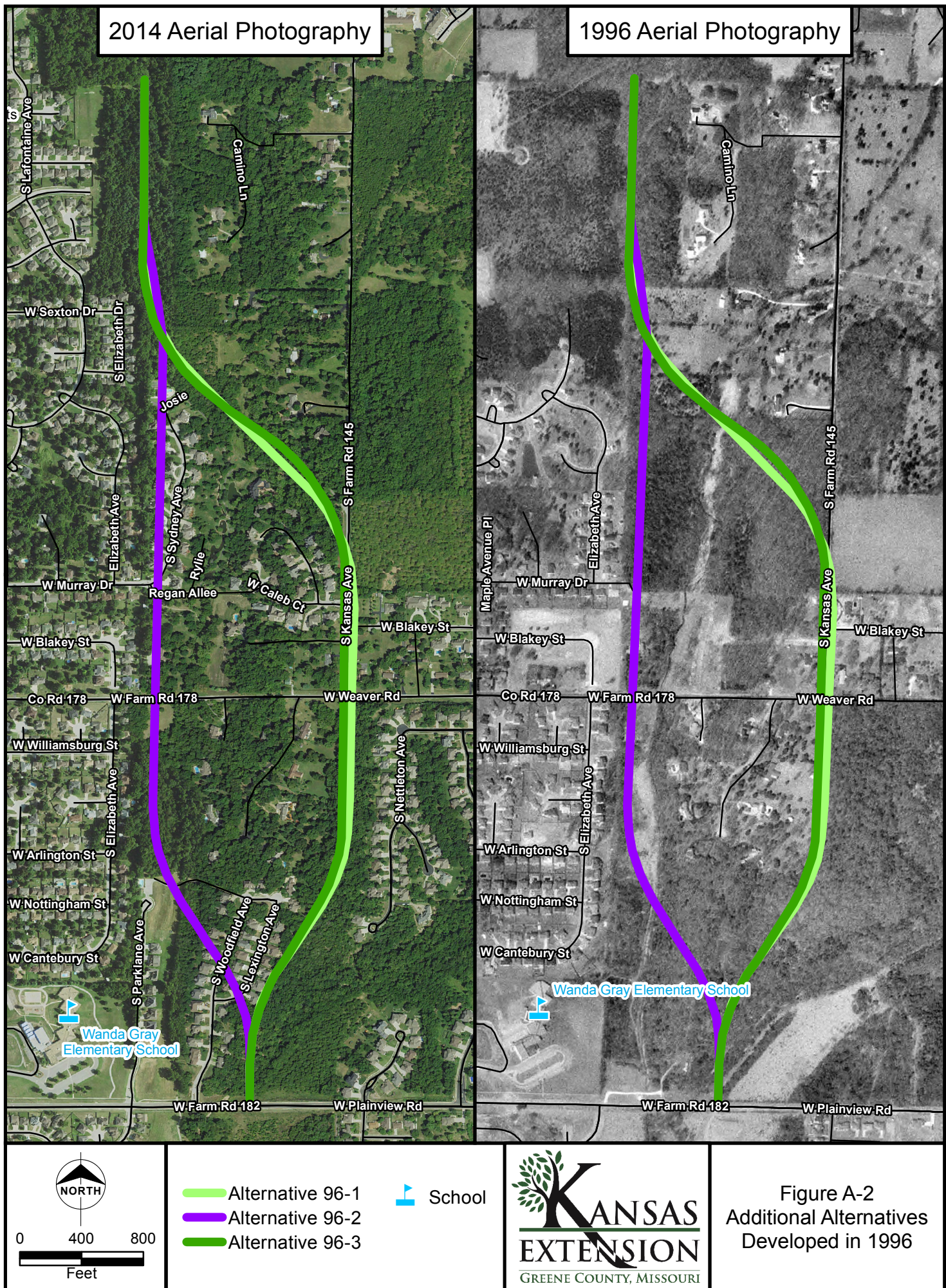
In the mid-1990s, a decision was made to upgrade the proposed Kansas Expressway from a two-lane arterial to a four-lane expressway. Subsequently, Greene County evaluated three alignments in 1995 (Figure A-2) for the extension of the Kansas Expressway from the Springfield city limits to Plainview Road due to concerns with the original alignment identified in 1991. On April 16, 1996, the Planning and Zoning Board voted in favor of the Greene County recommendation to adopt Alternative 96-1, and on June 3, 1996, the Greene County Commission approved the Greene County recommendation based on fewer residential impacts, ease of construction, lower cost, and a safer intersection at Weaver Road.

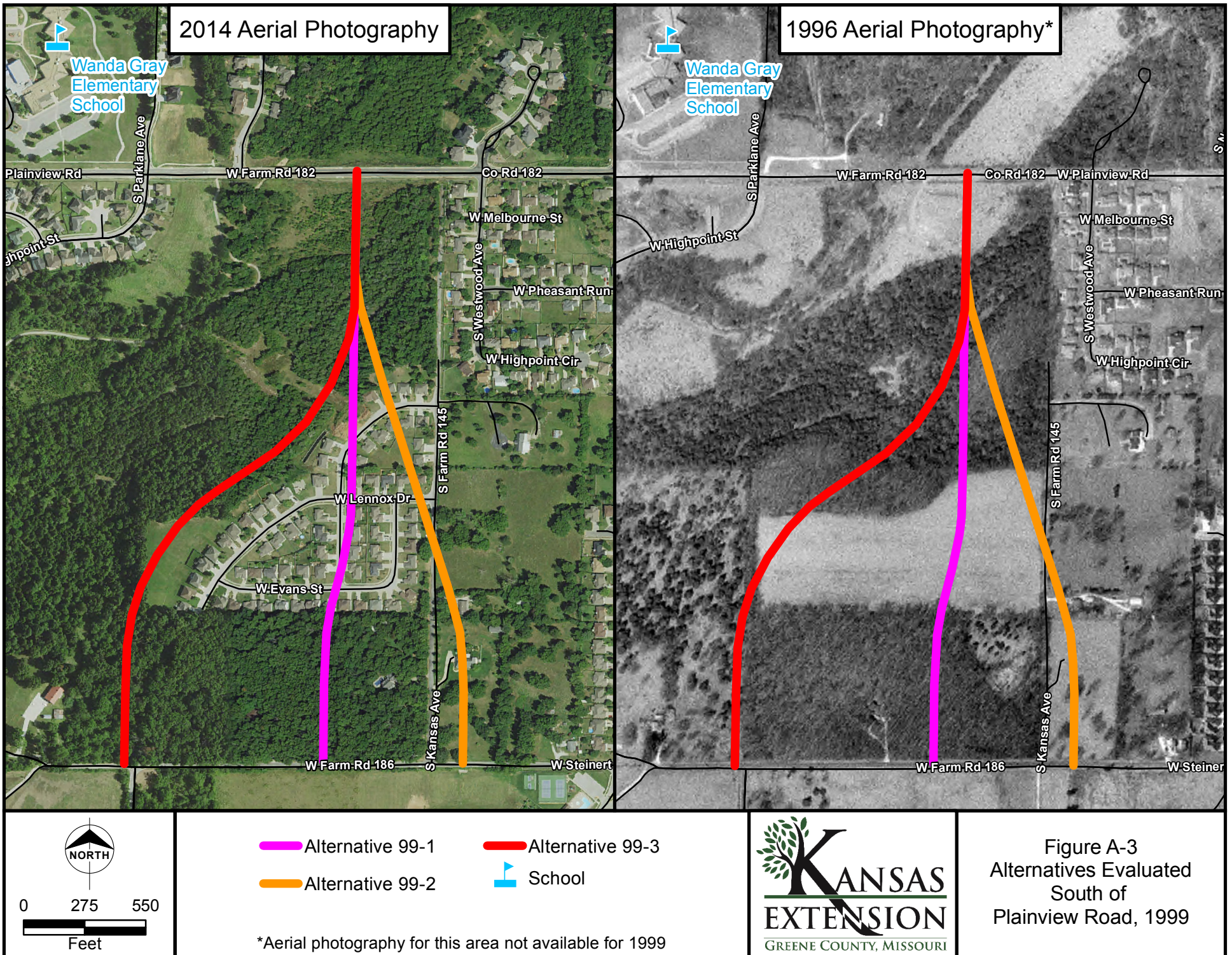
A.1.6 Alternatives 99-1, 99-2 and 99-3

In 1999, Greene County evaluated three alignments for the extension of the Kansas Expressway from Plainview Road south to Steinert Road (Figure A-3). In a letter from the Greene County Highway Department (GCHD) to the Greene County Commission dated February 17, 2000, the GCHD recommended that the Commission adopt Alternative 99-3 based on social factors (i.e., public preference) and a wish to disrupt the existing neighborhood as little as possible. In letters from the GCHD to the Greene County Director of Planning dated April 5, 2000, and April 17, 2000, the GCHD requested that the Planning Board take the necessary steps to amend the County Transportation Plan to provide for the alignment of the Kansas Expressway Extension.

A.1.7 Alternative 03-1

In 2003, a consultant on behalf of Greene County produced preliminary design plans for the proposed Kansas Expressway from Republic Road south to Steinert Road. At the same time, the GCHD was evaluating the “last leg” of the Kansas Expressway Extension from Steinert Road to the Greene/Christian County Line (Figure A-4).



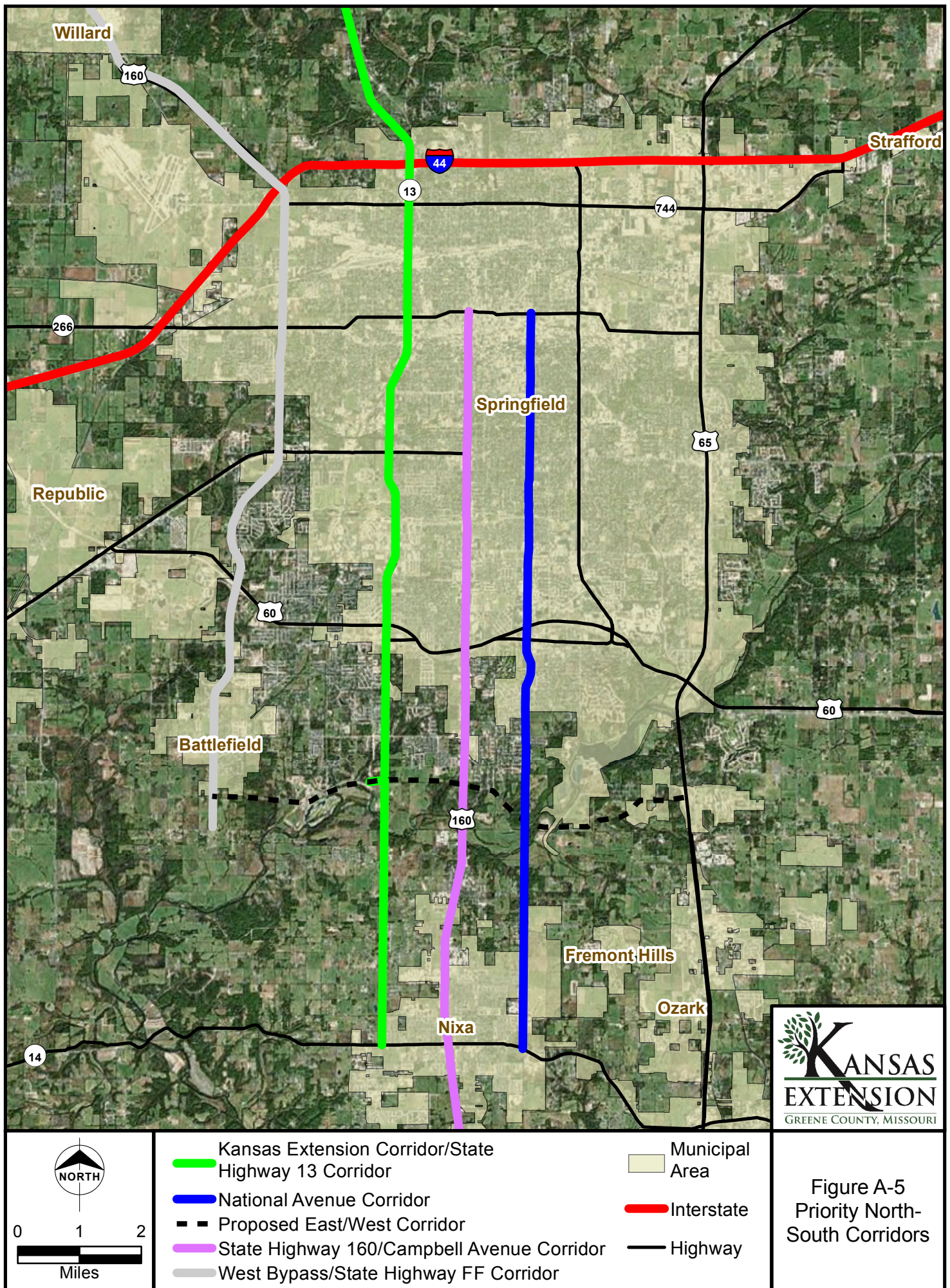




A.1.8 North-South High Priority Corridors

The OTO 2007 North-South Corridor Study examined and prioritized transportation options that would improve regional and local north-south travel, with particular emphasis on two areas, south of the James River Freeway and north of I-44. Four routes between Route MM on the west and U.S. Highway 65 on the east were identified by the OTO as potential locations to improve north-south travel in the Springfield area. The four corridors studied south of the James River Expressway were (Figure A-1):

- **West Bypass (Route FF):** Beginning on Highway 160 northwest of Springfield and extending to State Highway FF, the two-lane section of Highway FF would be widened to a four-lane expressway section or possibly relocated from the current alignment. South of Farm Road 194, a new four-lane expressway section would be constructed that would extend through Battlefield. The corridor would eventually cross the James River and continue in a southeastern direction to Highway 14 on the west side of the City of Nixa.
- **Kansas Expressway Extension/Route 13:** The existing Kansas Expressway would be extended south from its terminus at Republic Road as a new four-lane expressway. The alignment could use or be located close to Farm Road 141 near Farm Road 190 and would continue southward to Highway 14, aligning with Route MM.



- **Campbell Avenue (U.S. 160):** The existing Campbell Avenue designated as U.S. 160 south of the James River Freeway would be widened from four lanes to six lanes. A six-lane widening would be proposed north of U.S. 60 and continue south of Highway 14 through Nixa.
- **National Avenue:** National Avenue would be extended southward from its current termination point across the James River as a four-lane arterial roadway. The alignment could follow or parallel the Cheyenne Road alignment, and continue south to connect to Highway 14.

Through public and agency involvement during the preparation of the OTO 2007 study that the following actions be completed for the Kansas Expressway Extension:

- Conduct an alignment and environmental study
- Enact local land use regulations that could be used to preserve right-of-way (ROW)
- Begin preliminary engineering
- Fund ROW purchase
- Begin construction

A.1.9 Alternative 15-1

Due to funding limitations associated with Christian County, additional planning activities, and future plans for GCHD to upgrade Farm Road 190 between Cox Road and Campbell Avenue, a decision was made by GCHD to modify the proposed 03-1 alignment so that it would terminate at Cox Road within the boundaries of Greene County. That alignment alternative is identified as Alternative 15-1 (Figure A-6) and is the alternative that is the focus of the Environmental Assessment.

The remainder of this Appendix documents the decision-making process utilized to screen alternatives for the Kansas Extension corridor.

A.2 Screening of Kansas Extension Alternatives

In 2015, new Federal transportation legislation, “Fixing America’s Surface Transportation (FAST) Act,” expanded on combining the transportation planning and NEPA environmental review processes “to the maximum extent practicable and appropriate.” For transportation projects, an extensive amount of information is gathered during the planning process, which often occurs prior to the actual triggering of NEPA review requirements. This allows information gathered during the planning process, to the extent it is still current and relevant, to be incorporated into the NEPA document. Additionally, alternatives to proposed transportation projects analyzed and rejected during the planning process do not need to be re-analyzed during NEPA review.

A qualitative screening process was used to examine past alternatives identified during the planning process and compared with the current study corridor. A screening matrix was developed using the Purpose and Need statement and various environmental and engineering categories to compare the alternatives. The No Build and remaining alternatives were ranked using open, half-filled, and filled circles to indicate:

- **Filled circle:** The alternative would fully satisfy the purpose and need of the Project, would result in no or very minor effects, and/or result in potential future benefits.
- **Half-filled circle:** The alternative would satisfy all or part of the need but possibly with trade-offs such as limited capacity, or would result in negative effects that could be mitigated.
- **Open circle:** The alternative did not or would poorly satisfy the need or result in impacts that could not be fully mitigated.

The matrix is shown in Table A-1.

Table A-1: Build Alternatives Screening Matrix

Alternative	Improve the Function of the South Cox Road Corridor	Improve the Regional Transportation Network	Accommodate Existing and Projected Growth	Complete Adopted Regional Plans	Improve Non-Motorized Travel Opportunities	Displacements	Effects on Natural Resources	Topography	Structures	Length	Construction Impacts
No Build Alternative	○	○	○	○	○	●	●	●	●	●	●
Cox Alternative (89-2)	●	◐	●	◐	◐	○	◐	◐	◐	◐	○
Kansas Extension Alternative 89-1/90-1	●	●	●	●	●	●	○	○	◐	◐	◐
KSE North 1 Alternative 96-1	●	●	●	●	●	●	○	◐	◐	◐	◐
KSE North Alternative 96-2	●	●	●	◐	●	○	○	○	◐	◐	◐
KSE North 2 Alternative 96-3	●	●	●	●	●	◐	○	◐	◐	◐	◐
Alternative 99-1	●	●	●	◐	●	○	○	○	◐	◐	◐
Alternative 99-2	●	●	●	◐	●	○	○	○	◐	◐	◐
Alternative 99-3	●	●	●	●	●	●	○	◐	◐	◐	◐
Alternative 03-1	●	●	●	◐	●	◐	○	○	○	○	◐
Alternative 15-1 (Proposed Kansas Extension - Current Build Alternative)	●	●	●	●	●	●	◐	◐	◐	◐	◐
--	<p>● – Would improve the function of the South Cox Road corridor.</p> <p>◐ – Would slightly improve the function of the South Cox Road corridor.</p> <p>○ – Would not improve the function of the South Cox Road corridor.</p>	<p>● – Would improve the regional transportation network.</p> <p>◐ – Would slightly improve the regional transportation network.</p> <p>○ – Would not improve the regional transportation network.</p>	<p>● – Would accommodate existing and projected growth.</p> <p>◐ – Would slightly accommodate existing and projected growth.</p> <p>○ – Would not accommodate existing and projected growth.</p>	<p>● – Would be consistent with previously adopted plans.</p> <p>◐ – Would be somewhat consistent with previously adopted plans.</p> <p>○ – Would not be consistent with previously adopted plans.</p>	<p>● – Would improve non-motorized travel opportunities.</p> <p>◐ – Would slightly improve non-motorized travel opportunities.</p> <p>○ – Would not improve non-motorized travel opportunities.</p>	<p>● – Would have minimal or no displacements.</p> <p>◐ – Would have a moderate amount of displacements.</p> <p>○ – Would have a large number of displacements.</p>	<p>● – Would have no impact on natural resources.</p> <p>◐ – Would have minimal impact on natural resources.</p> <p>○ – Would have a moderate impact on natural resources.</p>	<p>● – Would have no topographic challenges.</p> <p>◐ – Would have moderate topographic challenges.</p> <p>○ – Would have considerable topographic challenges.</p>	<p>● – Would require no structures (e.g., bridges, walls, etc.).</p> <p>◐ – Would require a moderate amount of structures.</p> <p>○ – Would require several structures.</p>	<p>● – Length would be zero.</p> <p>◐ – Would be comparable in length to other alternatives.</p> <p>○ – Would be longer in length in comparison to other alternatives.</p>	<p>● – Would have no issues from a constructability standpoint.</p> <p>◐ – Would have moderate constructability issues.</p> <p>○ – Would have considerable issues from a constructability standpoint.</p>

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APPENDIX B - AIR STUDY

Memorandum



Date: February 17, 2017

To: Steve Thornhill, Burns & McDonnell
Kate Samuelson, Burns & McDonnell

From: Tess Fuller, Burns & McDonnell

Subject: Air Quality Analysis for the Kansas Extension Project

As a part of the Environmental Assessment for the Kansas Extension (Project) in Greene County, Missouri, Burns & McDonnell performed an air quality analysis to determine potential air quality impacts in the Project area. The analysis focused on National Ambient Air Quality Standard (NAAQS) pollutants, greenhouse gases (GHGs), and mobile source air toxics (MSATs).

The Federal government established the NAAQS under the Clean Air Act (CAA) to protect public health (including the sensitive populations such as asthmatics and the elderly), safety, and welfare from known or anticipated effects of eight air pollutants: sulfur dioxide (SO₂), particulate matter 10 microns or less in diameter (PM₁₀), particulate matter 2.5 microns or less in diameter (PM_{2.5}), carbon monoxide (CO), nitrogen dioxide (NO₂), ozone, lead, and GHGs. Emissions from transportation can contribute to several of the NAAQS pollutants: SO₂, PM₁₀, PM_{2.5}, ozone, CO, and NO₂. Conformity with the NAAQS, as required by the CAA, ensures that federally funded or approved transportation plans, programs, and projects conform to the air quality objectives established in the State Implementation Plan (SIP). The Missouri Department of Transportation (MoDOT) is responsible for implementing the conformity regulation in non-attainment and maintenance areas.

The City of Springfield is currently designated as an attainment area for air quality, indicating that the region complies with the Federal clean air standards¹. Therefore the conformity requirements of 40 Code of Federal Regulations (CFR) 93 do not apply to the Project.

Air toxic emissions are also covered under the CAA. In 2007, the U.S. Environmental Protection Agency (EPA) expanded the requirements of the CAA to reduce toxic emissions by mobile sources by publishing a rule on the Control of Hazardous Air Pollutants from Mobile Sources². The rule identifies a number of compounds that are emitted from mobile sources. Seven of these compounds have been selected as priority MSAT pollutants by the Federal Highway Administration (FHWA). This rule requires nationwide control that will dramatically decrease MSAT emissions through the development and use of cleaner fuels and more efficient vehicle engines. On October 18, 2016, the FHWA issued the *Updated Interim Guidance on Mobile*

¹ U.S. Environmental Protection Agency. (01 October 2015). *The Green Book Nonattainment Areas for Criteria Pollutants*. Retrieved 18 February 2016 from <http://www3.epa.gov/airquality/greenbook/>.

² National Archives and Records Administration. (26 February 2007). *Federal Register*, Vol. 72, No. 37. Retrieved 6 March 2016 from <https://www.gpo.gov/fdsys/pkg/FR-2007-02-26/pdf/E7-2667.pdf>

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*Source Air Toxic Analysis in NEPA Documents*³. This memorandum discusses a tiered approach for discussing MSAT emissions for NEPA evaluations. Based on the guidance in the memo, since the design year annual average daily traffic for the Project is projected to be below 140,000 (see attached figure), a quantitative MSAT analysis was not required to be performed. Since the impacts from MSAT pollutants will be minimal, a qualitative approach was used to investigate the impacts of MSAT pollutants on the surrounding area from the Project.

In December of 2014, the President of the United States and the Counsel for Environmental Quality (CEQ) published guidance on analyzing the impacts of GHG emissions for NEPA evaluations. Combustion of fossil fuels in vehicles creates GHG emissions in the form of carbon dioxide (CO₂), methane, and nitrous oxide (N₂O).

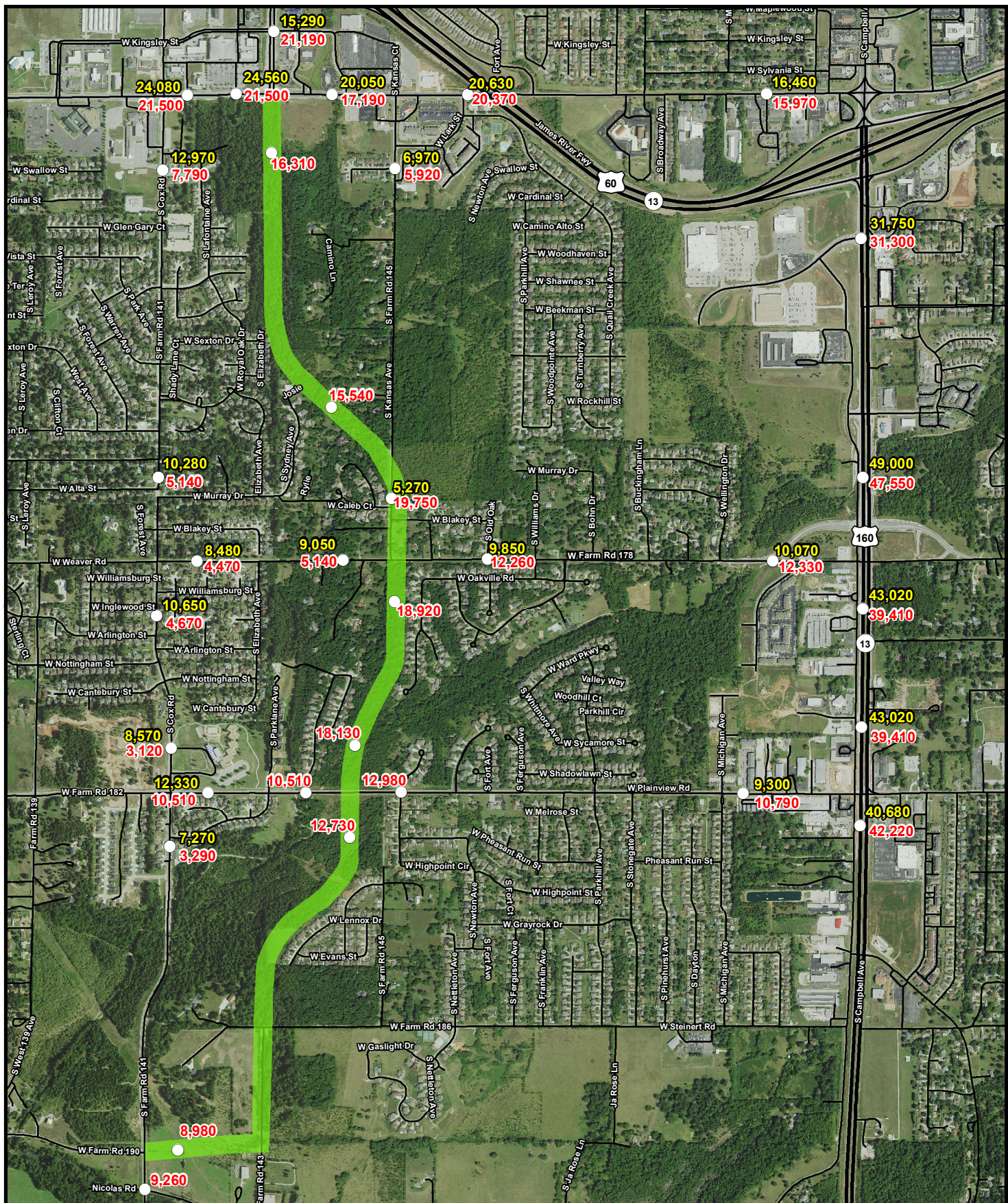
In order to qualitatively analyze the impacts of NAAQS pollutants, GHG, and MSAT emissions from the Project, the daily value for vehicle-miles travelled (VMT) for both the build and the no-build scenario was analyzed. Emissions (on a pound per hour and tons per year basis) from vehicles may be estimated using the VMT. Emission factors exist for NAAQS pollutants, GHG, and MSAT pollutants, which utilize the VMT; therefore, comparing the VMT of each option is a way to estimate the increase or decrease in these pollutants.

The Project is expected to reduce congestion, as well as reduce traffic, along Cox Road and Campbell Avenue, by redirecting existing and projected traffic from these roads. While the overall number of vehicles is expected to increase with the Project, the predicted daily value for VMT for the 2040 no-build scenario is 12,282,244 miles, while the predicted daily value for the VMT for the 2040 build scenario is 12,264,398 miles. Since the Project would decrease the 2040 VMT, vehicles are expected to move more quickly through the area and idle less during commuting. Therefore, the NAAQS, GHG, and MSAT emissions from the build scenario are expected to be the same or lower in the design year (2040) than those from the no-build scenario in the Project area. It is important to note that there could be increases in NAAQS, GHG, and MSAT emissions in a few localized areas; however, the area as whole is not expected to see a detrimental impact to the air quality between the build and no-build scenarios.

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Attachments: Figure 2-2

³ Federal Highway Administration. (2016, October 18). *Information: Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents*. Retrieved 17 February 2017 from https://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/msat/2016msat.pdf



0 750 1,500
Feet

█ Study Corridor

█ 2040 = 2040 AADT - Build
█ 2040 = 2040 AADT - No Build



Figure 2-2
No Build and Build Traffic
Forecasts (2040 AADT)

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APPENDIX C - NOISE STUDY

Memorandum



Date: July 7, 2016

To: Steve Thornhill, Burns & McDonnell
Kate Samuelson, Burns & McDonnell

From: Tess Fuller, Burns & McDonnell

Subject: Noise Analysis for the Kansas Extension Project

A preliminary noise analysis has been performed as a part of the Environmental Assessment for the Kansas Extension Project (Project). The Project is located in Greene County, Missouri. The Project consists of a four-lane expressway connecting the current Kansas Extension and Cox Road.

Introduction

The Missouri Department of Transportation (MoDOT) has created a Noise Policy Guide¹ that describes procedures for implementing requirements of the Federal Highway Association (FHWA) Noise Standard (Title 23, Article 722, Code of Federal Regulations, June 2013) and the National Environmental Policy Act (NEPA). These policies require an investigation of potential noise impacts for Type I projects. Type I projects involve construction of new highways or new alignments, land additions, or significant changes in vertical or horizontal alignments of existing facilities.

MoDOT has established Noise Activity Criteria (NAC) for activity categories A through G. The activity categories are defined by the land use of the area. Activity categories A through E are given an activity criteria sound level. These values are shown in Table 1.

¹ http://epg.modot.org/index.php?title=127.13_Noise

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Table 1: MoDOT Noise Activity Criteria

Activity Category	Activity Criteria (dBA) ^a		Evaluation Location	Activity Description
	L _{eq} (h) ^b	L ₁₀ (h)		
A	57	60	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B	67	70	Exterior	Residential
C	67	70	Exterior	Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails and trail crossings
D	52	55	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E	72	75	Exterior	Hotels, motels, offices, restaurants, and other developed lands, properties or activities not included in A through D or F
F	--	--	--	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical) and warehousing
G	--	--	--	Undeveloped lands that are not permitted for development

Source: MoDOT, 2014 (available at http://epg.modot.org/index.php?title=127.13_Noise)(a) dBA = A-weighted decibels, L_{eq}(h) = the hourly equivalent steady-state sound level, L₁₀(h) = the hourly sound level exceeded 10 percent of the time(b) Within this study, the L_{eq}(h) will be analyzed.

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Existing Noise Levels

A desktop review of the Project area was performed, and the area surrounding the Project was broken up into 22 common noise environments (CNEs). The CNEs were determined based on land use and similar sound environments (i.e., intersections, proximity to highways and other noise sources). Of the 22 identified CNEs, 14 fall into categories A through E, with the majority of the CNEs falling into the activity category B because they are residential areas. Based on these CNEs, ambient measurement points were chosen to establish an existing, ambient noise level for the Project area. Since the Project is creating a new alignment, measurement points were taken in the neighborhoods surrounding the new alignment. The CNEs and ambient measurement points are shown in Figure 1 (Attachment A).

Ambient measurements were taken in the afternoon of October 28 and the morning of October 29, 2015. Noise measurements were taken for anywhere between 5 and 15 minutes, depending on when the equivalent, steady-state sound level (L_{eq}) stopped fluctuating, as required in the MoDOT and FHWA policy regarding existing measurements. The L_{eq} for each measurement is shown below in Table 2. The L_{eq} measured levels ranged between 44.7 and 57.6 A-weighted decibels (dBA).

Table 2: Ambient Measurements

Time Period	Measurement Point	L_{eq}^a (dBA)	Notes
3 p.m. to 6 p.m.	MP1	46.4	Bird noise, trees rustling, leaves blowing along the ground, traffic in distance.
	MP2	50.6	Siren in distance, car door shutting, traffic in distance from Republic pretty constant, leaves rustling.
	MP3	50.1	Traffic from Republic in distance loud and constant. Talking nearby. Bird cawed.
	MP4	50.5	Distant traffic, distant dogs barking, bike ridden through leaves nearby, rustling leaves, cicadas chirping, birds chirping.
	MP5	53.0	Birds chirping, dog barking, talking nearby.
	MP6	45.7	Traffic in distance, bird cawing, leaves rustling, car door slam in distance, crickets chirping, leaves blowing on ground, construction noise in distance.
	MP7	45.9	Crickets chirping, rustling trees, metal clang in distance, crow cawing, distant traffic that wasn't constantly loud.

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Time Period	Measurement Point	L _{eq} ^a (dBA)	Notes
	MP8	52.8	Crickets chirping, crow cawing, distant traffic, unidentified constant motor noise in distance changing volume.
6 a.m. to 9 a.m.	MP1	46.3	Traffic in distance dominating and constant, car idling nearby after returning and then leaving, garage door opened nearby and closed, car started and idled for a short time, then a second car did the same.
	MP2	47.3	Traffic noise in distance dominant and constant, crickets chirping.
	MP3	49.4	Traffic noise in distance dominant and constant.
	MP4	49.8	Distant traffic constant, dog barking in distance, bird chirping nearby.
	MP5	56.5	Birds chirping, loud siren, dogs barking.
	MP6	44.7	Birds chirping/cawing, traffic audible in distance, car parked nearby, distant construction noise.
	MP7	45.7	Birds cawing and chirping, dropped pen.
	MP8	57.6	Birds chirping, partly cloudy, traffic noise in distance.

(a) L_{eq} = equivalent, steady-state sound level, dBA = A-weighted decibels

Future Predicted Noise Levels

At least one sensitive noise receptor was selected as a representative receptor for each of the 14 CNEs that were classified as activity categories B or C. To predict future noise levels from the build option, each of the 16 representative receptors were modeled in the FHWA's TNM, Version 2.5. This modeling was used to determine which, if any, areas are predicted to be impacted by the Project and would thus need further investigation and a noise abatement analysis. The representative receptors selected and used in the analysis are shown in Figure 2, located in Attachment A. The ambient measurements performed were used to estimate the existing sound levels for each of the CNEs.

TNM uses several inputs to predict sound levels at receptors. These inputs (discussed in further detail, below) were used to model future traffic sound levels at the 16 representative receptors for the CNEs that included residences, parks, and cemeteries. These inputs include geometric data of the proposed roadway alignment (x-, y-, and z-coordinates), topography, traffic composition (heavy trucks and automobiles), traffic speed, and peak hourly traffic volumes. Because, in some areas, there are predicted to be large changes in elevation between the road and the representative

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receptors, terrain lines were also used in the model to capture the effect that these elevation differences would have on the nearby receptors. Traffic composition, speeds, and volumes used in the model are shown in Table 3. The model used design year (2040) traffic data and alignment, which includes two northbound lanes and two southbound lanes. Traffic for each direction was assumed to be divided evenly between the two lanes.

Table 3: Federal Highway Administration Traffic Noise Model Inputs

Segment	Automobiles (vehicles per hour) ^a		Heavy Trucks (vehicles per hour) ^a		Operating Speed (mph) ^b
	Northbound	Southbound	Northbound	Southbound	
Republic to S Farm Road 145	852	988	9	11	50
S Farm Road 145 to Weaver	781	871	9	11	50
Weaver to Plainview Road	451	491	5	5	50
Plainview Road to FR190	505	561	5	7	50
S Farm Road 145	180	181	2	2	30
Segment	Eastbound	Westbound	Eastbound	Westbound	Operating Speed (mph) ^b
Weaver Road (east of Kansas Extension)	388	389	4	4	30
Weaver Road (west of Kansas Extension)	224	225	3	3	30
Plainview Road (east of Kansas Extension)	543	543	6	6	40
Plainview Road (west of Kansas Extension)	440	440	5	5	40

(a) Traffic counts shown from the OTO Regional Demand Model

(b) Operating speed was determined by Burns & McDonnell; mph = miles per hour

Traffic signals are expected to be utilized for three intersections along the Kansas Extension alignment at: S Farm Road 145, Weaver Road, and Plainview Road. The signal inputs are summarized in Table 4. Since all three of the intersections are stoplights, the speed constraint was set at 0 miles per hour (mph), since the traffic will be idling and then accelerating to operating speed.

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Table 4: Percentage of Vehicles Affected at Traffic Signals

Intersection	Vehicles Affected at Traffic Signals ^a			
	Northbound	Southbound	Eastbound	Westbound
Kansas Extension at S Farm Road 145	51%	51%	0% ^b	81% ^c
Kansas Extension at Weaver Road	62%	73%	78%	77%
Kansas Extension at Plainview Road	69%	70%	75%	67%

(a) Values developed by Burns & McDonnell

(b) Southbound S Farm Road 145

(c) Northbound S Farm Road 145

Following the MoDOT Noise Policy, a receptor is determined to be impacted if the predicted sound levels increased 15 decibels (dB) or more from the existing ambient sound levels or if the predicted sound level approaches (falls within 1 dB), is equal to, or greater than the applicable NAC. Table 5 (Attachment B) shows the results of the TNM model for the Project and which representative receptors would be impacted.

As shown in Table 5 (Attachment B) and Figure 3 (Attachment A), 4 of the 16 representative receptors would be impacted by the Project and warrant an abatement analysis to determine if a reasonable and feasible noise barrier can be constructed for the impacted areas. These 4 representative receptors are impacted due to sound level increases since the alignment is running through an undeveloped corridor. Because the Project runs through an undeveloped corridor, it was not possible to use the FHWA's Traffic Noise Model (TNM) to predict existing traffic sound levels at the receptors closest to the Project, which are the most likely receptors to be impacted due to the Project.

Noise Abatement

Noise abatement measures were considered for the four impacted representative receptors in the study area. Due to physical and financial constraints, noise walls were determined to be the only feasible method of traffic noise abatement. Per MoDOT's Noise Policy Guide, a wall is deemed to be feasible if it passes an engineering analysis for drainage, emergency accessibility, utility access, etc. and if at least 67 percent of first-row, impacted receptors experience at least a 5-dB reduction from the noise wall. If a wall is determined to be feasible, it will be analyzed for reasonableness. A reasonableness evaluation consists of three parts: a noise reduction design goal where 67 percent of first-row receptors experience at least a 7-dB reduction from the noise wall, an economic analysis requiring the wall be equal to or less than 1,300 square feet per

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benefitted receptor, and a favorable response from the owners and residents. The Noise Policy Guide also limits a noise wall's height to 20 feet.

Transportation engineers were consulted to determine the best location to place the noise walls considering both constructability and abatement perspectives. Thus, all four walls analyzed were deemed to be feasible from an engineering standpoint.

Representative Receptor 3

There are 18 first-row residences represented by Rep3. A receptor was placed in the location closest to the Kansas Extension for each of these first-row residences. Several wall designs were analyzed for feasibility and reasonableness. None of the wall designs were able to meet the reasonableness noise reduction design goal of providing at least 7-dB of noise reduction for 67 percent or more of the first-row, benefitted receptors. When all segments were perturbed to 20 feet and providing the maximum amount of attenuation to the receptors in the area, only 8 of the 18 first-row receptors were predicted to experience 7-dB or more of noise reduction from the noise wall. While this fully perturbed wall meets the feasibility criteria, the 44 percent of benefitted, first-row receptors does not meet one of the reasonableness factors. Figure 4 (Attachment A) shows the locations of the noise wall and receptors analyzed in the barrier analysis.

Representative Receptor 6

There are two first-row residences represented by Rep6. A receptor was placed in the location closest to the Kansas Extension for each of these first-row residences. Several wall designs were analyzed for feasibility and reasonableness. None of the wall designs were able to meet the reasonableness noise reduction design goal of providing at least 7-dB of noise reduction for 67 percent or more of the first-row, benefitted receptors. When all segments were perturbed to 20 feet and providing the maximum amount of attenuation to the receptors in the area, only one of the two first-row receptors were predicted to experience 7-dB or more of noise reduction from the noise wall. While this fully perturbed wall meets the feasibility criteria, the 50 percent of benefitted, first-row receptors does not meet one of the reasonableness factors. Figure 5 (Attachment A) shows the locations of the noise wall and receptors analyzed in the barrier analysis.

Representative Receptor 8

There are 17 first-row residences represented by Rep8. A receptor was placed in the location closest to the Kansas Extension for each of these first-row residences. Several wall designs were modeled to determine segment heights which would meet the feasibility goal with the smallest wall area. A feasibility analysis was run on these receptors for a designed noise wall that spanned between 2 and 14 feet tall which was found to meet the feasibility goal. Two of these 17 first-row receptors are modeled to be impacted, and reductions at these two receptors from this sound

July 7, 2016

Page 8

wall are predicted to be between 7 and 9.6 decibels. Thus, 100 percent of the impacted first-row receptors can experience at least a 5-decibel reduction and meet the feasibility criterion.

The designed wall was then examined for reasonableness. Of the 17 first-row receptors, 14 were predicted to experience 7 dB or more from the noise wall. Thus, 82 percent of front row receptors are predicted to be benefitted, and the second reasonable criterion was analyzed. The designed sound wall spans 1,290 feet, has segments between 2 feet and 14 feet high. The wall area was calculated to be 13,115 square feet. The calculated area was determined to be 937 square feet per benefitted receptor. This value is lower than the 1,300 square feet per benefitted receptor value that is listed in the MoDOT Noise Policy Guide. Thus, this barrier would be considered reasonable. Figure 6 (Attachment A) shows the locations of the noise wall and receptors analyzed in the barrier analysis.

Representative Receptor 12

There are 22 first-row residences represented by Rep12. A receptor was placed in the location closest to the Kansas Extension for each of these first-row residences. Several wall designs were modeled to determine segment heights which would meet the feasibility goal with the smallest wall area. A feasibility analysis was run on these receptors shown for a designed noise wall that spanned between 6 and 18 feet tall and met the feasibility goals with the smallest wall area. Fifteen of these 22 first-row receptors were modeled to be impacted, and reductions at these impacted receptors from this sound wall design are predicted to be between 7 and 10.1 dB. Thus, 100 percent of the impacted first-row receptors can experience at least a 5-dB reduction and meet the feasibility criterion.

The designed noise wall was then examined for reasonableness. Of the 22 first-row receptors, 20 were predicted to experience 7 dB or more from the noise wall. Thus, 91 percent of front row receptors are predicted to be benefitted, and the second reasonable criterion was analyzed. The designed sound wall spans 1,708 feet and has segments between 6 feet and 18 feet high. The wall area was calculated to be 21,727 square feet. The calculated area was determined to be 1,086 square feet per benefitted receptor. This value is lower than the 1,300 square feet per benefitted receptor value that is listed in the MoDOT Noise Policy Guide. Thus, this barrier would be considered reasonable. Figure 7 (Attachment A) shows the locations of the noise wall and receptors analyzed in the barrier analysis.

Conclusion

Based on the traffic noise analysis, four areas along the Kansas Extension corridor are expected to be impacted from the Project. Barrier analyses were performed for each of these four impacted areas. Of these four noise walls, two were deemed to meet both feasibility criteria and two of the three reasonableness criteria. Once the final design has been completed, the traffic noise modeling will be updated to reflect the final design. Final recommendations will be made after

Memorandum *(cont'd)*



July 7, 2016

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these updates have been made and public involvement is complete for the final reasonableness criterion.

Enclosure

Attachment A

Attachment B

ATTACHMENT A

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COPYRIGHT © 2016 BURNS & McDONNELL ENGINEERING COMPANY, INC.
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

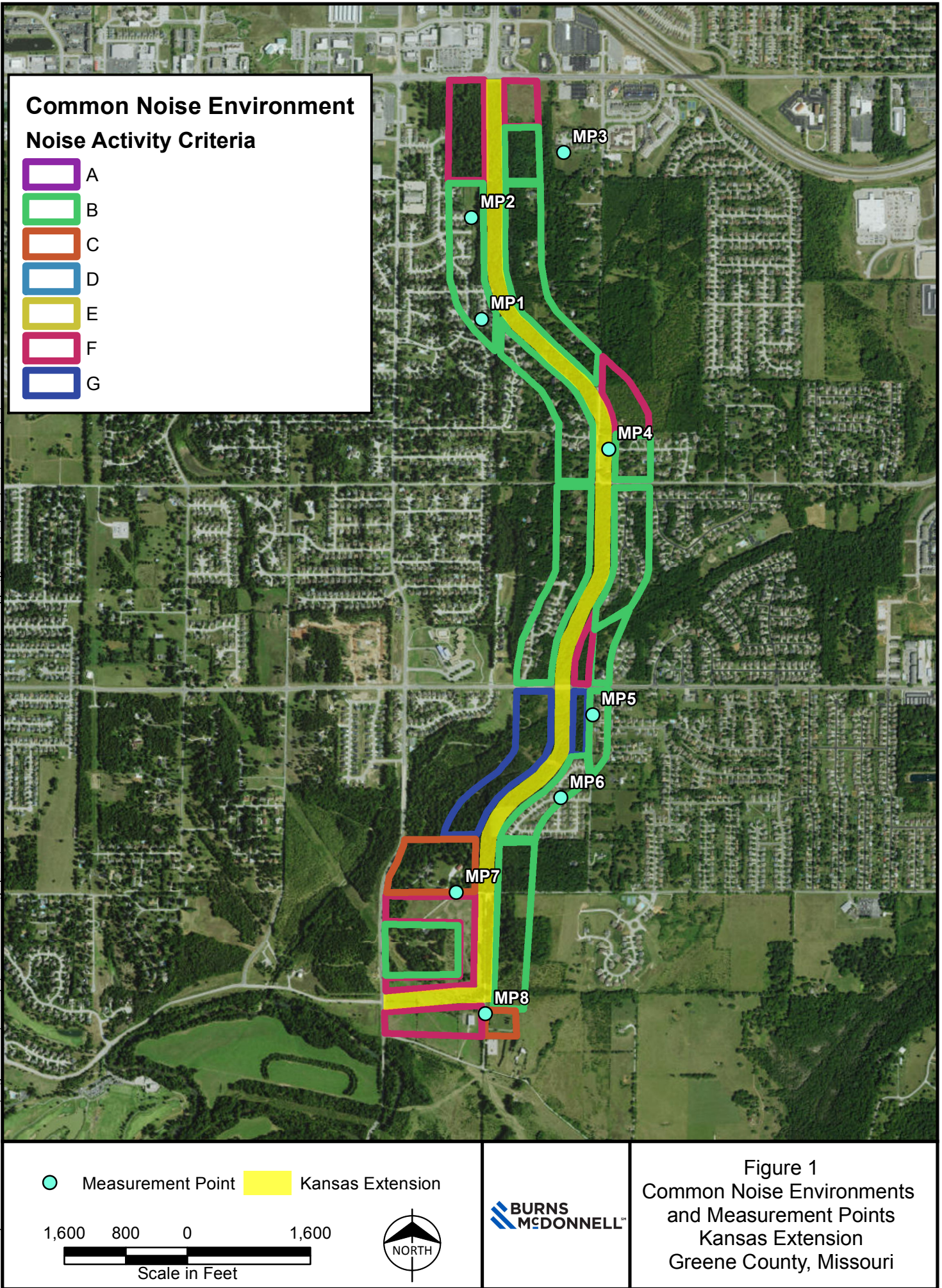
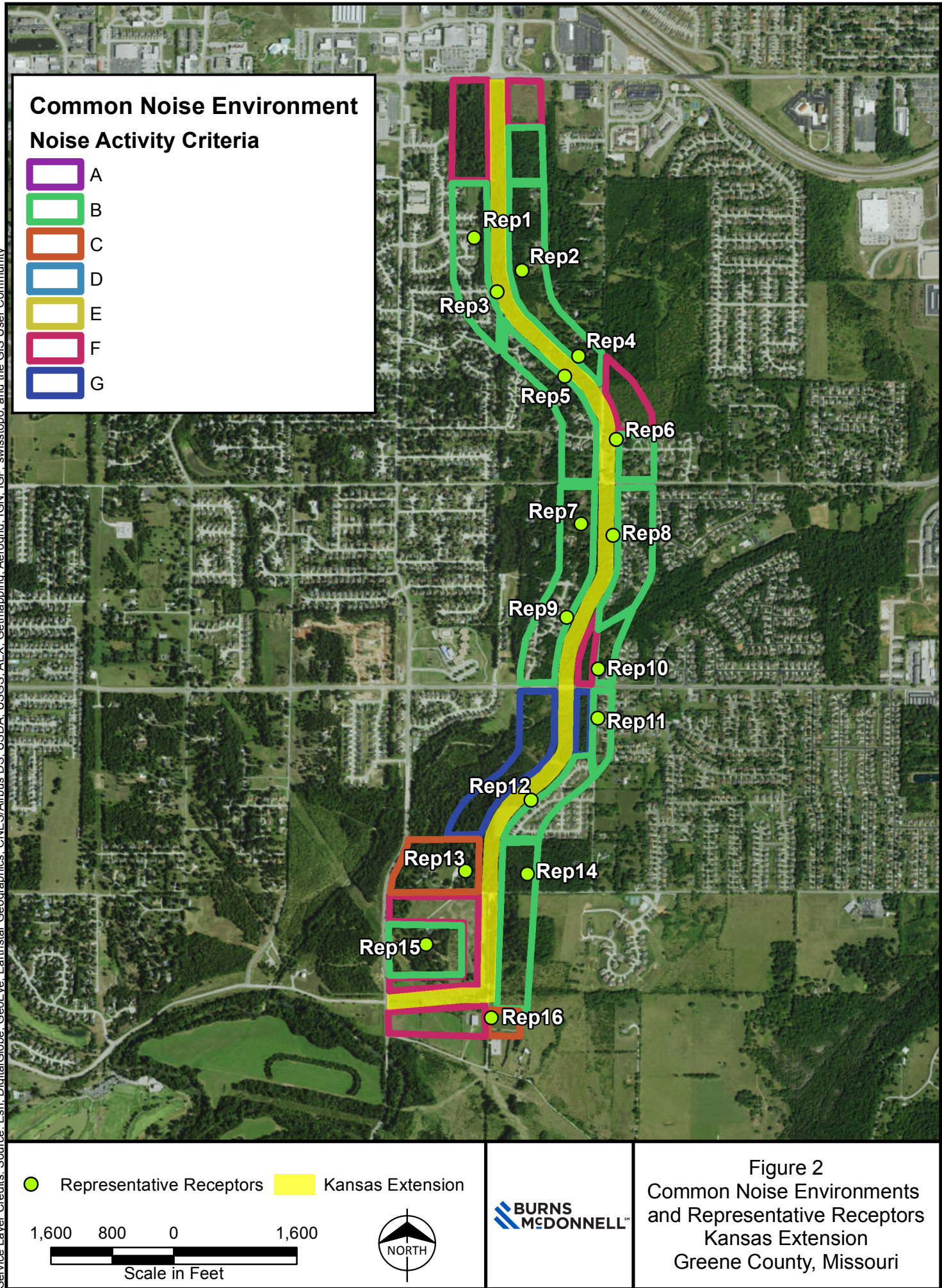
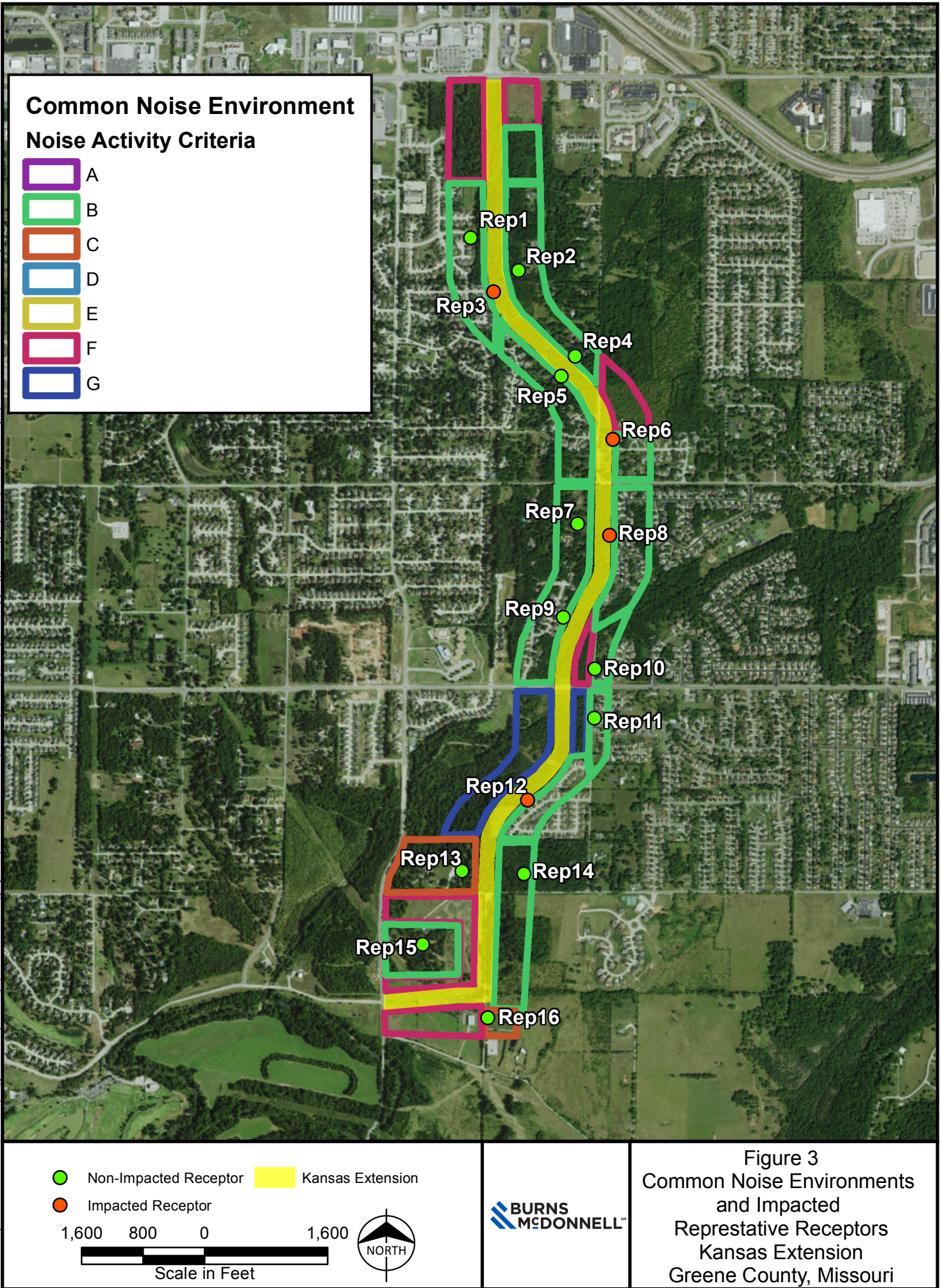


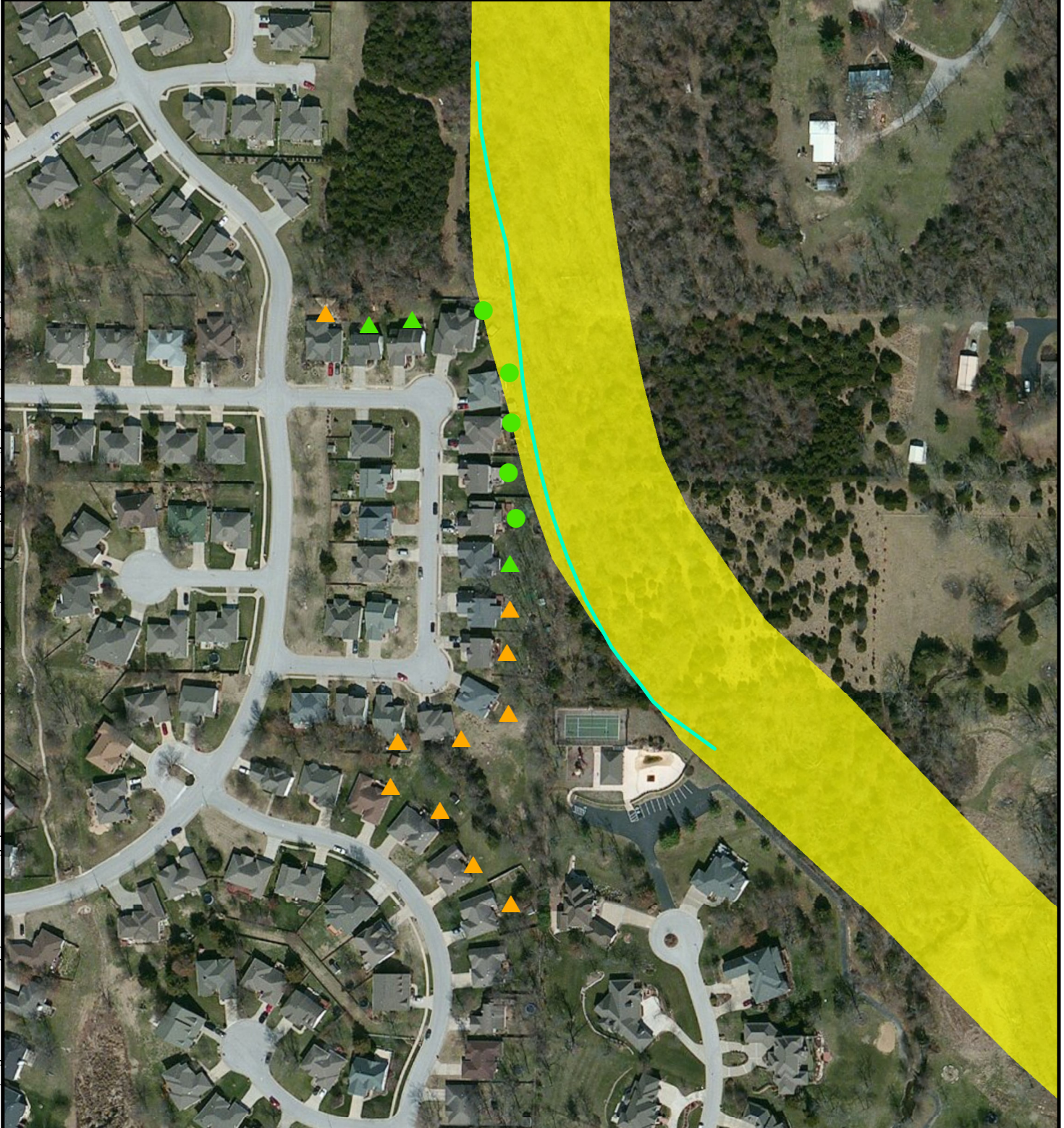
Figure 1
Common Noise Environments
and Measurement Points
Kansas Extension
Greene County, Missouri





Analyzed Receptors

- | | |
|--------------------------------|----------------------------|
| ▲ Not Impacted, Not Benefitted | ● Impacted, Not Benefitted |
| ▲ Not Impacted, Benefitted | ● Impacted, Benefitted |



— Analyzed Barrier Kansas Extension

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Scale in Feet

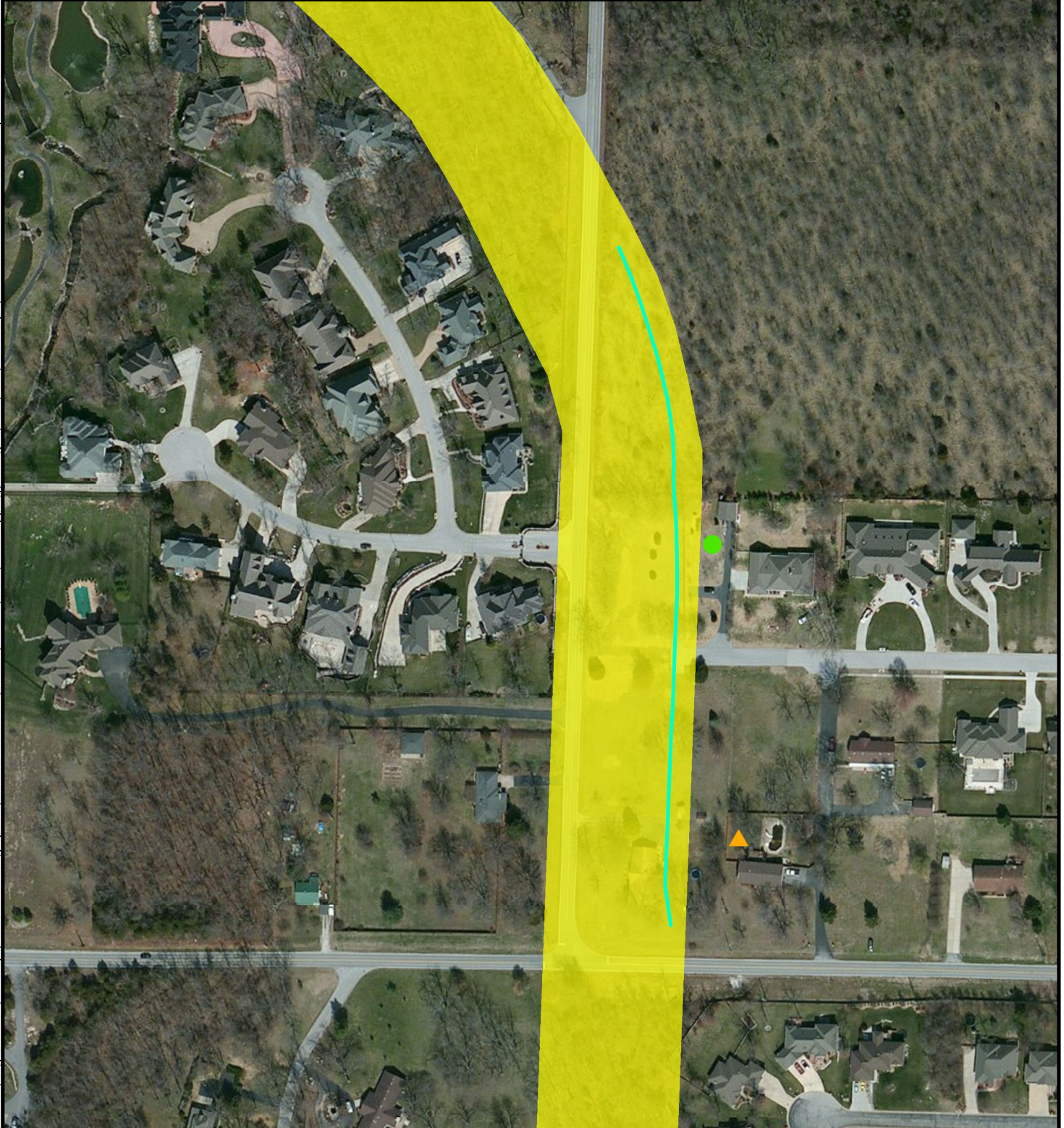


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MCDONNELL**

Figure 4
Barrier Analysis Results
Rep3
Kansas Extension
Greene County, Missouri

Analyzed Receptors

- | | |
|--------------------------------|----------------------------|
| ▲ Not Impacted, Not Benefitted | ● Impacted, Not Benefitted |
| ▲ Not Impacted, Benefitted | ● Impacted, Benefitted |



— Analyzed Barrier Kansas Extension

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 Scale in Feet

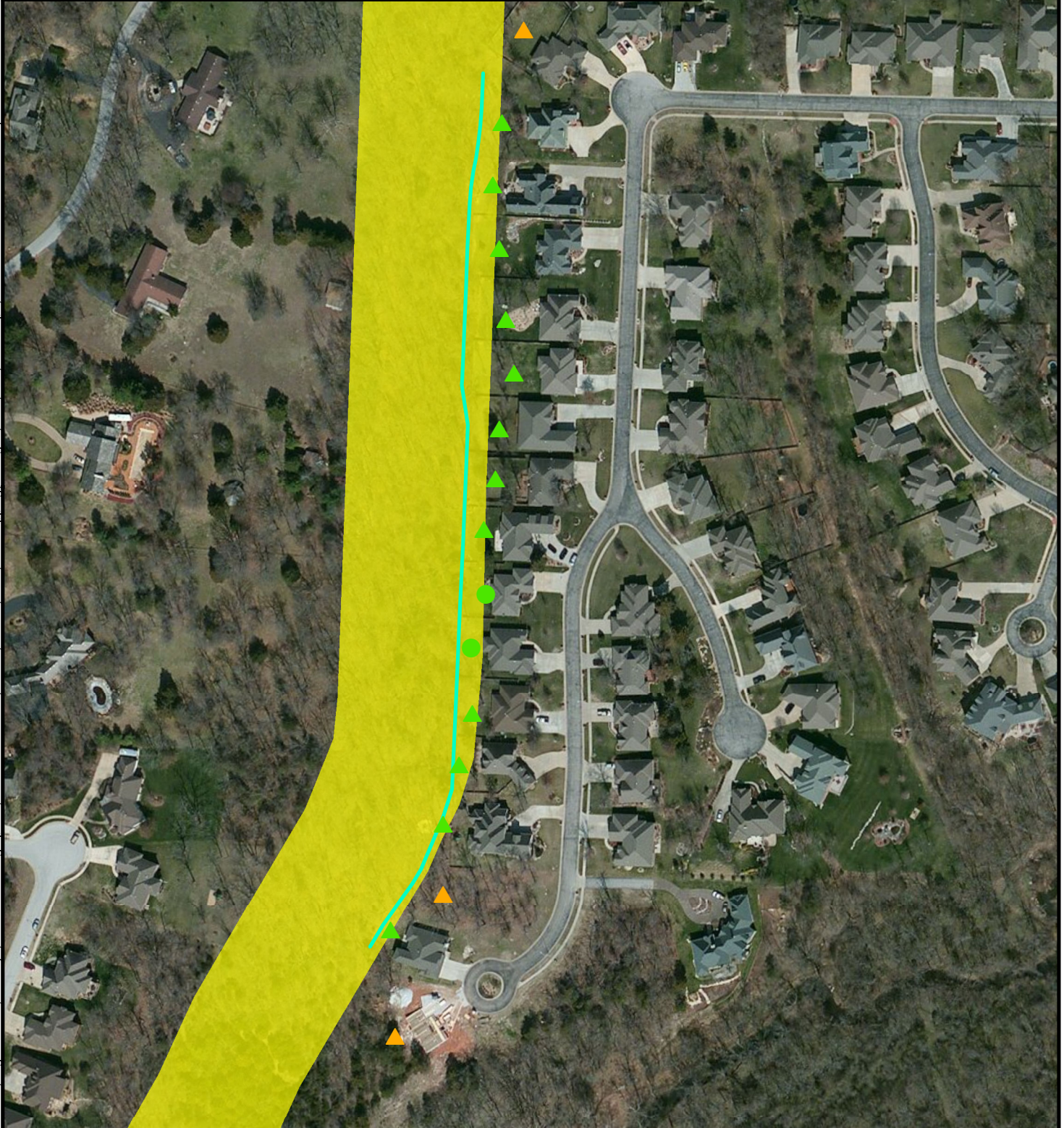


**BURNS
 McDONNELL**

Figure 5
Barrier Analysis Results
Rep6
Kansas Extension
Greene County, Missouri

Analyzed Receptors

- | | |
|--------------------------------|----------------------------|
| ▲ Not Impacted, Not Benefitted | ● Impacted, Not Benefitted |
| ▲ Not Impacted, Benefitted | ● Impacted, Benefitted |



— Analyzed Barrier Kansas Extension

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 Scale in Feet

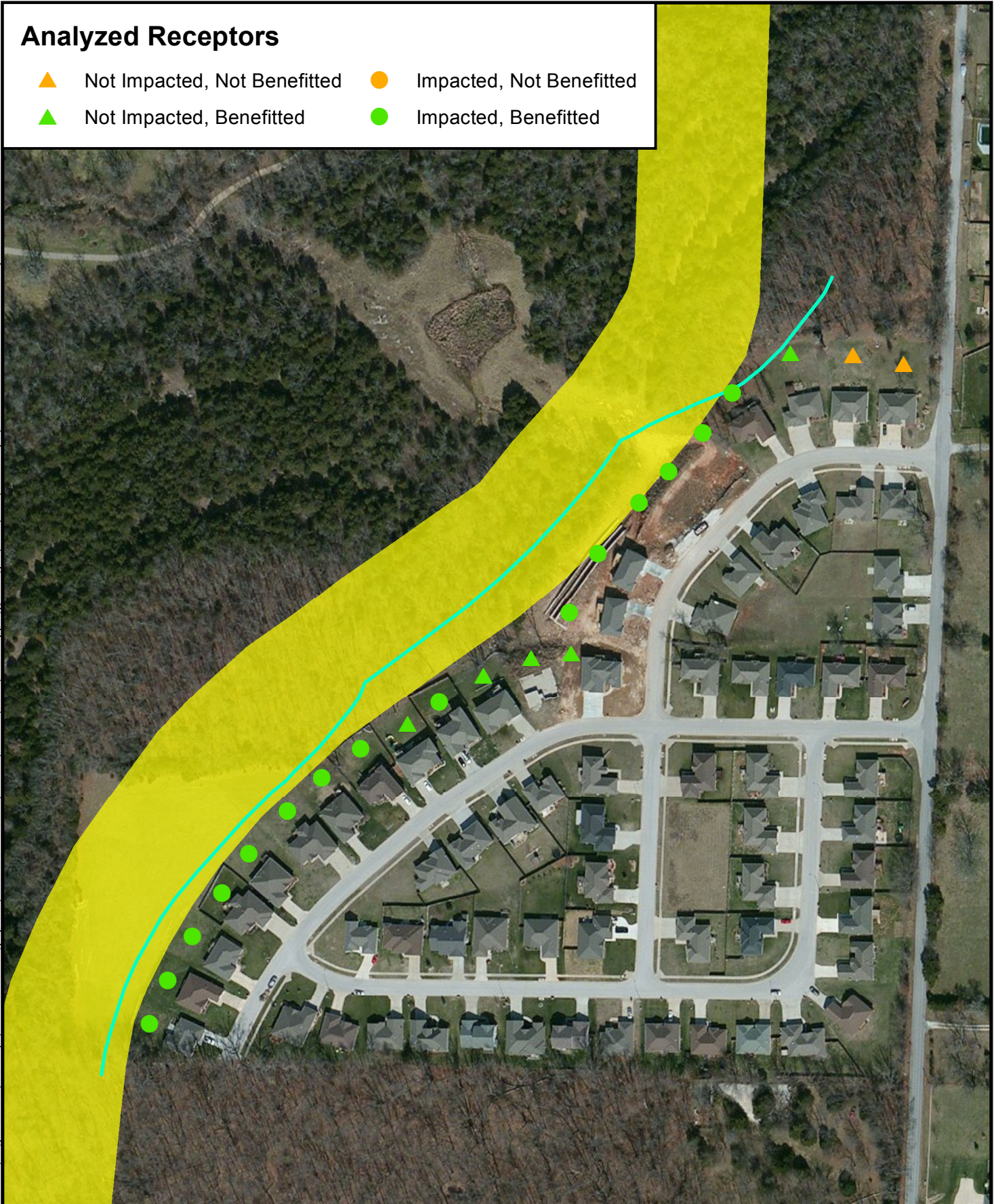


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Figure 6
 Barrier Analysis Results
 Rep8
 Kansas Extension
 Greene County, Missouri

Analyzed Receptors

- | | |
|--------------------------------|----------------------------|
| ▲ Not Impacted, Not Benefitted | ● Impacted, Not Benefitted |
| ▲ Not Impacted, Benefitted | ● Impacted, Benefitted |



— Analyzed Barrier Kansas Extension

200 100 0 200

 Scale in Feet



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Figure 7
 Barrier Analysis Results
 Rep12
 Kansas Extension
 Greene County, Missouri

ATTACHMENT B

Memorandum



Table 5: Sound Level Results and Impact Analysis for Representative Receptors

Representative Receptor	Background Sound Level L_{eq} (dBA)	Predicted Traffic Sound Level (dBA)^a	Overall Sound Level (dBA)^a	NAC Category^a	NAC Approach Sound Level (dBA)^a	Sound Level Increase (dBA)^a	Impacted?^b
Rep1	47.3	55.4	56.0	B	66	8.7	No
Rep2	49.4	55.9	56.8	B	66	7.4	No
Rep3	46.3	68.9	68.9	B	66	22.6	Yes
Rep4	46.3	59.4	59.6	B	66	13.3	No
Rep5	49.8	51.5	53.7	B	66	3.9	No
Rep6	49.8	64.7	64.8	B	66	15.0	Yes
Rep7	49.8	52.6	54.4	B	66	4.6	No
Rep8	49.8	64.7	64.8	B	66	15.0	Yes
Rep9	53.0	60.9	61.6	B	66	8.6	No
Rep10	53.0	54.0	56.5	B	66	3.5	No
Rep11	53.0	54.6	56.9	B	66	3.9	No
Rep12	44.7	60.8	60.9	B	66	16.2	Yes
Rep13	45.7	52.6	53.4	C	66	7.7	No
Rep14	45.7	49.4	50.9	B	66	5.2	No
Rep15	52.8	46.8	53.8	B	66	1.0	No
Rep16	52.8	53.8	56.4	C	66	3.5	No

(a) dBA = A-weighted decibels; NAC = Noise Activity Criteria

(b) Impacted if the predicted sound levels increased 15 decibels or more from the existing ambient sound levels

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APPENDIX D - WETLANDS STUDY



November 24, 2015

Adam Humphrey
Greene County Highway Department
2065 North Clifton Avenue
Springfield, MO 65803

Re: Wetland Delineation Report
Kansas Extension Project
Greene County

Dear Mr. Humphrey:

Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) was retained by Greene County, Missouri (Greene County) to provide wetland delineation services for the proposed Kansas Extension Project in Springfield, Greene County, Missouri (Project). The following sections provide information on the proposed Project and summarize the completed wetland delineation.

INTRODUCTION

Greene County is proposing to extend the Kansas Expressway to the south from Republic Road approximately 2.3 miles to a new connection with South Cox Road (S. Farm Road 141) at W. Farm Road 190 as shown in Figure A-1 (Survey Area). The Project is classified as an urban primary artery roadway, with two travel lanes in each direction separated by a grass median. As an additional north-south corridor in southern Greene County, the Project will alleviate traffic congestion from Cox Road and Campbell Avenue and provide an alternate route for the communities of Greene County.

The Project has the potential to impact wetlands or other waters of the U.S. that may be under the jurisdiction of the U.S. Army Corps of Engineers (USACE) as designated by Section 404 of the Clean Water Act. In an effort to avoid and minimize potential impacts to waters of the U.S., Burns & McDonnell conducted a wetland delineation of the Survey Area to determine the boundaries and extent of potential waters of the U.S., including streams, creeks, and ponds.

METHODS

The following discussions summarize the methods used to review existing data and conduct the wetland delineation.

Existing Data Review

Burns & McDonnell reviewed available background information for the Survey Area prior to conducting a site visit. This available background information included the 2011 U.S. Geological Survey (USGS) 7.5-minute topographic map (Springfield and Nixa, MO quadrangles), USGS National Hydrograph Dataset (NHD), Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL), U.S. Fish & Wildlife Service (USFWS) National Wetland Inventory (NWI) map, National Agriculture Imagery Program (NAIP) aerial photography



Adam Humphrey
Greene County Highway Department
November 24, 2015
Page 2

(2014), and U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) 2015 Soil Survey Geographic (SSURGO) digital data for Greene County. Maps generated from this available data are included as Figures A-2 and A-3 in Appendix A.

Wetland Delineation

A wetland delineation of the Survey Area was completed in accordance with the 1987 *Corps of Engineers Wetlands Delineation Manual* (1987 Manual) and the 2012 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountain and Piedmonts Region – Version 2.0* (Regional Supplement). Sample plots were established at multiple locations and Wetland Determination Data Forms from the Regional Supplement were completed to characterize the Survey Areas (Appendix B). Vegetation, soil conditions, and hydrologic indicators were recorded at each of these sample plots. Locations of sample plots and other identified features were surveyed using a real-time, sub-meter-accurate, Global Positioning System (GPS) unit. Natural color photographs were taken onsite and are included in Appendix C (Photographs C-1 through C-18).

RESULTS

The following sections describe the results of the existing data review and the completed wetland delineation.

Existing Data Review

The existing USGS topographic map was reviewed to familiarize Burns & McDonnell wetland personnel with the topography of the Survey Area and potential locations of waters of the U.S. (Figure A-2). The NFHL data and USGS topographic map indicate that parts of the Survey Area are located within the 100 year floodplains of Workman Branch and Ward Branch.

The USFWS NWI map does not indicate any wetlands located in the Survey Area (Figure A-2). Two tributaries to the James River, along with Ward Branch and Workman Branch, are indicated within the Survey Area. Wetland presence based only on NWI maps cannot be assumed to be an accurate assessment of potentially occurring jurisdictional wetlands. Wetland identification criteria differ between the USFWS and the USACE. As a result, wetlands shown on a NWI map may not be under the jurisdiction of the USACE, and USACE-jurisdictional wetlands are not always included on the NWI maps. Therefore, a field visit was conducted to identify any wetlands or other waters of the U.S. that may be present.

The 2014 aerial photograph indicates the Survey Area consists largely of forested and residential areas (Figure A-3). Two streams and no wetlands or ponds are visible within the Survey Area based on review of the aerial photography.



Adam Humphrey
Greene County Highway Department
November 24, 2015
Page 3

The NRCS SSURGO digital data indicate that 13 soil map units are located in the Survey Area (Figure A-3). These are:

- Goss gravelly silt loam, 8 to 15 percent slopes*
- Wanda silt loam, 2 to 5 percent slopes
- Goss-Gasconade complex, 3 to 50 percent slopes*
- Keeno-Bona complex, 2 to 5 percent slopes*
- Secesh-Cedargap complex, 1 to 3 percent slopes, frequently flooded
- Viraton silt loam, 2 to 5 percent slopes*
- Wilderness gravelly silt loam, 3 to 8 percent slopes*
- Gasconade-Gatewood-Rock outcrop complex, 3 to 15 percent slopes*
- Winnipeg silt loam, 2 to 5 percent slopes
- Goss-Wilderness complex, 3 to 8 percent slopes
- Dapue silt loam, 0 to 2 percent slopes, occasionally flooded*
- Cedargap silt loam, 1 to 3 percent slopes, frequently flooded*
- Secesh-Cedargap complex, 0 to 2 percent slopes, frequently flooded

Of these 13 map units, the 8 marked with an asterisk are included on local and national hydric soil lists. Hydric soil maps can indicate the presence of hydric conditions; however, a site investigation is required to verify that hydric soil is present.

Wetland Delineation

On October 13, 2015, and November 17, 2015, Brianna Richards and Cody Clark, wetland scientists with Burns & McDonnell, conducted a wetland delineation of the Survey Area. The Survey Area was largely composed of forested and residential areas. Typical tree species within the forested areas included American sycamore (*Platanus occidentalis*), shagbark hickory (*Carya ovata*), and slippery elm (*Ulmus rubra*). Typical herbaceous species included coral-berry (*Symphoricarpos orbiculatus*) and multiflora rose (*Rosa multiflora*).

Typical soils in the Survey Area were dark grayish brown (10YR 4/2) or very dark grayish brown (10YR 3/2) in color. Redoximorphic features were observed in the wetland sample plot. Soils were typically silt loam in texture. The primary source of hydrology in the Survey Area was precipitation.

Jurisdictional Areas

One wetland and six streams were identified during the wetland delineation (Photographs C-1 through C-18). The wetland and streams are described below and shown in Figure A-4. Table 1 provides the type and size of the features delineated in the Survey Area.

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Greene County Highway Department
November 24, 2015
Page 4

Wetland 1 (W-1). Wetland 1 is a 0.065-acre palustrine forested (PFO) wetland located near the southern end of the Survey Area (Figure A-4, Page 1; Photograph C-1). The dominant plant species included black willow (*Salix nigra*), American sycamore, and tall fescue (*Schedonorus arundinaceus*). Indicators of hydrology present in W-1 included drainage patterns, a concave geomorphic position, and a positive FAC-neutral test.

Stream 1 (S-1). Stream 1 (136 feet delineated) is an ephemeral stream originating from a spring that flows north near the southern end of the Survey Area (Figure A-4, page 1; Photographs C-8 and C-9). This stream channel averaged 2 feet wide and 0.1 foot deep. The average bank height was 0.5 foot. Vegetation along S-1 included eastern red cedar (*Juniperus virginiana*) and coral-berry. The substrate of S-1 consisted of silt cobble.

Stream 2 (S-2). Stream 2 (94 feet delineated) is an ephemeral stream that flows north near the southern end of the Survey Area (Figure A-4, page 1; Photographs C-10 and C-11). This stream averaged 2 feet wide and had banks that averaged 0.5 foot high. Vegetation along S-2 included eastern red cedar and coral-berry. The substrate of S-2 consisted of silt and gravel. No water was present in S-2 during the site visit.

Stream 3 (S-3). Stream 3 (420 feet delineated) is an ephemeral stream that flows south across the central portion of the Survey Area (Figure A-4, page 2; Photograph C-12). This stream averaged 3 feet wide and had banks that averaged 1 foot high. Vegetation along S-3 included eastern red cedar and coral-berry. The substrate of S-3 consisted of silt and cobble. No water was present in S-3 during the site visit.

Stream 4 (S-4). Stream 4, Ward Branch (536 feet delineated), is a perennial stream that typically flows southwest across the central portion of the Survey Area (Figure C-4, page 2; Photographs C-13 and C-14). Although no water was present in S-4 during the site visit, the stream was classified as perennial on the USGS topographic map as well as in the NHD dataset. Therefore, Ward Branch was designated as perennial. This stream channel averaged 8 feet wide, had a 1 foot ordinary high water mark (OHWM), and had banks that averaged 6 feet high. Vegetation along S-4 included common eastern red cedar and slippery elm. The substrate of S-4 consisted of silt and cobble.

Stream 5 (S-5). Stream 5 (210 feet delineated) is an ephemeral stream that flows southeast across the northern portion of the Survey Area (Figure A-4, page 3; Photographs C-15 and C-16). This stream averaged 1 foot wide and had banks that averaged 0.5 foot high. Vegetation along S-5 included eastern red cedar and coral-berry. The substrate of S-5 consisted of silt, and 0.5 foot of water was present in S-5 during the site visit.



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Greene County Highway Department
November 24, 2015
Page 5

Stream 6 (S-6). Stream 6, Workman Branch (444 feet delineated), is a perennial stream that flows southwest across the central portion of the Survey Area (Figure C-4, page 3; Photographs C-17 and C-18). This stream channel averaged 15 feet wide and had banks that averaged 5 feet high. Vegetation along S-6 included common eastern red cedar and slippery elm. The substrate of S-6 consisted of silt and cobble. Two feet of water was present in S-6 during the site visit, and the water was above the OHWM.

SUMMARY

Burns & McDonnell conducted a wetland delineation of the Survey Area to identify wetlands and other waters of the U.S. A total of one PFO wetland, four ephemeral streams, and two perennial streams were identified within the Survey Area.

Thank you for the opportunity to assist with this Project. If you have any questions regarding this wetland delineation or require additional information, please contact Brianna Richards by telephone at (816) 447-9928 or by e-mail at brichards@burnsmcd.com.

Sincerely,

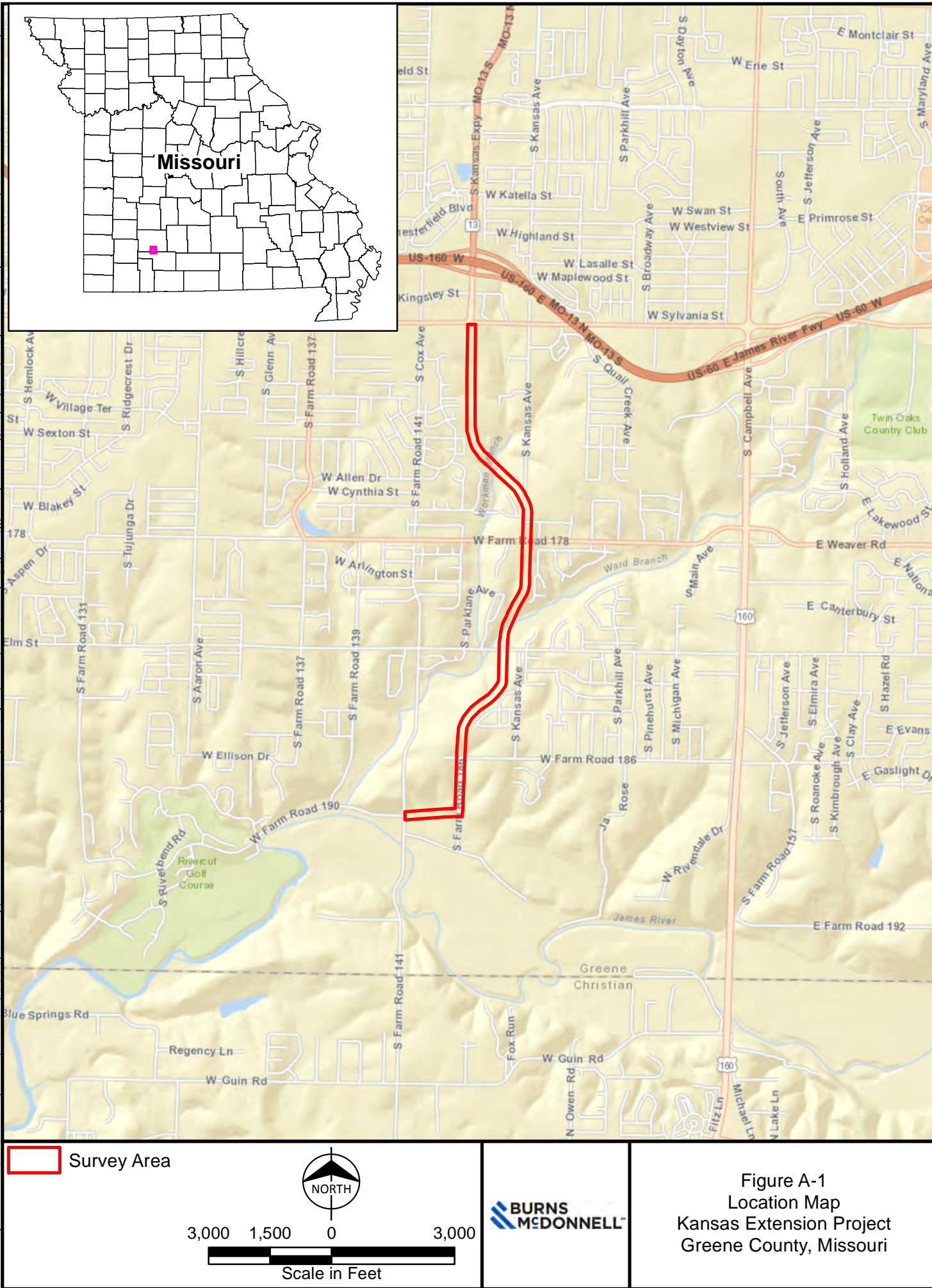
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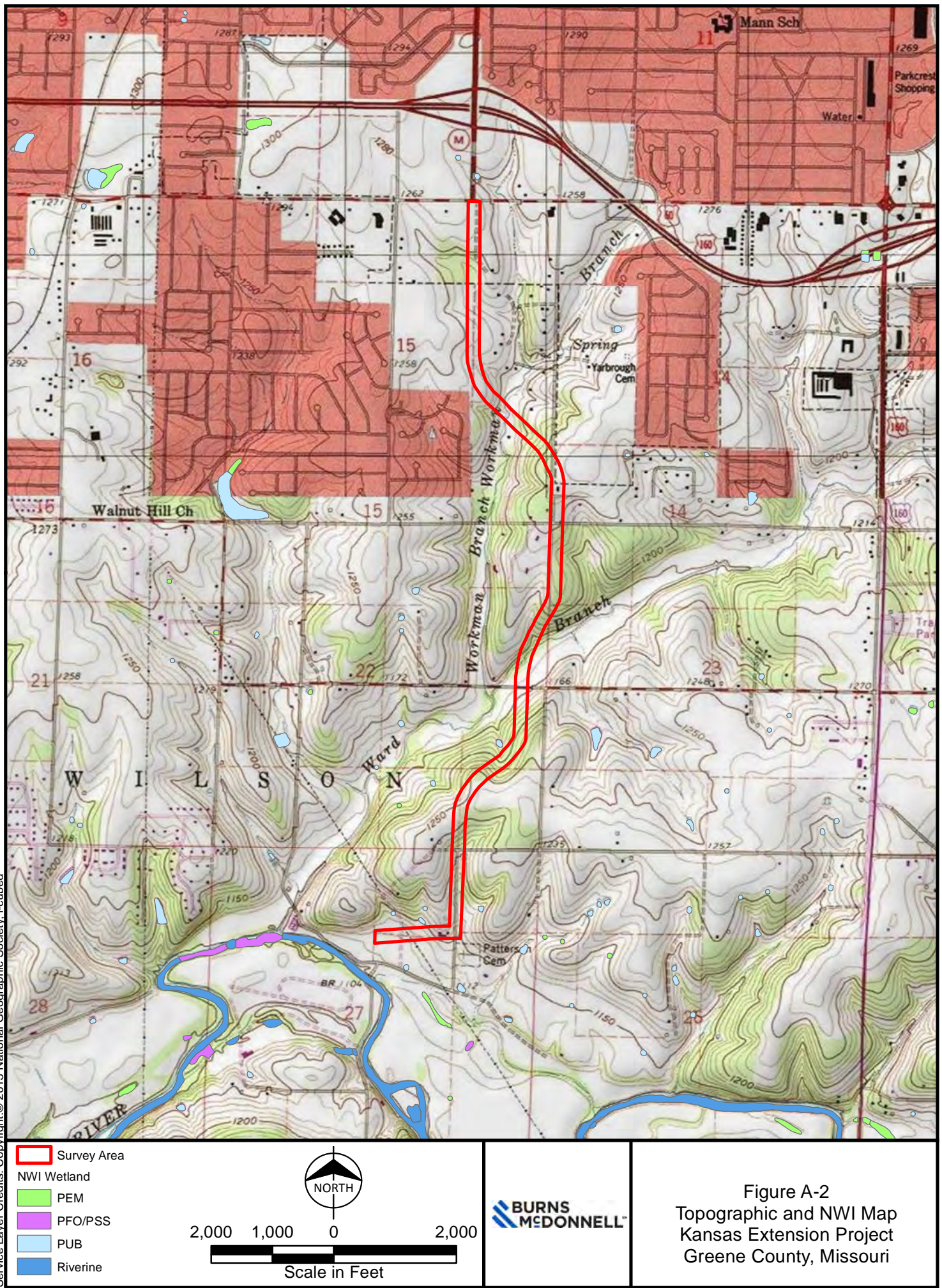
Brianna Richards
Wetland Specialist

Attachments:

- Appendix A - Figures
- Appendix B - Routine Wetland Determination Data Forms, Eastern Mountain and Piedmonts Region
- Appendix C - Site Photographs

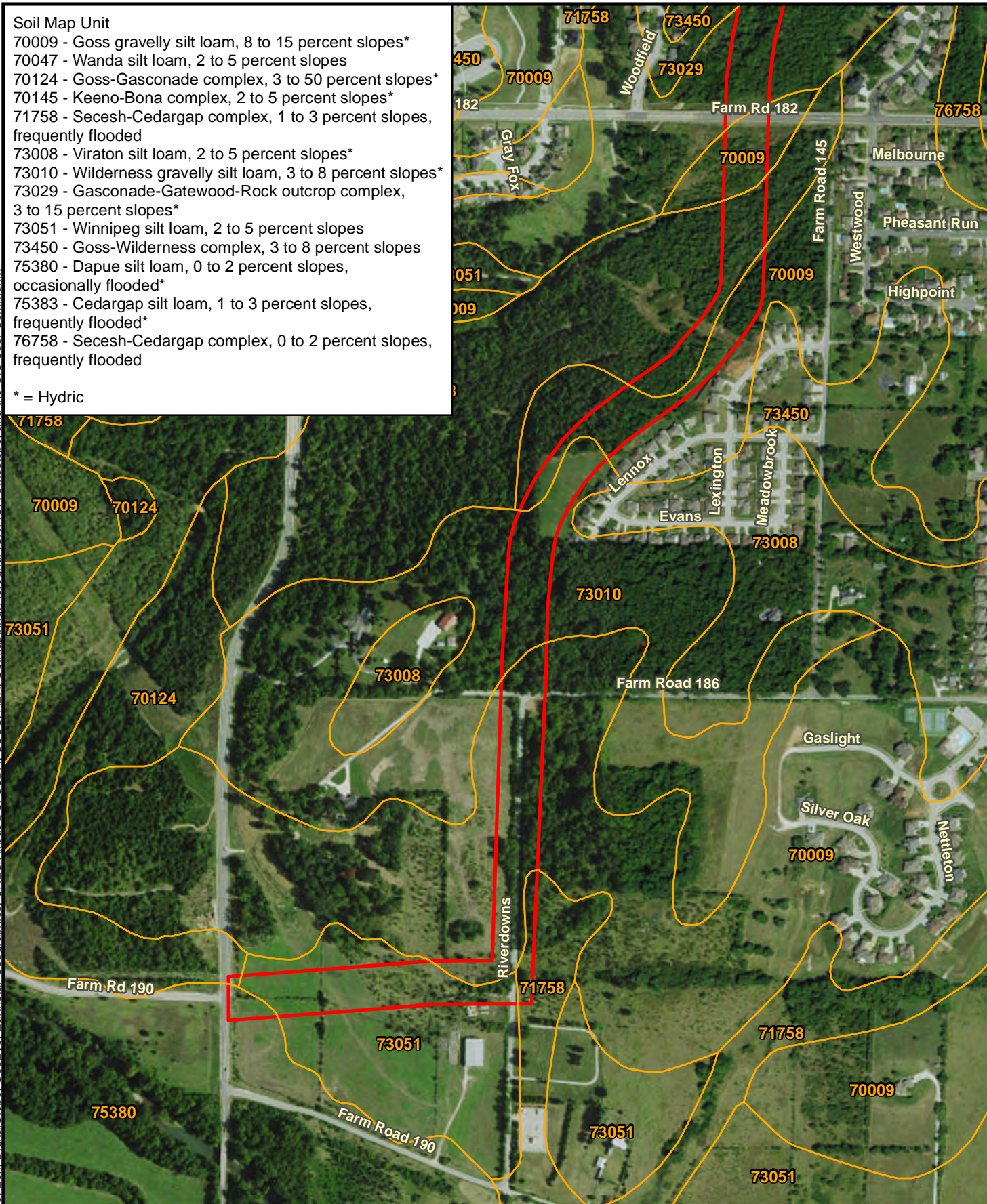
APPENDIX A - FIGURES





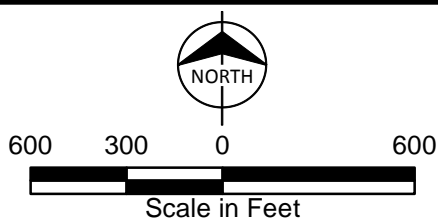


Soil Map Unit
 70009 - Goss gravelly silt loam, 8 to 15 percent slopes*
 70047 - Wanda silt loam, 2 to 5 percent slopes
 70124 - Goss-Gasconade complex, 3 to 50 percent slopes*
 70145 - Keeno-Bona complex, 2 to 5 percent slopes*
 71758 - Secesh-Cedargap complex, 1 to 3 percent slopes, frequently flooded
 73008 - Viraton silt loam, 2 to 5 percent slopes*
 73010 - Wilderness gravelly silt loam, 3 to 8 percent slopes*
 73029 - Gasconade-Gatewood-Rock outcrop complex, 3 to 15 percent slopes*
 73051 - Winnipeg silt loam, 2 to 5 percent slopes
 73450 - Goss-Wilderness complex, 3 to 8 percent slopes
 75380 - Dapue silt loam, 0 to 2 percent slopes, occasionally flooded*
 75383 - Cedargap silt loam, 1 to 3 percent slopes, frequently flooded*
 76758 - Secesh-Cedargap complex, 0 to 2 percent slopes, frequently flooded

* = Hydric



 Survey Area
 Soil Map Unit





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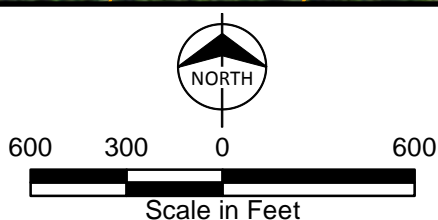
Figure A-3
 Soils Map
 Kansas Extension Project
 Greene County, Missouri
 Page 1 of 3

Soil Map Unit
 70009 - Goss gravelly silt loam, 8 to 15 percent slopes*
 70047 - Wanda silt loam, 2 to 5 percent slopes
 70124 - Goss-Gasconade complex, 3 to 50 percent slopes*
 70145 - Keeno-Bona complex, 2 to 5 percent slopes*
 71758 - Secesh-Cedargap complex, 1 to 3 percent slopes, frequently flooded
 73008 - Viraton silt loam, 2 to 5 percent slopes*
 73010 - Wilderness gravelly silt loam, 3 to 8 percent slopes*
 73029 - Gasconade-Gatewood-Rock outcrop complex, 3 to 15 percent slopes*
 73051 - Winnipeg silt loam, 2 to 5 percent slopes
 73450 - Goss-Wilderness complex, 3 to 8 percent slopes
 75380 - Dapue silt loam, 0 to 2 percent slopes, occasionally flooded*
 75383 - Cedargap silt loam, 1 to 3 percent slopes, frequently flooded*
 76758 - Secesh-Cedargap complex, 0 to 2 percent slopes, frequently flooded

* = Hydric



 Survey Area
 Soil Map Unit





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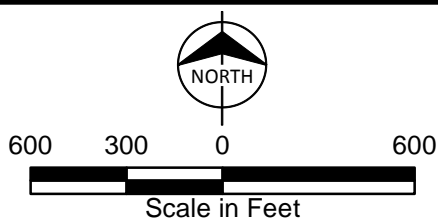
Figure A-3
 Soils Map
 Kansas Extension Project
 Greene County, Missouri
 Page 2 of 3

Soil Map Unit
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 70047 - Wanda silt loam, 2 to 5 percent slopes
 70124 - Goss-Gasconade complex, 3 to 50 percent slopes*
 70145 - Keeno-Bona complex, 2 to 5 percent slopes*
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 73450 - Goss-Wilderness complex, 3 to 8 percent slopes
 75380 - Dapue silt loam, 0 to 2 percent slopes, occasionally flooded*
 75383 - Cedargap silt loam, 1 to 3 percent slopes, frequently flooded*
 76758 - Secesh-Cedargap complex, 0 to 2 percent slopes, frequently flooded

* = Hydric



 Survey Area
 Soil Map Unit

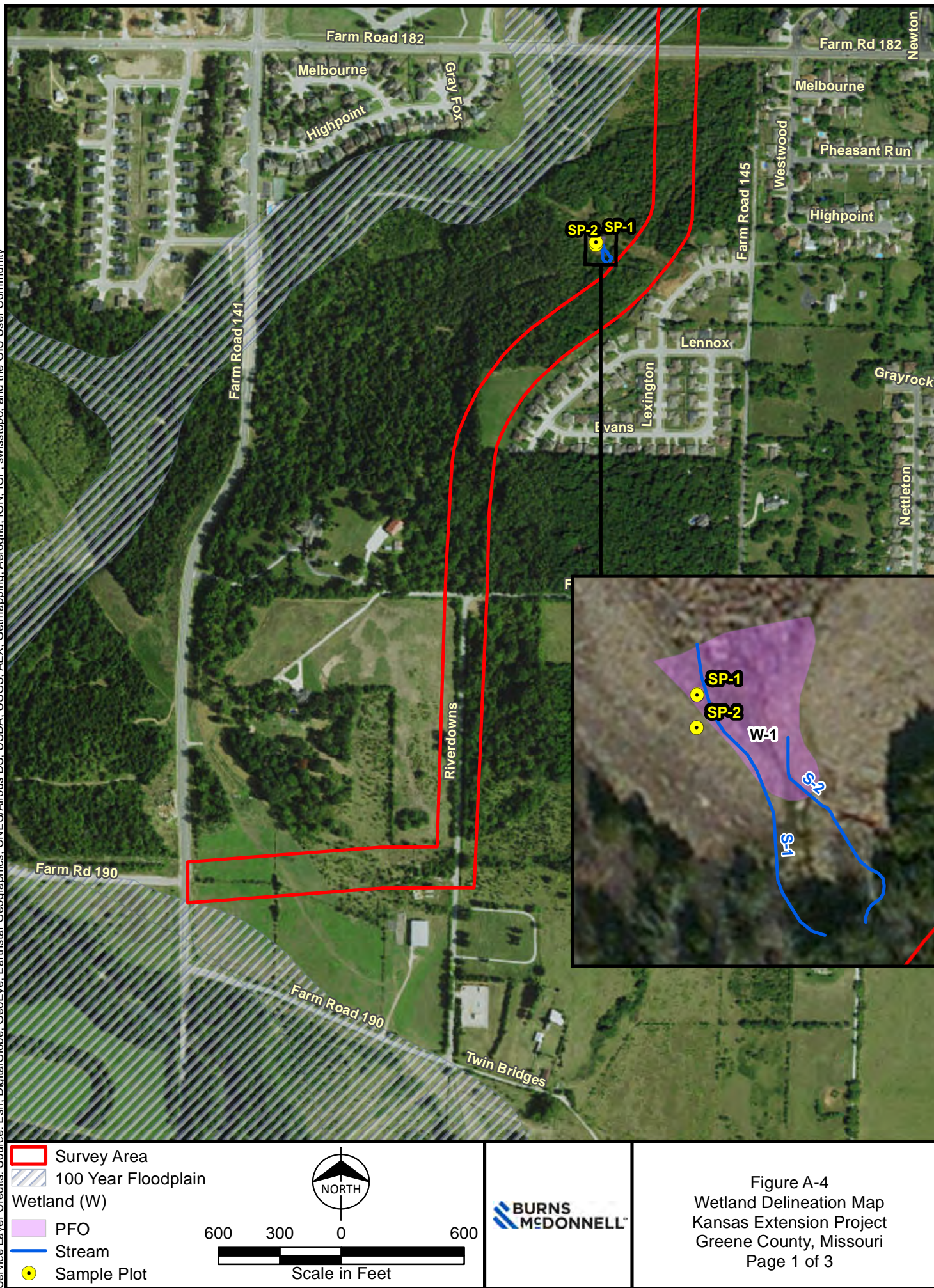


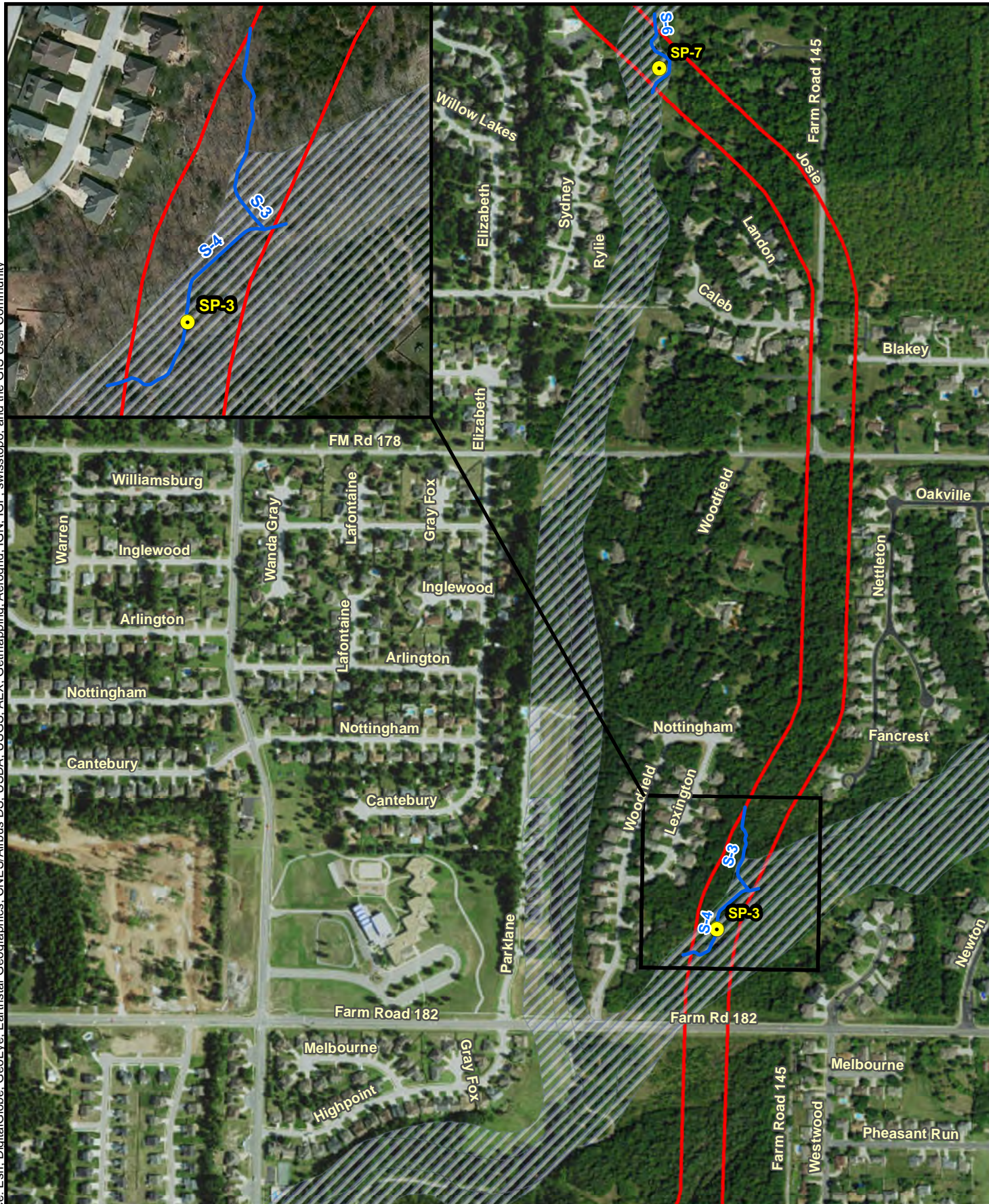
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 McDONNELL**

Figure A-3
 Soils Map
 Kansas Extension Project
 Greene County, Missouri
 Page 3 of 3

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- Survey Area
- 100 Year Floodplain
- Wetland (W)
- PFO
- Stream
- Sample Plot

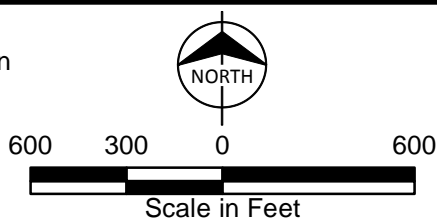


Figure A-4
Wetland Delineation Map
Kansas Extension Project
Greene County, Missouri
Page 2 of 3

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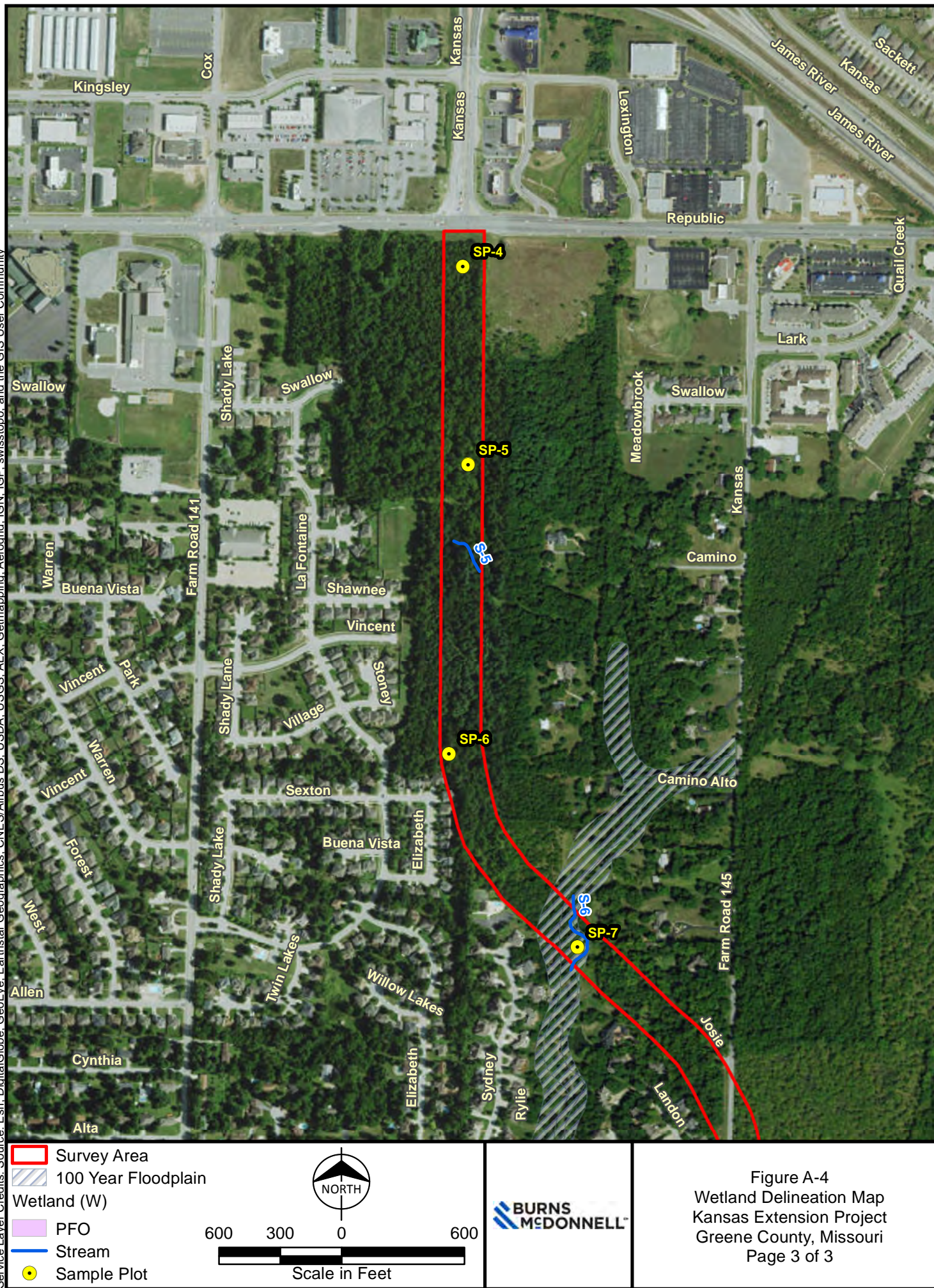


Figure A-4
Wetland Delineation Map
Kansas Extension Project
Greene County, Missouri
Page 3 of 3

**APPENDIX B - ROUTINE WETLAND DETERMINATION DATA FORMS,
EASTERN MOUNTAIN AND PIEDMONT REGION**

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Kansas Extension Project City/County: Greene County Sampling Date: 10/13/2015
 Applicant/Owner: Greene County State: MO Sampling Point: SP-1
 Investigator(s): B. Richards, C. Clark Section, Township, Range: S22, T28N, R22W
 Landform (hillslope, terrace, etc.): depression Local relief (concave, convex, none): concave Slope (%): 2
 Subregion (LRR or MLRA): H Lat: 37.11394 Long: -93.31807 Datum: NAD 83
 Soil Map Unit Name: Viraton silt loam, 2 to 5 percent slopes NWI Classification: N/A

Are climate/hydrologic conditions on the site typical for this time of year? ☒ Yes ☐ No (If no, explain in Remarks)
 Vegetation Soil Hydrology Are "Normal Circumstances" present? ☒ Yes ☐ No
 Significantly Disturbed? ☐ ☐ ☐
 Naturally Problematic? ☐ ☐ ☐ (If needed, explain any answers in Remarks)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No	Remarks: PFO Wetland W-1. Photo C-1.
Hydrophytic Vegetation Present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Hydric Soil Present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Wetland Hydrology Present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Is the Sampled Area within a Wetland?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one required; check all that apply)</u> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> High Water Table (A2) <input 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 type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13) </div> <div style="width: 45%;"> <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input 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) </div> </div>			<u>Secondary Indicators (2 or more required)</u> <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8) <input checked="" 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 type="checkbox"/> Stunted or Stressed Plants (D1) <input checked="" type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input checked="" type="checkbox"/> FAC-Neutral Test (D5)																				
Field Observations:	<table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 40%;"></th> <th style="width: 10%;">Yes</th> <th style="width: 10%;">No</th> <th style="width: 40%;">Depth (inches):</th> </tr> <tr> <td>Surface Water Present?</td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td>_____</td> </tr> <tr> <td>Water Table Present?</td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td>_____</td> </tr> <tr> <td>Saturation Present? (includes capillary fringe)</td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td>_____</td> </tr> <tr> <td>Wetland Hydrology Present?</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> <td></td> </tr> </table>		Yes	No	Depth (inches):	Surface Water Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____	Water Table Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____	Saturation Present? (includes capillary fringe)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____	Wetland Hydrology Present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections, etc.), if available:	
	Yes	No	Depth (inches):																				
Surface Water Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____																				
Water Table Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____																				
Saturation Present? (includes capillary fringe)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____																				
Wetland Hydrology Present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>																					
Remarks: Wetland hydrology indicators B10, D2, and D5 are present.																							

VEGETATION (Four Strata) – Use scientific names of plants

 Sampling Point: SP-1

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status	
1. <u>Salix nigra</u>	40 %	Y	OBL	Dominance Test worksheet: Number of Dominant Species that are OBL, FACW, or FAC: <u>2</u> (A) Total Number of Dominant Species Across All Strata: <u>3</u> (B) Percent of Dominant Species that are OBL, FACW, or FAC: <u>67%</u> (A/B)
2. _____	%			
3. _____	%			
4. _____	%			
5. _____	%			
6. _____	%			
7. _____	%			
40 % = Total Cover				Prevalence Index worksheet: <div style="display: flex; justify-content: space-between;"> Total % Cover of: Multiply by: </div> OBL species _____ % x 1 = <u>0</u> FACW species _____ % x 2 = <u>0</u> FAC species _____ % x 3 = <u>0</u> FACU species _____ % x 4 = <u>0</u> UPL species _____ % x 5 = <u>0</u> Column Totals: <u>0</u> % (A) <u>0</u> (B) Prevalence Index = B/A = _____
				Hydrophytic Vegetation Indicators: <input type="checkbox"/> Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> Dominance Test is >50% <input type="checkbox"/> Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) <small>¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic</small>
				Definitions 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? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Woody Vine Stratum (Plot size: 30')				Remarks: Hydrophytic vegetation is present.
1. _____	%			
2. _____	%			
3. _____	%			
4. _____	%			
5. _____	%			
		0 % = Total Cover		

SOIL

Sampling Point: SP-1

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		
0-8	10YR 4/2	90	10YR 4/4	10	C	M	Silt Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains²Location: PL=Pore Lining, M=Matrix**Hydric Soil Indicators:**

- | | |
|---|---|
| <input type="checkbox"/> Histosol (A1) | <input type="checkbox"/> Dark Surface (S7) |
| <input type="checkbox"/> Histic Epipedon (A2) | <input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148) |
| <input type="checkbox"/> Black Histic (A3) | <input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148) |
| <input type="checkbox"/> Hydrogen Sulfide (A4) | <input type="checkbox"/> Loamy Gleyed Matrix (F2) |
| <input type="checkbox"/> Stratified Layers (A5) | <input checked="" type="checkbox"/> Depleted Matrix (F3) |
| <input type="checkbox"/> 2 cm Muck (A10) (LRR N) | <input type="checkbox"/> Redox Dark Surface (F6) |
| <input type="checkbox"/> Depleted Below Dark Surface (A11) | <input type="checkbox"/> Depleted Dark Surface (F7) |
| <input type="checkbox"/> Thick Dark Surface (A12) | <input type="checkbox"/> Redox Depressions (F8) |
| <input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148) | <input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136) |
| <input type="checkbox"/> Sandy Gleyed Matrix (S4) | <input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122) |
| <input type="checkbox"/> Sandy Redox (S5) | <input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148) |
| <input type="checkbox"/> Stripped Matrix (S6) | |

Indicators for Problematic Hydric Soils³:

- ☐ 2 cm Muck (A10) (**MLRA 147**)
☐ Coast Prairie Redox (A16) (**MLRA 147, 148**)
☐ Piedmont Floodplain Soils (F19) (**MLRA 136, 147**)
☐ Red Parent Material (TF2)
☐ Very Shallow Dark Surface (TF12)
☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: Gravel fill Depth (inches): 8

Hydric Soil Present?☒ Yes ☐ No

Remarks: Hydric soil indicator F3 is present.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Kansas Extension Project City/County: Greene County Sampling Date: 10/13/2015
 Applicant/Owner: Greene County State: MO Sampling Point: SP-2
 Investigator(s): B. Richards, C. Clark Section, Township, Range: S22, T28N, R22W
 Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): convex Slope (%): 5
 Subregion (LRR or MLRA): H Lat: 37.113903 Long: -93.318072 Datum: NAD 83
 Soil Map Unit Name: Viraton silt loam, 2 to 5 percent slopes NWI Classification: N/A

Are climate/hydrologic conditions on the site typical for this time of year? ☐ Yes ☐ No (If no, explain in Remarks)

	Vegetation	Soil	Hydrology	Are "Normal Circumstances" present? <input type="checkbox"/> Yes <input type="checkbox"/> No
Significantly Disturbed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Naturally Problematic?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(If needed, explain any answers in Remarks)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No	Remarks: Photo C-2
Hydrophytic Vegetation Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Hydric Soil Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Wetland Hydrology Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Is the Sampled Area within a Wetland?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one required; check all that apply)</u>			<u>Secondary Indicators (2 or more required)</u>		
<input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> High Water Table (A2) <input 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 type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input 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 type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)			
Field Observations:			Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections, etc.), if available:		
	Yes	No	Depth (inches):		
Surface Water Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____		
Water Table Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____		
Saturation Present? (includes capillary fringe)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____		
Wetland Hydrology Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
Remarks: No wetland hydrology indicators are present.					

VEGETATION (Four Strata) – Use scientific names of plants

 Sampling Point: SP-2

Tree Stratum	(Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status	
1. <u>Salix nigra</u>		5 %	Y	OBL	Dominance Test worksheet: Number of Dominant Species that are OBL, FACW, or FAC: <u>2</u> (A) Total Number of Dominant Species Across All Strata: <u>5</u> (B) Percent of Dominant Species that are OBL, FACW, or FAC: <u>40%</u> (A/B)
2. _____		%			
3. _____		%			
4. _____		%			
5. _____		%			
6. _____		%			
7. _____		%			
		<u>5 %</u> = Total Cover			
Sapling/Shrub Stratum	(Plot size: 15')				Prevalence Index worksheet: <div style="display: flex; justify-content: space-between;"> Total % Cover of: Multiply by: </div> OBL species <u>5 %</u> x 1 = <u>5</u> FACW species <u>5 %</u> x 2 = <u>10</u> FAC species <u>20 %</u> x 3 = <u>60</u> FACU species <u>5 %</u> x 4 = <u>20</u> UPL species <u>95 %</u> x 5 = <u>475</u> Column Totals: <u>130 %</u> (A) <u>570</u> (B) Prevalence Index = B/A = <u>4.38</u>
1. <u>Platanus occidentalis</u>		5 %	Y	FACW	
2. <u>Ceanothus cuneatus</u>		5 %	Y	NL	
3. <u>Juniperus virginiana</u>		5 %	Y	FACU	
4. _____		%			
5. _____		%			
6. _____		%			
		<u>15 %</u> = Total Cover			
Herb Stratum	(Plot size: 5')				Hydrophytic Vegetation Indicators: <input type="checkbox"/> Rapid Test for Hydrophytic Vegetation <input type="checkbox"/> Dominance Test is >50% <input type="checkbox"/> Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic
1. <u>Bromus inermis</u>		70 %	Y	UPL	
2. <u>Symphyotrichum pilosum</u>		20 %	N	FAC	
3. <u>Daucus carota</u>		15 %	N	UPL	
4. <u>Medicago sativa</u>		5 %	N	UPL	
5. _____		%			
6. _____		%			
7. _____		%			
8. _____		%			
9. _____		%			
10. _____		%			
11. _____		%			
		<u>110 %</u> = Total Cover			
Woody Vine Stratum	(Plot size: 30')				Definitions 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. _____		%			
		<u>0 %</u> = Total Cover			
Remarks: Hydrophytic vegetation is not present.					Hydrophytic Vegetation Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

SOIL

Sampling Point: SP-2

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		
0-1	10YR 4/3	100					Silt Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains²Location: PL=Pore Lining, M=Matrix**Hydric Soil Indicators:**

- | | |
|---|---|
| <input type="checkbox"/> Histosol (A1) | <input type="checkbox"/> Dark Surface (S7) |
| <input type="checkbox"/> Histic Epipedon (A2) | <input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148) |
| <input type="checkbox"/> Black Histic (A3) | <input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148) |
| <input type="checkbox"/> Hydrogen Sulfide (A4) | <input type="checkbox"/> Loamy Gleyed Matrix (F2) |
| <input type="checkbox"/> Stratified Layers (A5) | <input checked="" type="checkbox"/> Depleted Matrix (F3) |
| <input type="checkbox"/> 2 cm Muck (A10) (LRR N) | <input type="checkbox"/> Redox Dark Surface (F6) |
| <input type="checkbox"/> Depleted Below Dark Surface (A11) | <input type="checkbox"/> Depleted Dark Surface (F7) |
| <input type="checkbox"/> Thick Dark Surface (A12) | <input type="checkbox"/> Redox Depressions (F8) |
| <input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148) | <input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136) |
| <input type="checkbox"/> Sandy Gleyed Matrix (S4) | <input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122) |
| <input type="checkbox"/> Sandy Redox (S5) | <input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148) |
| <input type="checkbox"/> Stripped Matrix (S6) | |

Indicators for Problematic Hydric Soils³:

- ☐ 2 cm Muck (A10) (**MLRA 147**)
- ☐ Coast Prairie Redox (A16) (**MLRA 147, 148**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 136, 147**)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic**Restrictive Layer (if observed):**

Type: Gravel fill Depth (inches): 1

Hydric Soil Present?☐ Yes ☒ No

Remarks: No hydric soil indicators are present.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Kansas Extension Project City/County: Greene County Sampling Date: 10/13/2015
 Applicant/Owner: Greene County State: MO Sampling Point: SP-3
 Investigator(s): B. Richards, C. Clark Section, Township, Range: S22, T28N, R22W
 Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): none Slope (%): 0
 Subregion (LRR or MLRA): H Lat: 37.117762 Long: -93.316552 Datum: NAD 83
 Soil Map Unit Name: Secesh-Cedargap complex, 0 to 2 percent slopes, frequently flooded NWI Classification: N/A

Are climate/hydrologic conditions on the site typical for this time of year? ☒ Yes ☐ No (If no, explain in Remarks)
 Vegetation Soil Hydrology Are "Normal Circumstances" present? ☒ Yes ☐ No
 Significantly Disturbed? ☐ ☐ ☐
 Naturally Problematic? ☐ ☐ ☐ (If needed, explain any answers in Remarks)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No	Remarks: Photo C-3
Hydrophytic Vegetation Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Hydric Soil Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Wetland Hydrology Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Is the Sampled Area within a Wetland?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one required; check all that apply)</u>			<u>Secondary Indicators (2 or more required)</u>		
<input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> High Water Table (A2) <input 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 type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input 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 type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)			
Field Observations:	Yes No	Depth (inches):	Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections, etc.), if available:		
Surface Water Present?	<input type="checkbox"/> <input checked="" type="checkbox"/>	_____			
Water Table Present?	<input type="checkbox"/> <input checked="" type="checkbox"/>	_____			
Saturation Present? (includes capillary fringe)	<input type="checkbox"/> <input checked="" type="checkbox"/>	_____			
Wetland Hydrology Present?	<input type="checkbox"/> <input checked="" type="checkbox"/>				
Remarks: No wetland hydrology indicators are met.					

VEGETATION (Four Strata) – Use scientific names of plants

 Sampling Point: SP-3

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status	
1. <u>Ulmus rubra</u>	60 %	Y	FAC	Dominance Test worksheet: Number of Dominant Species that are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>3</u> (B) Percent of Dominant Species that are OBL, FACW, or FAC: <u>33%</u> (A/B)
2. <u>Juniperus virginiana</u>	5 %	N	FACU	
3. <u>Carya ovata</u>	5 %	N	FACU	
4. <u>Platanus occidentalis</u>	5 %	N	FACW	
5. _____	%			
6. _____	%			
7. _____	%			
75 % = Total Cover				
Sapling/Shrub Stratum (Plot size: 15')				Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ % x 1 = <u>0</u> FACW species _____ % x 2 = <u>0</u> FAC species _____ % x 3 = <u>0</u> FACU species _____ % x 4 = <u>0</u> UPL species _____ % x 5 = <u>0</u> Column Totals: <u>0</u> % (A) <u>0</u> (B) Prevalence Index = B/A = _____
1. <u>Rosa multiflora</u>	5 %	Y	FACU	
2. _____	%			
3. _____	%			
4. _____	%			
5. _____	%			
6. _____	%			
7. _____	%			
5 % = Total Cover				
Herb Stratum (Plot size: 5')				Hydrophytic Vegetation Indicators: <input type="checkbox"/> Rapid Test for Hydrophytic Vegetation <input type="checkbox"/> Dominance Test is >50% <input type="checkbox"/> Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic
1. <u>Bromus inermis</u>	90 %	Y	FACU	
2. <u>Parthenocissus quinquefolia</u>	5 %	N	FACU	
3. <u>Boehmeria cylindrica</u>	5 %	N	FACW	
4. _____	%			
5. _____	%			
6. _____	%			
7. _____	%			
8. _____	%			
9. _____	%			
10. _____	%			
11. _____	%			
12. _____	%			
100 % = Total Cover				
Woody Vine Stratum (Plot size: 30')				Definitions 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. _____	%			
0 % = Total Cover				
Remarks: Hydrophytic vegetation is not present.				Hydrophytic Vegetation Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

SOIL

Sampling Point: SP-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

[illegible]¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains²Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ☐ Histosol (A1)
 - ☐ Histic Epipedon (A2)
 - ☐ Black Histic (A3)
 - ☐ Hydrogen Sulfide (A4)
 - ☐ Stratified Layers (A5)
 - ☐ 2 cm Muck (A10) (**LRR N**)
 - ☐ Depleted Below Dark Surface (A11)
 - ☐ Thick Dark Surface (A12)
 - ☐ Sandy Mucky Mineral (S1) (**LRR N, MLRA 147, 148**)
 - ☐ Sandy Gleyed Matrix (S4)
 - ☐ Sandy Redox (S5)
 - ☐ Stripped Matrix (S6)
 - ☐ Dark Surface (S7)
 - ☐ Polyvalue Below Surface (S8) (**MLRA 147, 148**)
 - ☐ Thin Dark Surface (S9) (**MLRA 147, 148**)
 - ☐ Loamy Gleyed Matrix (F2)
 - ☐ Depleted Matrix (F3)
 - ☐ Redox Dark Surface (F6)
 - ☐ Depleted Dark Surface (F7)
 - ☐ Redox Depressions (F8)
 - ☐ Iron-Manganese Masses (F12) (**LRR N, MLRA 136**)
 - ☐ Umbric Surface (F13) (**MLRA 136, 122**)
 - ☐ Piedmont Floodplain Soils (F19) (**MLRA 148**)

Indicators for Problematic Hydric Soils³:

- ☐ 2 cm Muck (A10) (**MLRA 147**)
- ☐ Coast Prairie Redox (A16) (**MLRA 147, 148**)
- ☐ Piedmont Floodplain Soils (F19)
(**MLRA 136, 147**)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____ Depth (inches): _____

Hydric Soil Present?

☐ Yes ☒ No

Remarks: No hydric soil indicators are met.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Kansas Extension Project City/County: Greene County Sampling Date: 11/17/2015
 Applicant/Owner: Greene County State: MO Sampling Point: SP-4
 Investigator(s): B. Richards, C. Clark Section, Township, Range: S15, T28N, R22W
 Landform (hillslope, terrace, etc.): plain Local relief (concave, convex, none): none Slope (%): 0
 Subregion (LRR or MLRA): H Lat: 37.137797 Long: -93.319477 Datum: NAD 83
 Soil Map Unit Name: Wanda silt loam, 2 to 5 percent slopes NWI Classification: N/A

Are climate/hydrologic conditions on the site typical for this time of year? ☒ Yes ☐ No (If no, explain in Remarks)
 Vegetation Soil Hydrology Are "Normal Circumstances" present? ☒ Yes ☐ No
 Significantly Disturbed? ☐ ☐ ☐
 Naturally Problematic? ☐ ☐ ☐ (If needed, explain any answers in Remarks)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No	Remarks: Photo C-4. The site received 3.04 inches of rain on the day of the survey, and flooding throughout the site was present.
Hydrophytic Vegetation Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Hydric Soil Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Wetland Hydrology Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Is the Sampled Area within a Wetland?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one required; check all that apply)</u>			<u>Secondary Indicators (2 or more required)</u>		
<input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> High Water Table (A2) <input 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 type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input 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 type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)			
Field Observations:			Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections, etc.), if available:		
Yes No Surface Water Present? <input type="checkbox"/> <input checked="" type="checkbox"/> Water Table Present? <input type="checkbox"/> <input checked="" type="checkbox"/> Saturation Present? <input type="checkbox"/> <input checked="" type="checkbox"/> (includes capillary fringe) Wetland Hydrology Present? <input type="checkbox"/> <input checked="" type="checkbox"/>	Depth (inches): _____ _____ _____	_____ _____ _____			
Remarks: No wetland hydrology indicators are met.					

VEGETATION (Four Strata) – Use scientific names of plants

 Sampling Point: SP-4

Tree Stratum	(Plot size: <u>30'</u>)	Absolute % Cover	Dominant Species?	Indicator Status	
1. <u>Juniperus virginiana</u>		80 %	Y	FACU	Dominance Test worksheet: Number of Dominant Species that are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>3</u> (B) Percent of Dominant Species that are OBL, FACW, or FAC: <u>33%</u> (A/B)
2. <u>Ulmus rubra</u>		5 %	N	FAC	
3. _____		%			
4. _____		%			
5. _____		%			
6. _____		%			
7. _____		%			
		<u>85 %</u> = Total Cover			
Sapling/Shrub Stratum	(Plot size: <u>15'</u>)				Prevalence Index worksheet: <div style="display: flex; justify-content: space-between;"> Total % Cover of: Multiply by: </div> OBL species _____ % x 1 = <u>0</u> FACW species _____ % x 2 = <u>0</u> FAC species _____ % x 3 = <u>0</u> FACU species _____ % x 4 = <u>0</u> UPL species _____ % x 5 = <u>0</u> Column Totals: <u>0</u> % (A) <u>0</u> (B) Prevalence Index = B/A = _____
1. _____		5 %			
2. _____		%			
3. _____		%			
4. _____		%			
5. _____		%			
6. _____		%			
7. _____		%			
		<u>5 %</u> = Total Cover			
Herb Stratum	(Plot size: <u>5'</u>)				Hydrophytic Vegetation Indicators: <input type="checkbox"/> Rapid Test for Hydrophytic Vegetation <input type="checkbox"/> Dominance Test is >50% <input type="checkbox"/> Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic
1. <u>Symphoricarpos orbiculatus</u>		10 %	Y	FACU	
2. <u>Lysimachia nummularia</u>		5 %	Y	FACW	
3. _____		%			
4. _____		%			
5. _____		%			
6. _____		%			
7. _____		%			
8. _____		%			
9. _____		%			
10. _____		%			
11. _____		%			
12. _____		%			
		<u>15 %</u> = Total Cover			
Woody Vine Stratum	(Plot size: <u>30'</u>)				Definitions 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? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
1. _____		%			
2. _____		%			
3. _____		%			
4. _____		%			
5. _____		%			
		<u>0 %</u> = Total Cover			
Remarks: Hydrophytic vegetation is not present.					

SOIL

Sampling Point: SP-4

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		
0-4	10YR 3/2	100					Silt Loam	
4-24	10YR 3/6	100					Silt Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains²Location: PL=Pore Lining, M=Matrix**Hydric Soil Indicators:**

- | | |
|---|---|
| <input type="checkbox"/> Histosol (A1) | <input type="checkbox"/> Dark Surface (S7) |
| <input type="checkbox"/> Histic Epipedon (A2) | <input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148) |
| <input type="checkbox"/> Black Histic (A3) | <input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148) |
| <input type="checkbox"/> Hydrogen Sulfide (A4) | <input type="checkbox"/> Loamy Gleyed Matrix (F2) |
| <input type="checkbox"/> Stratified Layers (A5) | <input type="checkbox"/> Depleted Matrix (F3) |
| <input type="checkbox"/> 2 cm Muck (A10) (LRR N) | <input type="checkbox"/> Redox Dark Surface (F6) |
| <input type="checkbox"/> Depleted Below Dark Surface (A11) | <input type="checkbox"/> Depleted Dark Surface (F7) |
| <input type="checkbox"/> Thick Dark Surface (A12) | <input type="checkbox"/> Redox Depressions (F8) |
| <input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148) | <input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136) |
| <input type="checkbox"/> Sandy Gleyed Matrix (S4) | <input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122) |
| <input type="checkbox"/> Sandy Redox (S5) | <input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148) |
| <input type="checkbox"/> Stripped Matrix (S6) | |

Indicators for Problematic Hydric Soils³:

- ☐ 2 cm Muck (A10) (**MLRA 147**)
- ☐ Coast Prairie Redox (A16) (**MLRA 147, 148**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 136, 147**)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____ Depth (inches): _____

Hydric Soil Present?☐ Yes ☒ No

Remarks: No hydric soil indicators are met.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Kansas Extension Project City/County: Greene County Sampling Date: 11/17/2015
 Applicant/Owner: Greene County State: MO Sampling Point: SP-5
 Investigator(s): B. Richards, C. Clark Section, Township, Range: S15, T28N, R22W
 Landform (hillslope, terrace, etc.): depression Local relief (concave, convex, none): concave Slope (%): 0
 Subregion (LRR or MLRA): H Lat: 37.135138 Long: -93.319376 Datum: NAD 83
 Soil Map Unit Name: Cedargap silt loam, 1 to 3 percent slopes, frequently NWI Classification: N/A

Are climate/hydrologic conditions on the site typical for this time of year? ☐ Yes ☒ No (If no, explain in Remarks)
 Vegetation Soil Hydrology Are "Normal Circumstances" present? ☒ Yes ☐ No
 Significantly Disturbed? ☐ ☐ ☐
 Naturally Problematic? ☐ ☐ ☐ (If needed, explain any answers in Remarks)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No	Remarks: Photo C-4. The site received 3.04 inches of rain on the day of the survey, and flooding throughout the site was present.
Hydrophytic Vegetation Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Hydric Soil Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Wetland Hydrology Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Is the Sampled Area within a Wetland?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one required; check all that apply)</u> <input checked="" type="checkbox"/> Surface Water (A1) <input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)			<u>Secondary Indicators (2 or more required)</u> <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 type="checkbox"/> Stunted or Stressed Plants (D1) <input checked="" type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)																				
Field Observations: <table style="width: 100%; border-collapse: collapse;"> <tr> <th></th><th>Yes</th><th>No</th><th>Depth (inches):</th></tr> <tr> <td>Surface Water Present?</td><td style="text-align: center;"><input type="checkbox"/></td><td style="text-align: center;"><input checked="" type="checkbox"/></td><td style="border-bottom: 1px solid black;"></td></tr> <tr> <td>Water Table Present?</td><td style="text-align: center;"><input type="checkbox"/></td><td style="text-align: center;"><input checked="" type="checkbox"/></td><td style="border-bottom: 1px solid black;"></td></tr> <tr> <td>Saturation Present? (includes capillary fringe)</td><td style="text-align: center;"><input checked="" type="checkbox"/></td><td style="text-align: center;"><input type="checkbox"/></td><td style="border-bottom: 1px solid black;"></td></tr> <tr> <td>Wetland Hydrology Present?</td><td style="text-align: center;"><input type="checkbox"/></td><td style="text-align: center;"><input checked="" type="checkbox"/></td><td></td></tr> </table>		Yes	No	Depth (inches):	Surface Water Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>		Water Table Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>		Saturation Present? (includes capillary fringe)	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Wetland Hydrology Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>		Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections, etc.), if available:		
	Yes	No	Depth (inches):																				
Surface Water Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>																					
Water Table Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>																					
Saturation Present? (includes capillary fringe)	<input checked="" type="checkbox"/>	<input type="checkbox"/>																					
Wetland Hydrology Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>																					
Remarks: Wetland hydrology indicators A1 and D2 are present.																							

VEGETATION (Four Strata) – Use scientific names of plants

 Sampling Point: SP-5

Tree Stratum (Plot size: <u>30'</u>)	Absolute % Cover	Dominant Species?	Indicator Status	
1. <u>Ulmus rubra</u>	15 %	Y	FAC	Dominance Test worksheet: Number of Dominant Species that are OBL, FACW, or FAC: <u>2</u> (A) Total Number of Dominant Species Across All Strata: <u>5</u> (B) Percent of Dominant Species that are OBL, FACW, or FAC: <u>40%</u> (A/B)
2. _____	%			
3. _____	%			
4. _____	%			
5. _____	%			
6. _____	%			
7. _____	%			
15 % = Total Cover				
Sapling/Shrub Stratum (Plot size: <u>15'</u>)				Prevalence Index worksheet: <div style="display: flex; justify-content: space-between;"> Total % Cover of: Multiply by: </div> OBL species <u>0 %</u> x 1 = <u>0</u> FACW species <u>5 %</u> x 2 = <u>10</u> FAC species <u>25 %</u> x 3 = <u>75</u> FACU species <u>30 %</u> x 4 = <u>120</u> UPL species <u>10 %</u> x 5 = <u>50</u> Column Totals: <u>70 %</u> (A) <u>255</u> (B) Prevalence Index = B/A = <u>3.64</u>
1. <u>Symphoricarpos orbiculatus</u>	15 %	Y	FACU	
2. _____	%			
3. _____	%			
4. _____	%			
5. _____	%			
6. _____	%			
7. _____	%			
15 % = Total Cover				
Herb Stratum (Plot size: <u>5'</u>)				Hydrophytic Vegetation Indicators: <input type="checkbox"/> Rapid Test for Hydrophytic Vegetation <input type="checkbox"/> Dominance Test is >50% <input type="checkbox"/> Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic
1. <u>Symphoricarpos orbiculatus</u>	15 %	Y	FACU	
2. <u>Bromus inermis</u>	10 %	Y	UPL	
3. <u>Setaria pumila</u>	10 %	Y	FAC	
4. <u>Helianthus grosseserratus</u>	5 %	N	FACW	
5. _____	%			
6. _____	%			
7. _____	%			
8. _____	%			
9. _____	%			
10. _____	%			
11. _____	%			
12. _____	%			
40 % = Total Cover				
Woody Vine Stratum (Plot size: <u>30'</u>)				Definitions 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? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
1. _____	%			
2. _____	%			
3. _____	%			
4. _____	%			
5. _____	%			
0 % = Total Cover				
Remarks: Hydrophytic vegetation is not present.				

SOIL

Sampling Point: SP-5**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		
0-2	10YR 3/2	100					Silt Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains²Location: PL=Pore Lining, M=Matrix**Hydric Soil Indicators:**

- | | |
|---|---|
| <input type="checkbox"/> Histosol (A1) | <input type="checkbox"/> Dark Surface (S7) |
| <input type="checkbox"/> Histic Epipedon (A2) | <input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148) |
| <input type="checkbox"/> Black Histic (A3) | <input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148) |
| <input type="checkbox"/> Hydrogen Sulfide (A4) | <input type="checkbox"/> Loamy Gleyed Matrix (F2) |
| <input type="checkbox"/> Stratified Layers (A5) | <input type="checkbox"/> Depleted Matrix (F3) |
| <input type="checkbox"/> 2 cm Muck (A10) (LRR N) | <input type="checkbox"/> Redox Dark Surface (F6) |
| <input type="checkbox"/> Depleted Below Dark Surface (A11) | <input type="checkbox"/> Depleted Dark Surface (F7) |
| <input type="checkbox"/> Thick Dark Surface (A12) | <input type="checkbox"/> Redox Depressions (F8) |
| <input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148) | <input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136) |
| <input type="checkbox"/> Sandy Gleyed Matrix (S4) | <input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122) |
| <input type="checkbox"/> Sandy Redox (S5) | <input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148) |
| <input type="checkbox"/> Stripped Matrix (S6) | |

Indicators for Problematic Hydric Soils³:

- ☐ 2 cm Muck (A10) (**MLRA 147**)
- ☐ Coast Prairie Redox (A16) (**MLRA 147, 148**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 136, 147**)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic**Restrictive Layer (if observed):**Type: Gravel Depth (inches): 2**Hydric Soil Present?**☐ Yes ☒ No

Remarks: No hydric soil indicators are met.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Kansas Extension Project City/County: Greene County Sampling Date: 11/17/2015
Applicant/Owner: Greene County State: MO Sampling Point: SP-6
Investigator(s): B. Richards, C. Clark Section, Township, Range: S15, T28N, R22W
Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): convex Slope (%): 2
Subregion (LRR or MLRA): H Lat: 37.131246 Long: -93.319728 Datum: NAD 83
Soil Map Unit Name: Goss-Wilderness complex, 3 to 8 percent slopes NWI Classification: N/A

Are climate/hydrologic conditions on the site typical for this time of year? ☐ Yes ☒ No (If no, explain in Remarks)

	Vegetation	Soil	Hydrology	Are "Normal Circumstances" present?
Significantly Disturbed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Naturally Problematic?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(If needed, explain any answers in Remarks)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No	Remarks: Photo C-6. The site received 3.04 inches of rain on the day of the survey, and flooding throughout the site was present.
Hydrophytic Vegetation Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Hydric Soil Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Wetland Hydrology Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Is the Sampled Area within a Wetland?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

HYDROLOGY

Wetland Hydrology Indicators:				Secondary Indicators (2 or more required)
Primary Indicators (minimum of one required; check all that apply)				
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> True Aquatic Plants (B14)			<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)			<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)			<input type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Presence of Reduced Iron (C4)			<input type="checkbox"/> Moss Trim Lines (B16)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)			<input type="checkbox"/> Dry-Season Water Table (C2)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Thin Muck Surface (C7)			<input type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Other (Explain in Remarks)			<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Iron Deposits (B5)				<input type="checkbox"/> Stunted or Stressed Plants (D1)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)				<input type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Water-Stained Leaves (B9)				<input type="checkbox"/> Shallow Aquitard (D3)
<input type="checkbox"/> Aquatic Fauna (B13)				<input type="checkbox"/> Microtopographic Relief (D4)
				<input type="checkbox"/> FAC-Neutral Test (D5)
Field Observations:	Yes	No	Depth (inches):	Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections, etc.), if available:
Surface Water Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____	
Water Table Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____	
Saturation Present? (includes capillary fringe)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____	
Wetland Hydrology Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Remarks: No wetland hydrology indicators are present.				

VEGETATION (Four Strata) – Use scientific names of plants

 Sampling Point: SP-6

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status	
1. <u>Juniperus virginiana</u>	85 %	Y	FACU	Dominance Test worksheet: Number of Dominant Species that are OBL, FACW, or FAC: <u>0</u> (A) Total Number of Dominant Species Across All Strata: <u>2</u> (B) Percent of Dominant Species that are OBL, FACW, or FAC: <u>0%</u> (A/B)
2. <u>Ulmus rubra</u>	5 %	N	FAC	
3. _____	%			
4. _____	%			
5. _____	%			
6. _____	%			
7. _____	%			
90 % = Total Cover				Prevalence Index worksheet: <div style="display: flex; justify-content: space-between;"> Total % Cover of: _____ Multiply by: _____ </div> OBL species _____ % x 1 = <u>0</u> FACW species _____ % x 2 = <u>0</u> FAC species _____ % x 3 = <u>0</u> FACU species _____ % x 4 = <u>0</u> UPL species _____ % x 5 = <u>0</u> Column Totals: <u>0</u> % (A) <u>0</u> (B) Prevalence Index = B/A = _____
				Hydrophytic Vegetation Indicators: <input type="checkbox"/> Rapid Test for Hydrophytic Vegetation <input type="checkbox"/> Dominance Test is >50% <input type="checkbox"/> Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) <small>¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic</small>
				Definitions 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? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Remarks: Hydrophytic vegetation is not present.				

SOIL

Sampling Point: SP-6

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 3/2	100					Silt Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains²Location: PL=Pore Lining, M=Matrix**Hydric Soil Indicators:**

- | | |
|---|---|
| <input type="checkbox"/> Histosol (A1) | <input type="checkbox"/> Dark Surface (S7) |
| <input type="checkbox"/> Histic Epipedon (A2) | <input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148) |
| <input type="checkbox"/> Black Histic (A3) | <input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148) |
| <input type="checkbox"/> Hydrogen Sulfide (A4) | <input type="checkbox"/> Loamy Gleyed Matrix (F2) |
| <input type="checkbox"/> Stratified Layers (A5) | <input type="checkbox"/> Depleted Matrix (F3) |
| <input type="checkbox"/> 2 cm Muck (A10) (LRR N) | <input type="checkbox"/> Redox Dark Surface (F6) |
| <input type="checkbox"/> Depleted Below Dark Surface (A11) | <input type="checkbox"/> Depleted Dark Surface (F7) |
| <input type="checkbox"/> Thick Dark Surface (A12) | <input type="checkbox"/> Redox Depressions (F8) |
| <input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148) | <input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136) |
| <input type="checkbox"/> Sandy Gleyed Matrix (S4) | <input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122) |
| <input type="checkbox"/> Sandy Redox (S5) | <input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148) |
| <input type="checkbox"/> Stripped Matrix (S6) | |

Indicators for Problematic Hydric Soils³:

- ☐ 2 cm Muck (A10) (**MLRA 147**)
- ☐ Coast Prairie Redox (A16) (**MLRA 147, 148**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 136, 147**)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic**Restrictive Layer (if observed):**

Type: Gravel Depth (inches): 6

Hydric Soil Present?☐ Yes ☒ No

Remarks: No hydric soil indicators are met.

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Kansas Extension Project City/County: Greene County Sampling Date: 11/17/2015
 Applicant/Owner: Greene County State: MO Sampling Point: SP-7
 Investigator(s): B. Richards, C. Clark Section, Township, Range: S15, T28N, R22W
 Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): convex Slope (%): 2
 Subregion (LRR or MLRA): H Lat: 37.128666 Long: -93.317513 Datum: NAD 83
 Soil Map Unit Name: Secesh-Cedargap complex, 1 to 3 percent slopes, frequently flooded NWI Classification: N/A

Are climate/hydrologic conditions on the site typical for this time of year? ☐ Yes ☒ No (If no, explain in Remarks)

	Vegetation	Soil	Hydrology	
Significantly Disturbed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Are "Normal Circumstances" present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Naturally Problematic?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(If needed, explain any answers in Remarks)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No	Remarks: Photo C-7. The site received 3.04 inches of rain on the day of the survey, and flooding throughout the site was present.
Hydrophytic Vegetation Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Hydric Soil Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Wetland Hydrology Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Is the Sampled Area within a Wetland?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one required; check all that apply)</u>			<u>Secondary Indicators (2 or more required)</u>		
<input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> High Water Table (A2) <input 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 type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> True Aquatic Plants (B14) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input 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 type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)			
Field Observations:			Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections, etc.), if available:		
	Yes	No	Depth (inches):		
Surface Water Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____		
Water Table Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____		
Saturation Present? (includes capillary fringe)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	_____		
Wetland Hydrology Present?	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
Remarks: No wetland hydrology indicators are present.					

VEGETATION (Four Strata) – Use scientific names of plants					Sampling Point: <u>SP-7</u>	
<u>Tree Stratum</u> (Plot size: <u>30'</u>)			Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test worksheet: Number of Dominant Species that are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>4</u> (B) Percent of Dominant Species that are OBL, FACW, or FAC: <u>25%</u> (A/B)
1.	<u>Quercus rubra</u>		20 %	Y	FACU	Prevalence Index worksheet: Total % Cover of: _____ Multiply by: _____ OBL species _____ % x 1 = <u>0</u> FACW species _____ % x 2 = <u>0</u> FAC species _____ % x 3 = <u>0</u> FACU species _____ % x 4 = <u>0</u> UPL species _____ % x 5 = <u>0</u> Column Totals: <u>0</u> % (A) <u>0</u> (B) Prevalence Index = B/A = _____
2.	<u>Juniperus virginiana</u>		10 %	Y	FACU	
3.			%			
4.			%			
5.			%			
6.			%			
7.			%			
			30 % = Total Cover			
<u>Sapling/Shrub Stratum</u> (Plot size: <u>15'</u>)						
1.	<u>Symphoricarpos orbiculatus</u>		60 %	Y	FACU	Hydrophytic Vegetation Indicators: <input type="checkbox"/> Rapid Test for Hydrophytic Vegetation <input type="checkbox"/> Dominance Test is >50% <input type="checkbox"/> Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic
2.			%			
3.			%			
4.			%			
5.			%			
6.			%			
7.			%			
			60 % = Total Cover			
<u>Herb Stratum</u> (Plot size: <u>5'</u>)						
1.	<u>Symphoricarpos orbiculatus</u>		30 %	Y	FACU	Definitions 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? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2.	<u>Lysimachia nummularia</u>		10 %	Y	FACW	
3.			%			
4.			%			
5.			%			
6.			%			
7.			%			
8.			%			
9.			%			
10.			%			
11.			%			
12.			%			
			40 % = Total Cover			
<u>Woody Vine Stratum</u> (Plot size: <u>30'</u>)						
1.			%			Remarks: Hydrophytic vegetation is not present.
2.			%			
3.			%			
4.			%			
5.			%			
			0 % = Total Cover			

SOIL

Sampling Point: SP-7**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		
0-24	10YR 3/2	100					Silt Loam	

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains²Location: PL=Pore Lining, M=Matrix**Hydric Soil Indicators:**

- | | |
|---|---|
| <input type="checkbox"/> Histosol (A1) | <input type="checkbox"/> Dark Surface (S7) |
| <input type="checkbox"/> Histic Epipedon (A2) | <input type="checkbox"/> Polyvalue Below Surface (S8) (MLRA 147, 148) |
| <input type="checkbox"/> Black Histic (A3) | <input type="checkbox"/> Thin Dark Surface (S9) (MLRA 147, 148) |
| <input type="checkbox"/> Hydrogen Sulfide (A4) | <input type="checkbox"/> Loamy Gleyed Matrix (F2) |
| <input type="checkbox"/> Stratified Layers (A5) | <input type="checkbox"/> Depleted Matrix (F3) |
| <input type="checkbox"/> 2 cm Muck (A10) (LRR N) | <input type="checkbox"/> Redox Dark Surface (F6) |
| <input type="checkbox"/> Depleted Below Dark Surface (A11) | <input type="checkbox"/> Depleted Dark Surface (F7) |
| <input type="checkbox"/> Thick Dark Surface (A12) | <input type="checkbox"/> Redox Depressions (F8) |
| <input type="checkbox"/> Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148) | <input type="checkbox"/> Iron-Manganese Masses (F12) (LRR N, MLRA 136) |
| <input type="checkbox"/> Sandy Gleyed Matrix (S4) | <input type="checkbox"/> Umbric Surface (F13) (MLRA 136, 122) |
| <input type="checkbox"/> Sandy Redox (S5) | <input type="checkbox"/> Piedmont Floodplain Soils (F19) (MLRA 148) |
| <input type="checkbox"/> Stripped Matrix (S6) | |

Indicators for Problematic Hydric Soils³:

- ☐ 2 cm Muck (A10) (**MLRA 147**)
- ☐ Coast Prairie Redox (A16) (**MLRA 147, 148**)
- ☐ Piedmont Floodplain Soils (F19) (**MLRA 136, 147**)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic**Restrictive Layer (if observed):**

Type: _____ Depth (inches): _____

Hydric Soil Present?☐ Yes ☒ No

Remarks: No hydric soil indicators are met.

APPENDIX C - SITE PHOTOGRAPHS



Photograph C-1: View of sample plot (SP)-1 in PFO wetland (W)-1, facing west.



Photograph C-2: View of upland SP-2, facing south.



Photograph C-3: View of upland SP-3, facing north.



Photograph C-4: View of upland SP-4, facing south.



Photograph C-5: View of upland SP-5, facing south.



Photograph C-6: View of upland SP-6, facing north.



Photograph C-7: View of upland SP-7, facing south.



Photograph C-8: View of ephemeral stream (S)-1, facing northwest.



Photograph C-9: View of ephemeral S-1, facing southeast.



Photograph C-10: View of ephemeral S-2, facing south.



Photograph C-11: View of ephemeral S-2, facing north.



Photograph C-12: View of ephemeral S-3, facing north.



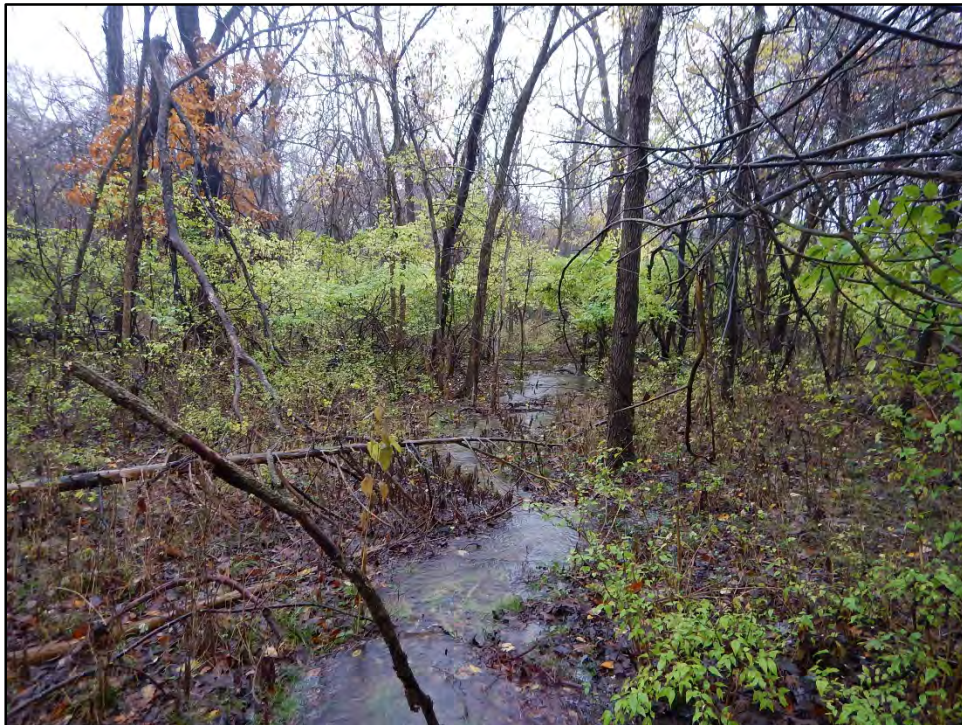
Photograph C-13: View of perennial S-4, facing north.



Photograph C-14: View of perennial S-4, facing south.



Photograph C-15: View of ephemeral S-5, facing northwest.



Photograph C-16: View of ephemeral S-5, facing southeast.



Photograph C-17: View of perennial S-6, facing north.



Photograph C-18: View of perennial S-6, facing south.

**APPENDIX E - THREATENED AND ENDANGERED SPECIES TECHNICAL MEMO AND
SUPPORTING DOCUMENTS**

Memorandum



Date: November 24, 2015

To: Adam Humphrey, Greene County Highway Department

From: Cody Clark, Burns & McDonnell Engineering Company, Inc.

Subject: Technical Memo: Kansas Extension Threatened and Endangered Species

This technical memo summarizes the results of the protected species evaluation prepared by Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) for Greene County Highway Department's proposed Kansas Extension Project (Project).

EXISTING CONDITIONS

The proposed Project is classified as a new urban arterial roadway to be constructed in the southern section of Greene County in Springfield, Missouri. This project will extend the existing Kansas Expressway corridor south of its present termination point at Republic Road by approximately 2.3 miles to a new intersection with Farm Road 190 (see Figure 1). Topographic maps indicate the Project area occurs in an area of rolling hills and crosses two perennial streams (Workman Branch and Ward Branch) that are tributaries to the James River. The streams were dry at the time of the October habitat assessment field survey. Review of aerial imagery of the Project area (see Figure 2) shows that the Project area is generally in a narrow strip of undeveloped, wooded area adjacent to developed housing subdivisions. Geographic Information System (GIS) information provided by Greene County shows the location of several sinkholes and a possible cave within and adjacent to the Project area. No obvious sinkholes or caves were visible during a pedestrian survey (described in the next section) of the Project area; however, erosion and dense vegetation may have obscured them from view.

PROTECTED SPECIES EVALUATION

A habitat assessment field survey was completed by Burns & McDonnell biologists during the weeks of October 12 and November 16, 2015, to determine if any potential habitat for protected species occurs within the proposed Project corridor. Hardwood forested areas are common throughout the Project area. Common tree communities included mixed oak-hickory woods, stands of eastern red cedar, and mixed riparian corridor hardwoods. Many of the areas within the Project corridor included dense thickets of bush honeysuckle.

Based on the available information from the Missouri Department of Conservation (MDC) and U.S. Fish and Wildlife Service (USFWS) websites, a total of nine state- or federally listed species are known or likely to occur in Greene County (Table 1). During the habitat assessment field surveys, the Project corridor was evaluated to determine if potential habitat was present for any of the nine species listed in Table 1 that are protected under the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended (ESA), or Title 3, Division 10, Chapter 4.11 of the Missouri Code of State Regulations. Additionally, potential habitat for the bald eagle (*Haliaeetus leucocephalus*), which is no longer a state or federally listed species but is protected under the Bald Eagle Protection Act of 1940 (16 U.S.C. 668-668d, 54 Stat. 250), as amended

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(BGEPA) and the Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712; Ch. 128; July 13, 1918; 40 Stat. 755), as amended (MBTA), was evaluated within the Project corridor.

Table 1: Protected Species Known or Likely to Occur within Greene County

Species	State Status	Federal Status	Designated Critical Habitat in Greene County
Black-tailed jackrabbit (<i>Lepus californicus</i>)	Endangered	None	No
Geocarpon (<i>Geocarpon minimum</i>)	Endangered	Threatened	No
Gray bat (<i>Myotis grisescens</i>)	Endangered	Endangered	No
Indiana bat (<i>Myotis sodalis</i>)	Endangered	Endangered	No
Missouri bladder-pod (<i>Physaria filiformis</i>)	Endangered	Threatened	No
Niangua darter (<i>Etheostoma nianguae</i>)	Endangered	Threatened	Yes: Pomme de Terre River, Greene County
Northern long-eared bat (<i>Myotis septentrionalis</i>)	None	Threatened	No
Ozark cavefish (<i>Amblyopsis rosae</i>)	Endangered	Threatened	No
Western prairie fringed orchid (<i>Platanthera praeclara</i>)	Endangered	Threatened	No

Source: USFWS (<http://www.fws.gov/midwest/endangered/lists/missouri-cty.html>)(2015) and MDC (<http://mdc.mo.gov/your-property/greener-communities/heritage-program/results/county/Greene>) (2015)

The following subsections describe if potential habitat was present for each of the nine species listed in Table 1.

Black-tailed Jackrabbit

The black-tailed jackrabbit (*Lepus californicus*) inhabits large contiguous native grasslands and grazed areas with scattered shrubby vegetation. The proposed Project corridor crosses wooded areas adjacent to residential neighborhoods in the southern section of the City of Springfield. No potential habitat for the black-tailed jackrabbit was observed within the Project corridor during

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the habitat assessment field survey. Based on the lack of suitable habitat, Burns & McDonnell has determined that the proposed Project would have no effect on the black-tailed jackrabbit.

Indiana Bat

Summer roosting sites for the Indiana bat (*Myotis sodalis*) include live trees and snags (dead trees) with suitable sloughing of bark or cavities (e.g., eastern cottonwood, silver maple, and shag bark hickory). Foraging sites include riparian areas, upland forests, ponds, and fields. Within karst regions, limestone caves with pools are the preferred wintering roosts for this bat species. No caves capable of supporting bats were observed within the proposed Project corridor. A limited number of potential roost trees occur in the wooded areas within the proposed Project corridor. Woody vegetation clearing within the proposed Project corridor would need to occur between October 1 and March 31, when the Indiana bat would be in hibernation caves, per the Missouri Department of Conservation (MDC) best management practices (BMPs) for the Indiana bat. If tree removal for the Project were to occur between October 1 and March 31, then the Project as proposed would have no adverse effect on the Indiana bat.

Northern Long-eared Bat

Northern long-eared bats (*Myotis septentrionalis*) spend winter hibernating in caves and mines. They use areas in various sized caves or mines with constant temperatures, high humidity, and no air currents. During the summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags. Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats seem to be flexible in selecting roosts, choosing roost trees based on suitability to retain bark or provide cavities or crevices. This bat has rarely been found roosting in structures, such as barns and sheds. No caves capable of supporting bats were observed on the proposed Project corridor. A limited number of potential roost trees occur within the wooded areas of the proposed Project corridor. Woody vegetation clearing within the Project corridor would need to occur between October 1 and March 31, when the northern long-eared bat would be in hibernation caves, per MDC BMPs. If tree removal for the Project were to occur between October 1 and March 31, then the Project as proposed would have no adverse effect on the northern long-eared bat.

Gray Bat

With rare exceptions, gray bats (*Myotis grisescens*) live in caves year-round. During the winter, gray bats hibernate in deep, vertical caves. In the summer, they roost in caves which are scattered along rivers. Both the summer and winter caves are often found in limestone karst areas of the southeastern United States. There were no suitable caves of either the summer or winter roosting type observed within the proposed Project corridor; therefore, Burns & McDonnell has determined that the proposed Project would have no effect on the gray bat, due to the lack of potential hibernacula or roosting habitat within the Project area.

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Ozark Cavefish

The Ozark cavefish (*Amblyopsis rosae*) often lives underground in cave streams and springs with a gravel bottom, or occasionally in pools over silt and sand bottoms. Its habitat is generally restricted to areas of limestone and dolomite bedrock containing caves, sinkholes and springs. There were no suitable caves observed within the proposed Project corridor. However, the River Bluff Cave is in close proximity from the southern end of the proposed Project. This cave is completely underground and the entrance is sealed. It is not known to be used by any bat species. Due to the lack of suitable cave habitats within the proposed Project corridor, Burns & McDonnell has determined that the proposed Project would have no effect on the Ozark cave fish. Additionally, MDC-recommended BMPs would be implemented during construction to prevent soil erosion from affecting any Ozark cavefish habitat that may be located downstream from the proposed Project.

The Ozark cavefish occurs in caves within the Springfield Plateau of the Ozark Highlands in northwest Arkansas, southwest Missouri, and northeast Oklahoma. They occur in streams of caves with chert rubble substrate and pool areas that receive groundwater recharge, but have also been collected from springs and wells. Ozark cavefish require a pristine water source, so they typically occupy caves whose water source comes from swelling groundwater, as opposed to surface-running streams.

The study area occurs within the Springfield Plain Ecological Subsection, which is a large, smooth plain that is underlain by Mississippian cherty limestones characterized by areas of well-developed karst and numerous springs. Sinkholes, springs and caves are especially prominent in the Springfield area. Groundwater is very abundant and generally of high quality, although the urbanized Springfield area experiences serious problems with groundwater contamination that are complicated by well-developed underground karst with rapid groundwater movement. Of the seven caves, one spring, and three wells in Greene County where this species has been reported, only four sites still contain cavefish.¹ None of these sites are within the study area, or in close proximity to it, and there are no known groundwater connections from either Workman Branch or Ward Branch to any occupied cavefish sites.

As a precaution during construction, appropriate containment basins, silt fences, filter strips, etc. would be employed for retention of stormwater runoff as a means of avoiding and reducing sedimentation introduction into karst features (e.g., caves, springs and sinkholes) and its associated groundwater. In the event that roadway construction requires filling a sinkhole,

¹ (Graening et al. 2009) - Graening, G., D. Fenolio, M.L. Niemiller, A.V. Brown, and J.B. Beard. (2010). The 30-year recovery effort for the Ozark cavefish (*Amblyopsis rosae*): Analysis of current distribution, population trends, and conservation status of this threatened species. *Environmental Biology of Fishes*, 87:55-88.

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guidelines from the Missouri Geological Survey will be employed. Therefore, as proposed, this project will not adversely affect the Ozark cavefish

Niangua Darter

The Niangua darter (*Etheostoma nianguae*) is only known to occur in Missouri. It lives in clear, perennial creeks and small to medium sized rivers with slight to moderate currents with silt-free gravel and rock bottoms. The largest remaining populations of the Niangua darter likely occur in the Niangua and Little Niangua Rivers. Elsewhere, they are declining or have disappeared.

Although there are two perennial streams mapped within the Project Area, both were dry at the time of survey. Burns & McDonnell has determined that the proposed Project would have no effect on the Niangua darter, due to the lack of potential habitat within the Project area.

Missouri Bladder-pod

Natural habitat for Missouri bladder-pod (*Physaria filiformis*) is primarily open limestone glades within unglaciated prairie areas, but it has been found on one dolomite glade in Arkansas. Glades are naturally treeless areas with shallow, loose soil and areas of exposed rock. The Missouri bladder-pod may also be found on highway right-of-way and pastures where mowing and grazing have kept the area open. No glades or other suitable habitat for the Missouri bladder-pod occurs within the proposed Project corridor; therefore, Burns & McDonnell has determined that the proposed Project would have no effect on the Missouri bladderpod.

Geocarpon

Geocarpon (*Geocarpon minimum*) normally inhabits sandstone glades and outcrops, many less than 1 acre in size. Within these glades, geocarpon thrives at the base of slightly tilted rock outcrops where seepage water flows across and forms shallow, sandy or gravelly depressions. No glades or other suitable habitat for geocarpon occurs within the proposed Project corridor; therefore, Burns & McDonnell has determined that the proposed Project would have no effect on the geocarpon.

Western Prairie Fringed Orchid

The western prairie fringed orchid (*Platanthera praeclara*) occurs in moist native grasslands. The proposed Project corridor crosses wooded areas adjacent to residential neighborhoods in the southern section of Greene County. No native grasslands or potential habitat for the western prairie fringed orchid occur within the Project corridor. Based on the lack of suitable habitat, Burns & McDonnell has determined that the proposed Project would have no effect on the western prairie fringed orchid.

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) was removed from the state and federal lists of threatened and endangered species; however, bald eagles are still protected by the BGEPA and

November 23, 2015

Page 6

MBTA. No bald eagles or bald eagle stick nests were observed within the proposed Project corridor during the habitat assessment field survey. Additionally, no large rivers or reservoirs that would attract roosting or nesting bald eagles occur within or immediately adjacent to the proposed Project corridor. Based on the lack of suitable bald eagle habitat, Burns & McDonnell has determined that the proposed Project would have no effect on the bald eagle.

SUMMARY

Burns & McDonnell has concluded that the proposed Project, which is located primarily within wooded areas adjacent to residential neighborhoods in the southern section of Greene County, would have no effect on any state or federally protected species. Tree clearing would need to occur between October 1 and March 31 to avoid affecting the Indiana and northern long-eared bats. Appropriate measures including the MDC's BMPs, where appropriate, would be implemented during construction of the Project to prevent soil erosion from affecting any protected species habitat that may occur downstream from the proposed Project. This includes silt fences and other runoff protection measures at and in the vicinity of potential sinkholes adjacent to the Project area. Construction methods would be chosen to limit and avoid impacts to protected species and their potential habitats.

Attachments

Figure 1

Figure 2

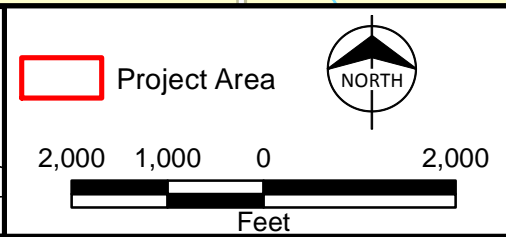
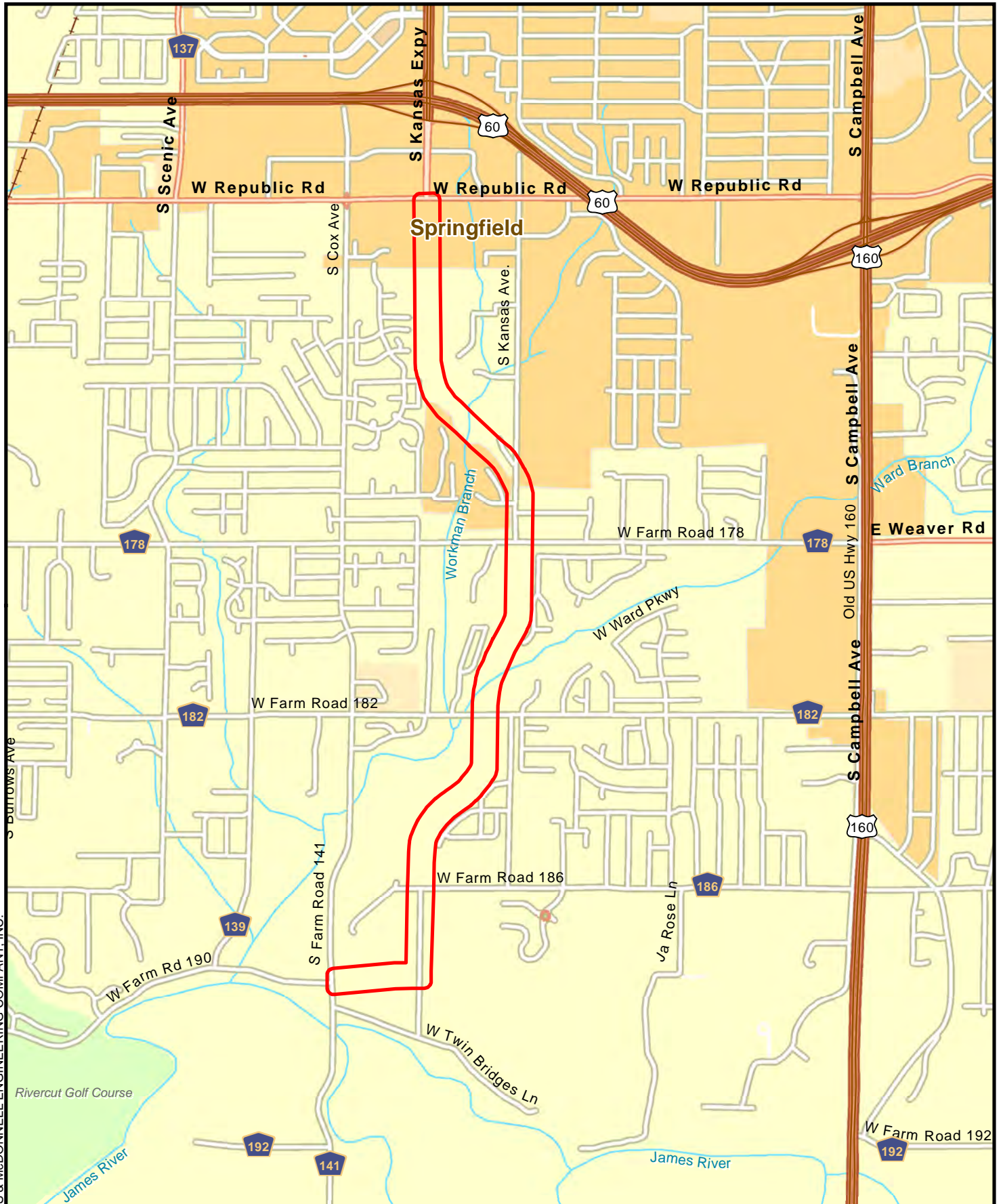


Figure 1
Project Location
Kansas Extension
Greene County, Missouri

Service Layer Credits:
Path: Z:\Clients\TRN\GreeneCnty\MO\87740_KansasExt\Studies\Geospatial\DataFiles\ArcDocs\Greene_County_Kansas_Expressway_A2_CC.mxd cadark 11/20/2015
COPYRIGHT © 2015 BURNS & McDONNELL ENGINEERING COMPANY, INC.

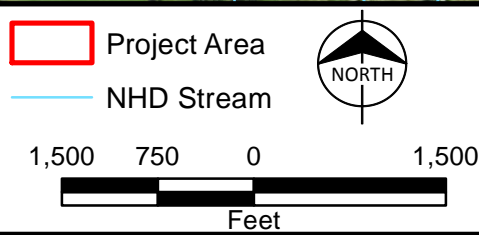
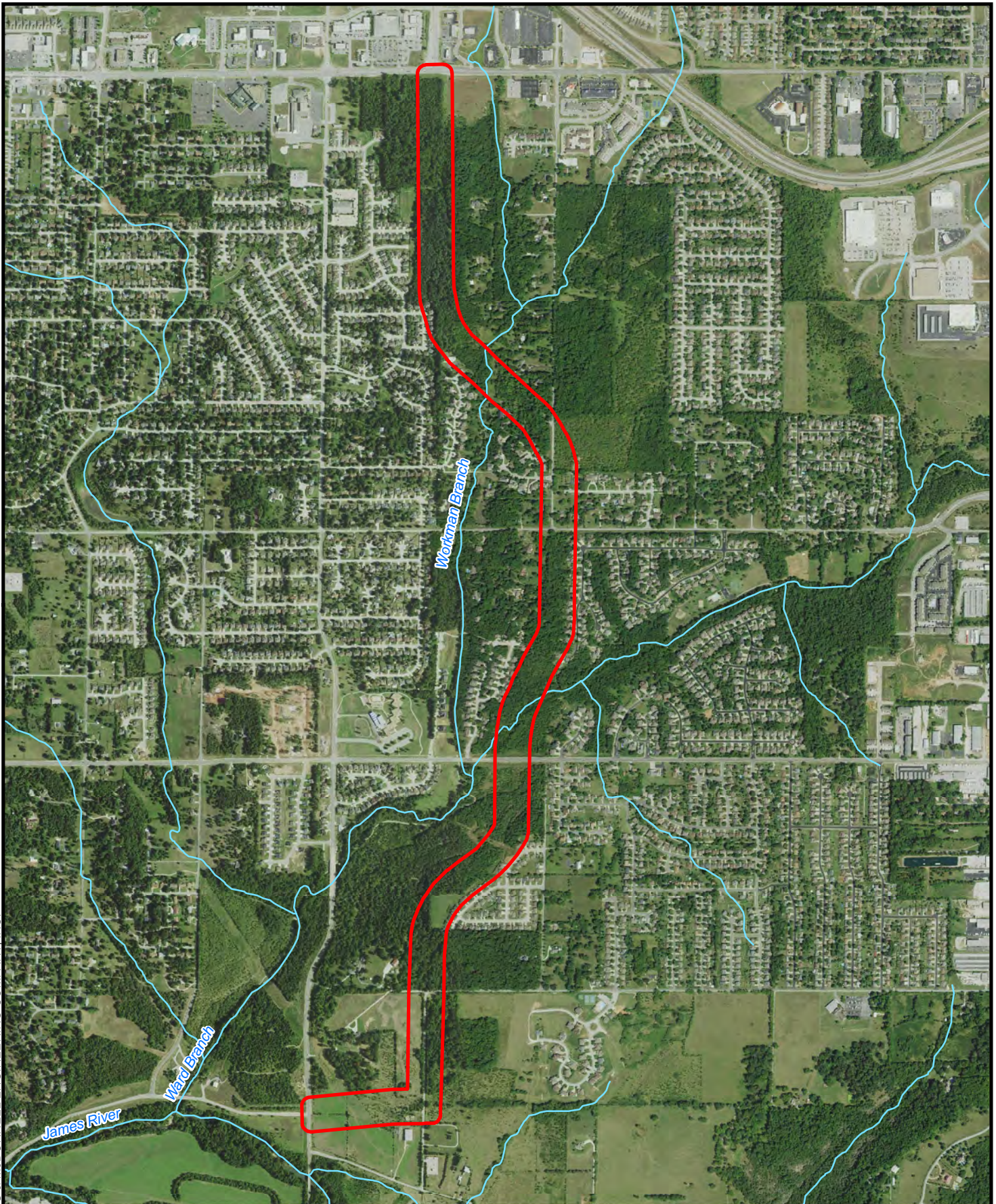


Figure 2
Aerial Image
Kansas Extension
Greene County, Missouri

Representative Terrestrial Species List

Common Name	Scientific Name
Woody Plant Species	
American elm	<i>Ulmus americana</i>
American sycamore	<i>Platanus occidentalis</i>
Bitternut hickory	<i>Carya cordiformis</i>
Black willow	<i>Salix nigra</i>
Eastern cottonwood	<i>Populus deltoides</i>
Eastern red cedar	<i>Juniperus virginiana</i>
Hackberry	<i>Celtis occidentalis</i>
Shagbark hickory	<i>Carya ovata</i>
Understory Plant Species	
Bush honeysuckle	<i>Diervilla</i> spp.
Coralberry	<i>Symphoricarpos orbiculatus</i>
Greenbrier species	<i>Smilax</i> spp.
Multiflora rose	<i>Rosa multiflora</i>
Poison ivy	<i>Toxicodendron radicans</i>
Virginia creeper	<i>Parthenocissus quinquefolia</i>
Herbaceous Plant Species	
Brome	<i>Bromus</i> spp.
Canada thistle	<i>Cirsium arvense</i>
Fescue	<i>Festuca</i> spp.
Queen Anne's lace	<i>Daucus carota</i>
Animal Species	
Black rat snake	<i>Pantherophis obsoletus</i>
Blue jay	<i>Cyanocitta cristata</i>
Common garter snake	<i>Thamnophis sirtalis</i>
Eastern wild turkey	<i>Meleagris gallopavo</i>
Northern cardinal	<i>Cardinalis cardinalis</i>
Raccoon	<i>Procyon lotor</i>
Virginia opossum	<i>Didelphis virginiana</i>
White-tailed deer	<i>Odocoileus virginianus</i>
Yellow warbler	<i>Setophaga petechia</i>



Missouri Department of Conservation

Missouri Department of Conservation's Mission is to protect and manage the forest, fish, and wildlife resources of the state and to facilitate and provide opportunities for all citizens to use, enjoy and learn about these resources.

Natural Heritage Review Level Three Report: Species Listed Under the Federal Endangered Species Act

There are records for species listed under the Federal Endangered Species Act, and possibly also records for species listed Endangered by the state, or Missouri Species and/or Natural Communities of Conservation Concern within or near the the defined Project Area. Please contact the U.S. Fish and Wildlife Service and the Missouri Department of Conservation for further coordination.

Foreword: Thank you for accessing the Missouri Natural Heritage Review Website developed by the Missouri Department of Conservation with assistance from the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, Missouri Department of Transportation and NatureServe. The purpose of this website is to provide information to federal, state and local agencies, organizations, municipalities, corporations and consultants regarding sensitive fish, wildlife, plants, natural communities and habitats to assist in planning, designing and permitting stages of projects.

PROJECT INFORMATION

Project Name and ID Number: Greene Cty #520

User Project Number: 87740

Project Description: Greene County

Project Type: Transportation, Roads

Contact Person: Bryan Gasper

Contact Information: bgasper@burnsmcd.com or 8163496770

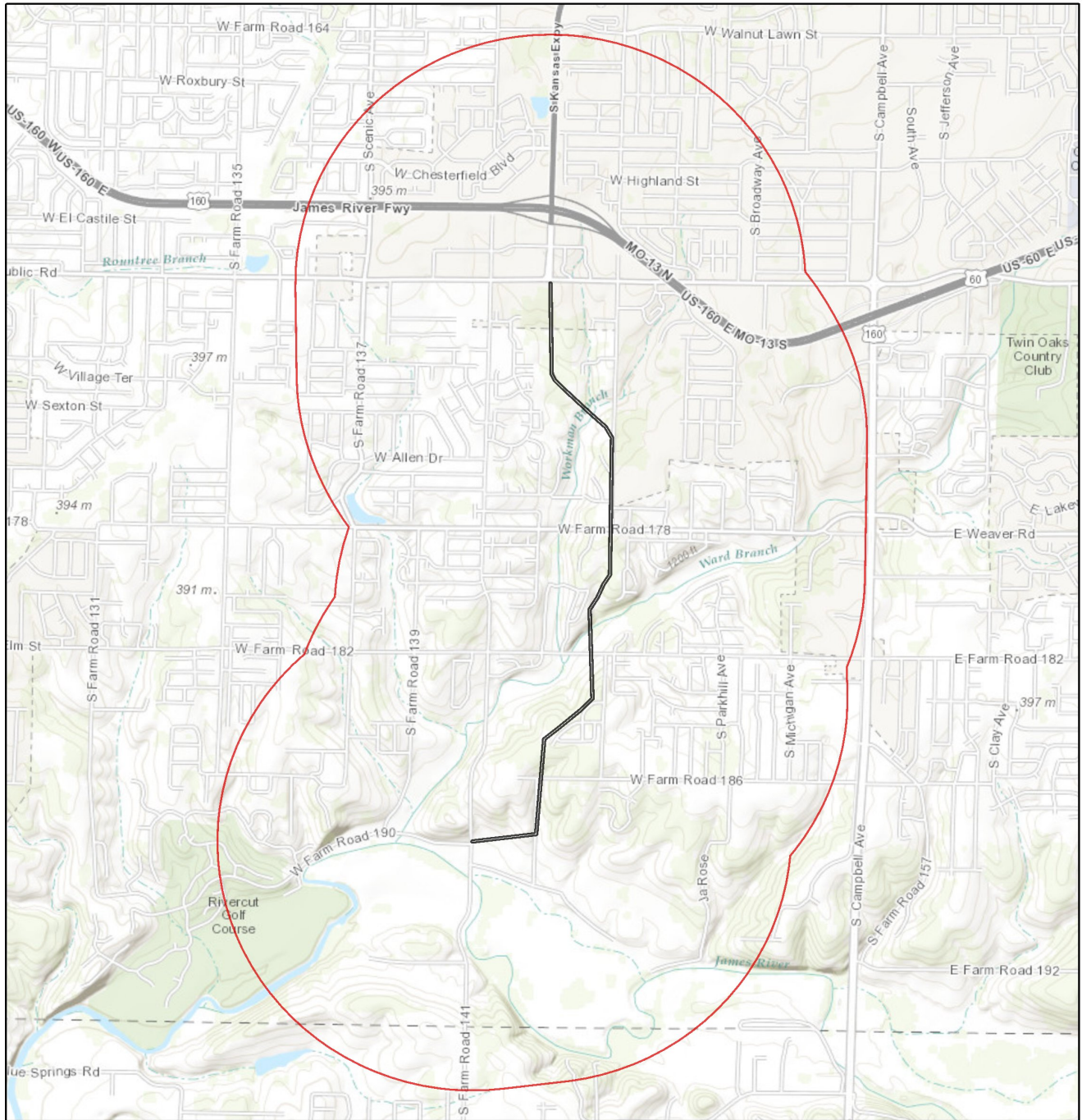
Disclaimer: The NATURAL HERITAGE REVIEW REPORT produced by this website identifies if a species tracked by the Natural Heritage Program is known to occur within or near the area submitted for your project, and shares suggested recommendations on ways to avoid or minimize project impacts to sensitive species or special habitats. If an occurrence record is present, or the proposed project might affect federally listed species, the user must contact the Department of Conservation or U.S. Fish and Wildlife Service for more information. The Natural Heritage Program tracks occurrences of sensitive species and natural communities where the species or natural community has been found. Lack of an occurrence record does not mean that a sensitive plant, animal or natural community is not present on or near the project area. Depending on the project, current habitat conditions, and geographic location in the state, surveys may be necessary. Additionally, because land use conditions change and animals move, the existence of an occurrence record does not mean the species/habitat is still present. Therefore, Reports include information about records near but not necessarily on the project site.

The Natural Heritage Report is not a site clearance letter for the project. It provides an indication of whether or not public lands and sensitive resources are known to be (or are likely to be) located close to the proposed project. Incorporating information from the Natural Heritage Program into project plans is an important step that can help reduce unnecessary impacts to Missouri's sensitive fish, forest and wildlife resources. However, the Natural Heritage Program is only one reference that should be used to evaluate potential adverse project impacts. Other types of information, such as wetland and soils maps and on-site inspections or surveys, should be considered. Reviewing current landscape and habitat information, and species' biological characteristics would additionally ensure that Missouri Species of Conservation Concern are appropriately identified and addressed in planning efforts.

U.S. Fish and Wildlife Service – Endangered Species Act (ESA) Coordination: Lack of a Natural Heritage Program occurrence record for federally listed species in your project area does not mean the species is not present, as the area may never have been surveyed. Presence of a Natural Heritage Program occurrence record does not mean the project will result in negative impacts. The information within this report is not intended to replace Endangered Species Act consultation with the U.S. Fish and Wildlife Service (USFWS) for listed species. Direct contact with the USFWS may be necessary to complete consultation and it is required for actions with a federal connection, such as federal funding or a federal permit; direct contact is also required if ESA concurrence is necessary. Visit the USFWS Information for Planning and Conservation (IPaC) website at <https://ecos.fws.gov/ipac/> for further information. This site was developed to help streamline the USFWS environmental review process and is a first step in ESA coordination. The Columbia Missouri Ecological Field Services Office may be reached at 573-234-2132, or by mail at 101 Park Deville Drive, Suite A, Columbia, MO 65203.


Transportation Projects: If the project involves the use of Federal Highway Administration transportation funds, these recommendations may not fulfill all contract requirements. Please contact the Missouri Department of Transportation at 573-526-4778 or www.modot.mo.gov/ehp/index.htm for additional information on recommendations.

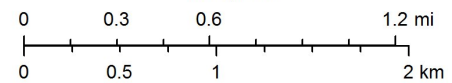
Greene Cty



February 23, 2016

1:35,704

- Project Boundary
-  Buffered Project Boundary



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Species or Communities of Conservation Concern within the Area:

There are records for species listed under the Federal Endangered Species Act, and possibly also records for species listed Endangered by the state, or Missouri Species and/or Natural Communities of Conservation Concern within or near the the defined Project Area. Please contact the U.S. Fish and Wildlife Service and the Missouri Department of Conservation for further coordination.

MDC Natural Heritage Review
Resource Science Division
P.O. Box 180
Jefferson City, MO
65102-0180
Phone: 573-522-4115 ext. 3182
NaturalHeritageReview@mdc.mo.gov

U.S. Fish and Wildlife Service
Ecological Service
101 Park Deville Drive
Suite A
Columbia, MO
65203-0007
Phone: 573-234-2132

Other Special Search Results:

No results have been identified for this project location.

Project Type Recommendations:

No recommendations have been identified for this project type.

Project Location and/or Species Recommendations:

Endangered Species Act Coordination - Indiana bats (*Myotis sodalis*, federal- and state-listed endangered) and **Northern long-eared bats** (*Myotis septentrionalis*, federal-listed threatened) hibernate during winter months in caves and mines. During the summer months, they roost and raise young under the bark of trees in wooded areas, often riparian forests and upland forests near perennial streams. During project activities, avoid degrading stream quality and where possible leave snags standing and preserve mature forest canopy. Do not enter caves known to harbor Indiana bats, especially from September to April. **If any trees need to be removed for your project, please contact the U.S. Fish and Wildlife Service (Ecological Services, 101 Park Deville Drive, Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132) for further coordination.**

The project location submitted and evaluated is within the range of the Gray Myotis (i.e., Gray Bat) in Missouri. Depending on habitat conditions of your project's location, Gray Myotis (*Myotis grisescens*, federal and state-listed endangered) could occur within the project area, as they forage over streams, rivers, lakes, and reservoirs. Avoid entry or disturbance of any cave inhabited by Gray Myotis and when possible retain forest vegetation along the stream and from the cave opening to the stream. See <http://mdc.mo.gov/104> for best management recommendations.

The project location submitted and evaluated is within the range of the Missouri Bladderpod. Missouri Bladderpod (*Physaria filiformis*, federal-listed threatened, state-listed endangered) may occur in the project area on limestone glades or limestone rock outcrops along roadsides or in pastures. The species may persist as a seed bank for several years and not be found during plant surveys. Soil disturbance or fire can stimulate seed germination in the fall, yielding flowering plants the following spring. Best Management Practices may be viewed at http://mdc.mo.gov/sites/default/files/resources/2010/08/9507_6443.pdf.

The project is within the known recharge area for the Ozark Cavefish (*Amblyopsis rosae*, federal-listed threatened, state-listed endangered). All activities that might adversely impact groundwater quality should be avoided. See Best Management Practices for Ozark Cavefish at http://mdc.mo.gov/sites/default/files/resources/2010/08/9563_6503.pdf and Best Management Practices for Karst Geology at <http://mdc.mo.gov/your-property/improve-your-property/building-karst-best-practices>. Additional coordination with the U.S. Fish and Wildlife Service may be required for the project under the federal Endangered Species Act (U.S. Fish and Wildlife Service, Ecological Services, 101 Park DeVille Drive, Suite A, Columbia, Missouri 65203-0007; phone 573-234-2132).

Invasive exotic species are a significant issue for fish, wildlife and agriculture in Missouri. Seeds, eggs, and larvae may be moved to new sites on boats or construction equipment. Please inspect and clean equipment thoroughly before moving between project sites. See <http://mdc.mo.gov/9633> for more information.

- Remove any mud, soil, trash, plants or animals from equipment before leaving any water body or work area.
- Drain water from boats and machinery that have operated in water, checking motor cavities, live-well, bilge and transom wells, tracks, buckets, and any other water reservoirs.
- When possible, wash and rinse equipment thoroughly with hard spray or HOT water (?140° F, typically available at do-it-yourself car wash sites), and dry in the hot sun before using again.

Streams and Wetlands – Clean Water Act Permits: Streams and wetlands in the project area should be protected from activities that degrade habitat conditions. For example, soil erosion, water pollution, placement of fill, dredging, in-stream activities, and riparian corridor removal, can modify or diminish aquatic habitats. Streams and wetlands may be protected under the Clean Water Act and require a permit for any activities that result in fill or other modifications to the site. Conditions provided within the U.S. Army Corps of Engineers (USACE) Clean Water Act Section 404 permit (<http://www.nwk.usace.army.mil/Missions/RegulatoryBranch.aspx>) and the Missouri Department of Natural Resources (DNR) issued Clean Water Act Section 401 Water Quality Certification (<http://dnr.mo.gov/env/wpp/401/index.html>), if required, should help minimize impacts to the aquatic organisms and aquatic habitat within the area. Depending on your project type, additional permits may be required by the Missouri Department of Natural Resources, such as permits for stormwater, wastewater treatment facilities, and confined animal feeding operations. Visit <http://dnr.mo.gov/env/wpp/permits/index.html> for more information on DNR permits. Visit both the USACE and DNR for more information on Clean Water Act permitting.

For further coordination with the Missouri Department of Conservation and the U.S. Fish and Wildlife Services, please see the contact information below.

MDC Natural Heritage Review
Resource Science Division
P.O. Box 180
Jefferson City, MO
65102-0180
Phone: 573-522-4115 ext. 3182
NaturalHeritageReview@mdc.mo.gov

U.S. Fish and Wildlife Service
Ecological Service
101 Park Deville Drive
Suite A
Columbia, MO
65203-0007
Phone: 573-234-2132

Miscellaneous Information

FEDERAL Concerns are species/habitats protected under the Federal Endangered Species Act and that have been known near enough to the project site to warrant consideration. For these, project managers must contact the U.S. Fish and Wildlife Service Ecological Services (101 Park Deville Drive Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132; Fax 573-234-2181) for consultation.

STATE Concerns are species/habitats known to exist near enough to the project site to warrant concern and that are protected under the Wildlife Code of Missouri (RSMo 3 CSR 1 0). "State Endangered Status" is determined by the Missouri Conservation Commission under constitutional authority, with requirements expressed in the Missouri Wildlife Code, rule 3CSR 10-4.111. Species tracked by the Natural Heritage Program have a "State Rank" which is a numeric rank of relative rarity. Species tracked by this program and all native Missouri wildlife are protected under rule 3CSR 10-4.110 General Provisions of the Wildlife Code.

Additional information on Missouri's sensitive species may be found at <http://mdc.mo.gov/discover-nature/field-guide/endangered-species>. Detailed information about the animals and some plants mentioned may be accessed at http://mdc4.mdc.mo.gov/applications/mofwis/mofwis_search1.aspx. If you would like printed copies of best management practices cited as internet URLs, please contact the Missouri Department of Conservation.



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Columbia Ecological Services Field Office
101 PARK DEVILLE DRIVE, SUITE A
COLUMBIA, MO 65203
PHONE: (573)234-2132 FAX: (573)234-2181

Consultation Code: 03E14000-2016-SLI-0920

February 22, 2016

Event Code: 03E14000-2016-E-00820

Project Name: Greene County

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:

This response has been generated by the Information, Planning, and Conservation (IPaC) system in order to provide information on natural resources that could be affected by your project. The response is provided by the U.S. Fish and Wildlife Service (Service) under the authority of the Endangered Species Act of 1973 (16 U.S.C. 1531-1543), the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d), the Migratory Bird Treaty Act (16 U.S.C. 703-712), and the Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*).

Threatened and Endangered Species

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

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 feel free to contact our office if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. **Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days.** This verification can be completed formally or informally as desired. 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 information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

For assistance in determining if suitable habitat for listed, candidate, or proposed species occurs within your project area or if species may be affected by project activities, please visit species profiles at <http://www.fws.gov/midwest/endangered/section7/s7process/lifehistory.html>. Indiana bats, gray bats, and northern long-eared bats occur throughout Missouri and the information below may help in determining if your project may affect these species.

Gray bats - Gray bats roost in caves or mines year-round and use forest riparian areas for foraging. If your project will impact caves or mines or will involve tree removal around these areas (particularly within stream corridors, riparian areas, or associated upland woodlots), gray bats could be affected.

Indiana and northern long-eared bats - These species hibernate in caves or mines only during the winter. The rest of the year they roost under loose tree bark in tree crevices or cavities during the day and forage around tree canopies of floodplain, riparian, and upland forests at night. Trees which should be considered potential roosting habitat include those exhibiting loose or shaggy bark, crevices, or hollows. Tree species often include, but are not limited to: shellbark or shagbark hickory, white oak, cottonwood, and maple. If your project will impact caves or mines or will involve clearing forested habitat containing suitable roosting habitat, Indiana bats or northern long-eared bats could be affected. If your project will involve removal of over 5 acres of forested habitat, you may wish to complete a Summer Habitat Assessment prior to contacting our office in order to expedite the consultation process. The Summer Habitat Assessment Form is available in Appendix A of the most recent version of the Range-wide Indiana Bat Summer Survey Guidelines, located at www.fws.gov/midwest/Endangered/mammals/inba/ under the heading Summer Survey Guidance.

If no suitable habitat for any federally-listed, candidate, or proposed species is present, and no species or their critical habitat will be affected, then no further consultation or coordination is required. However, if any of the following apply, please contact our office for further consultation:

1. Designated critical habitat is present within the project area,
2. Suitable habitat for listed, candidate, or proposed species is present within the project area (see above for habitat descriptions for bat species), or
3. You determine that project activities may affect these species or their critical habitat (e.g., project occurs upstream or within a distance such that the species or habitat could be affected).

The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. For additional conservation measures that may benefit species identified in the enclosed list, please contact our office.

Other Considerations

Bald and Golden Eagles - Although the bald eagle has recently been removed from the endangered species list, this species and the golden eagle are protected by the Bald and Golden

Eagle Act and the Migratory Bird Treaty Act. Should bald or golden eagles occur within or near the project area please contact our office for further coordination. For communication and wind energy projects, please refer to additional guidelines below.

Migratory Birds - The Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Service. The Service has the responsibility under the MBTA to proactively prevent the mortality of migratory birds whenever possible and we encourage implementation of recommendations that minimize potential impacts to migratory birds. Such measures include clearing forested habitat outside of the nesting season (generally March 1 to August 31) or conducting nest surveys prior to clearing to avoid injury to eggs or nestlings.

Communication Towers - Construction of new communications towers (including radio, television, cellular, and microwave) creates a potentially significant impact on migratory birds, especially some 350 species of night-migrating birds. However, the Service has developed voluntary guidelines for minimizing impacts and these can be found at <http://www.fws.gov/habitatconservation/communicationtowers.html>.

Transmission Lines - Migratory birds, especially large species with long wingspans, heavy bodies, and poor maneuverability can also collide with power lines. In addition, mortality can occur when birds, particularly hawks, eagles, kites, falcons, and owls, attempt to perch on uninsulated or unguarded power poles. In order to minimize these risks, please refer to guidelines developed by the Avian Power Line Interaction Committee's and the Service at http://www.aplic.org/uploads/files/2634/APPguidelines_final-draft_Aprl2005.pdf. Implementation of these measures is especially important along sections of lines adjacent to wetlands or other areas known to support large numbers of raptors and migratory birds.

Wind Energy - To minimize impacts to migratory birds and bats, wind energy projects should follow guidelines located at <http://www.fws.gov/windenergy>. In addition, please refer to the Service's Eagle Conservation Plan Guidance, located at http://www.fws.gov/windenergy/eagle_guidance.html, which provides guidance for conserving bald and golden eagles in the course of siting, constructing, and operating wind energy facilities.

Next Steps

Should you determine that project activities may impact any of the natural resources described herein, please contact our office for further coordination. Letters with requests for consultation or correspondence about your project should include the Consultation Tracking Number in the header.

If you have not already done so, please contact the Missouri Department of Conservation (Policy Coordination, P. O. Box 180, Jefferson City, MO 65102) for information concerning Missouri Natural Communities and Species of Conservation Concern.

We appreciate your concern for threatened and endangered species and please feel free to contact our office with questions or for additional information.

Amy Salveter

Attachment



United States Department of Interior
Fish and Wildlife Service

Project name: Greene County

Official Species List

Provided by:

Columbia Ecological Services Field Office
101 PARK DEVILLE DRIVE
SUITE A
COLUMBIA, MO 65203
(573) 234-2132

Consultation Code: 03E14000-2016-SLI-0920

Event Code: 03E14000-2016-E-00820

Project Type: TRANSPORTATION

Project Name: Greene County

Project Description: Road

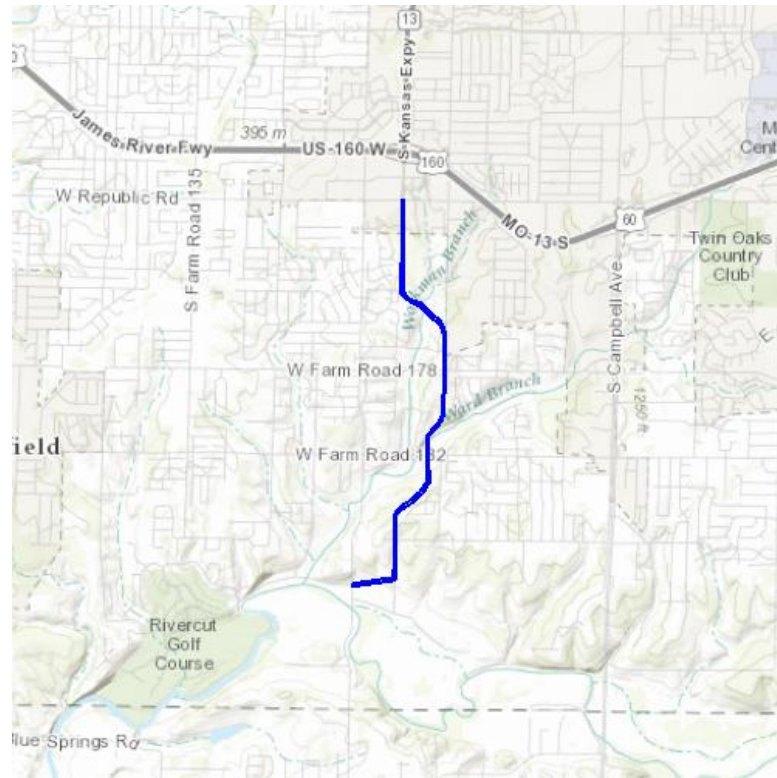
Please Note: The FWS office may have modified the Project Name and/or Project Description, so it may be different from what was submitted in your previous request. If the Consultation Code matches, the FWS considers this to be the same project. Contact the office in the 'Provided by' section of your previous Official Species list if you have any questions or concerns.



United States Department of Interior
Fish and Wildlife Service

Project name: Greene County

Project Location Map:



Project Coordinates: The coordinates are too numerous to display here.

Project Counties: Greene, MO



United States Department of Interior
Fish and Wildlife Service

Project name: Greene County

Endangered Species Act Species List

There are a total of 7 threatened or endangered species on your 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. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

Fishes	Status	Has Critical Habitat	Condition(s)
Ozark cavefish (<i>Amblyopsis rosae</i>) Population: Entire	Threatened		
Flowering Plants			
Missouri bladderpod (<i>Physaria filiformis</i>)	Threatened		
Western Prairie Fringed Orchid (<i>Platanthera praeclara</i>)	Threatened		
(<i>Geocarpon minimum</i>)	Threatened		
Mammals			
Gray bat (<i>Myotis grisescens</i>) Population: Entire	Endangered		
Indiana bat (<i>Myotis sodalis</i>) Population: Entire	Endangered		
Northern long-eared Bat (<i>Myotis septentrionalis</i>)	Threatened		



United States Department of Interior
Fish and Wildlife Service

Project name: Greene County

Critical habitats that lie within your project area

There are no critical habitats within your project area.



United States Department of Interior
Fish and Wildlife Service

Project name: Greene County

Appendix A: FWS National Wildlife Refuges

There are no refuges within your project area.



United States Department of Interior
Fish and Wildlife Service

Project name: Greene County

Appendix B: FWS Migratory Birds

The protection of birds is regulated by the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). The MBTA has no otherwise lawful activities. For more information regarding these Acts see: <http://www.fws.gov/birds/policies-and-regulations/laws-legislations/migratory-bird-treaty-act.php>
<http://www.fws.gov/birds/policies-and-regulations/laws-legislations/bald-and-golden-eagle-protection-act.php>

All project proponents are responsible for complying with the appropriate regulations protecting birds when planning and developing a project. To meet these conservation obligations, proponents should identify potential or existing project-related impacts to migratory birds and their habitat and develop and implement conservation measures that avoid, minimize, or compensate for these impacts. The Service's Birds of Conservation Concern (2008) report identifies species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become listed under the Endangered Species Act as amended (16 U.S.C 1531 et seq.).

For information about Birds of Conservation Concern, go to:

<http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>

For information about conservation measures that help avoid or minimize impacts to birds, please visit:

<http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>

To search and view summaries of year-round bird occurrence data within your project area, go to the Avian Knowledge Network Histogram Tools at:

<http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/akn-histogram-tools.php>

Migratory birds of concern that may be affected by your project:

There are 22 birds on your Migratory birds of concern list.

Species Name	Bird of Conservation Concern (BCC)	Seasonal Occurrence in Project Area
Bald eagle (<i>Haliaeetus leucocephalus</i>)	Yes	Year-round



United States Department of Interior
Fish and Wildlife Service

Project name: Greene County

Bell's Vireo (<i>Vireo bellii</i>)	Yes	Breeding
Bewick's Wren (<i>Thryomanes bewickii ssp. bewickii</i>)	Yes	Year-round
Blue-winged Warbler (<i>Vermivora pinus</i>)	Yes	Breeding
cerulean warbler (<i>Dendroica cerulea</i>)	Yes	Breeding
Dickcissel (<i>Spiza americana</i>)	Yes	Breeding
Fox Sparrow (<i>Passerella iliaca</i>)	Yes	Wintering
Henslow's sparrow (<i>Ammodramus henslowii</i>)	Yes	Breeding
Kentucky Warbler (<i>Oporornis formosus</i>)	Yes	Breeding
Least Bittern (<i>Ixobrychus exilis</i>)	Yes	Breeding
Loggerhead Shrike (<i>Lanius ludovicianus</i>)	Yes	Year-round
Painted Bunting (<i>Passerina ciris</i>)	Yes	Breeding
Pied-billed Grebe (<i>Podilymbus podiceps</i>)	Yes	Year-round
Prairie Warbler (<i>Dendroica discolor</i>)	Yes	Breeding
Prothonotary Warbler (<i>Protonotaria citrea</i>)	Yes	Breeding
Red-headed Woodpecker	Yes	Year-round



United States Department of Interior
Fish and Wildlife Service

Project name: Greene County

<i>(Melanerpes erythrocephalus)</i>		
Rusty Blackbird (<i>Euphagus carolinus</i>)	Yes	Wintering
Sedge Wren (<i>Cistothorus platensis</i>)	Yes	Migrating
Short-eared Owl (<i>Asio flammeus</i>)	Yes	Wintering
Willow Flycatcher (<i>Empidonax traillii</i>)	Yes	Breeding
Wood Thrush (<i>Hylocichla mustelina</i>)	Yes	Breeding
Worm eating Warbler (<i>Helmitheros vermivorum</i>)	Yes	Breeding



United States Department of Interior
Fish and Wildlife Service

Project name: Greene County

Appendix C: NWI Wetlands

There are no wetlands within your project area.



Missouri Department of Transportation
Patrick K. McKenna, Director

105 West Capitol Avenue
P.O. Box 270
Jefferson City, Missouri 65102
1.888.ASK MODOT (275.6636)

January 10, 2017

Ms. Karen Herrington, Supervisor
cc: Andy Roberts
Columbia Ecological Services Field Office
101 Park Deville Drive, Suite A
Columbia, MO 65203

Dear Dave and Andy:

Subject: **Design - Environmental Section
Local Public Agency
Greene County Kansas Expressway Extension STP-5909(802)
NEPA Stage-Preliminary Section 7 Informal Consultation &
Effects Determinations
Consultation Code Missouri: 03E14000-2016-SLI-0920**

The Missouri Department of Transportation (MoDOT) acting as the federally designated representative of the Federal Highway Administration (FHWA) is submitting the Section 7 Endangered Species Act (ESA) effects determinations for the referenced project. This project will ultimately extend the four-lane, divided Kansas Expressway roadway in south Springfield, MO from Republic Road to Farm Road 190 in southern Greene County through 2.3 miles of new alignment. Greene County is the Local Public Agency (LPA) sponsor for this federally funded project which is at the NEPA-Environmental Assessment (EA) approval stage.

The consultant for the LPA sponsor, Burns & McDonnell Engineering Company, Inc., in preparation of the EA has conducted desktop and field habitat assessments and proposed Section 7 ESA effects determinations for federally protected species. MoDOT has been in discussions with the consultant to complete and revise these determinations. At this time, MoDOT and FHWA considers there to be enough evidence to make a determination that the project May Affect, but is Not Likely to Adversely Affect the Ozark cavefish, gray bat, Indiana bat, and northern long-eared bat. MoDOT is requesting a review of the proposed activities as described below and in attachments from the EA document (under review) for concurrence with that determination at the National Environmental Policy Act (NEPA) documentation stage. This project is not considered to be a major construction activity for the purposes of NEPA documentation or consultation under Section 7 of the ESA.



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Project Description

Due to historical and continued development in southern Springfield, Missouri, Greene County and in northern Christian County, a large number of commuters are coming into Springfield from the south. The relative lack of sufficient north-south routes into the area results in increased traffic congestion and a higher crash rate compared to statewide averages. Congestion and higher crash rates are expected to continue to increase over the next 20 to 30 years. A new north-south roadway would shift traffic away from the Cox Road corridor; provide a newer, safer relief route for existing and future traffic; provide a better transportation network to accommodate existing and projected growth; as well as provide improved linkages to the area trail networks

The Project is located in the City of Springfield and in unincorporated portions of southern Greene County, Missouri (See Fig. 1, attached). The existing Kansas Expressway, extending from approximately Interstate 44 (I-44) to Republic Road in Springfield, is classified as an urban primary arterial roadway, with two travel lanes in each direction separated by a grass median. The proposed project is classified as a new urban arterial. This project will extend the existing Kansas Expressway corridor south of its present termination point at Republic Road by approximately 2.3 miles to a new intersection with Farm Road 190, including an east-west connection between Cox Road and the Kansas Expressway at the southern project limit. The ultimate final condition will be the construction of a four-lane, divided roadway through the length of the corridor. The Study Corridor, a 200-foot wide area, was used for the wetland survey, geological survey, and threatened and endangered species survey. The current conditions are evident in Figure 2 (attached), where the Study Corridor is represented by "Project Area".

Topographic maps indicate the Project area occurs in an area of rolling hills and crosses two perennial streams (Workman Branch and Ward Branch) that are tributaries to the James River. The streams were dry at the time of the October 2015 habitat assessment field survey conducted by the consultant. Review of aerial imagery shows the general project area consists mainly of undeveloped woods adjacent to developed housing subdivisions. Geographic Information System (GIS) information provided by Greene County to the consultant in 2015 showed the location of several sinkholes and a possible cave within and adjacent to the Project area. No obvious sinkholes or caves were visible within the Study Corridor during a pedestrian survey of the area conducted by the consultant in October 2015; however, erosion and dense vegetation may have obscured them from view. Subsequent geologic evaluation of karst features in and near the Study Corridor identified 23 features including shallow depressions, sinkhole collapses, one spring and at least one cave (see accompanying Preliminary Geologic Evaluation report from Palmerton and Parrish, Inc, 2016).

The preferred alternative would involve constructing a four-lane divided parkway extension of the Kansas Expressway south from Republic Road to Farm Route 192 along the alignment previously identified and preserved by Greene County. In consideration of available funding, the initial construction phase would include two travel lanes built through the entire north-south corridor. The additional two travel lanes would be constructed as funding becomes

available and traffic volumes dictate. The final configuration would also include a 10-footwide trail along one side of the extension with a 5-foot-wide sidewalk on the opposite side of the roadway. At this time, three bridges are proposed; one wider bridge at one stream location and two 2-lane bridges at the other. There are no preliminary bridge plans at this time.

The Right of Way corridor proposed would ultimately accommodate the four-lane divided primary arterial. The assumption at this time is that the entire proposed corridor width of 200' would likely be cleared during the initial 2-lane construction phase. Components of this project include clearing and grubbing, grading, the construction of new bridges with possible temporary construction crossings, establishment of a multi-use path on one side and sidewalk on the other, drainage and ditch work for the entire 2.3 mile project length, and possible sinkhole closures. There will be tree clearing necessary for this project. Based on the preferred alternative corridor evaluated, approximately 3.9 acres of riparian forest and approximately 40.4 acres of upland forest habitat would be removed if the entire corridor were cleared.

Resource Review and Project Investigations

The consultant obtained an IPaC Trust Resource List on November 25, 2015. Official species lists were obtained using IPaC on February 22, 2016 and updated November 7, 2016 (Consultation Code Missouri: 03E14000-2016-SLI-0920). The following species list was generated:

- Ozark cavefish
- Indiana bat
- Gray bat
- Northern long-eared bat

Originally, eight federally protected threatened and endangered species were reviewed which may occur within or near the project limits. A habitat assessment and field surveys were completed during October and November 2015 to determine if any current habitat conditions for protected species occur within the Study Corridor. The updated official species list no longer listed Missouri bladderpod, *Geocarpa*, Niangua darter, or western prairie fringed orchid nor was any suitable habitat found within the Study Corridor during field surveys. Although effects on these species were analyzed in the NEPA document (excerpt accompanying this letter) they will not be further evaluated for this consultation coordination.

The Missouri Speleological Survey database (2015 reference) and Missouri Department of Conservation Heritage Database (September 2016) were considered by MoDOT in screening this project in 2016. An acoustic bat survey conducted within the corridor and submitted to the Project team detected the presence of the gray bat and the northern long-eared bat along Workman Branch, but did not detect the presence of the Indiana bat (Ecological Solutions, Inc. August 2015, documentation previously submitted to USFWS and accompanying this letter). Suitable summer roosting and foraging habitat for the Indiana bat and northern long-eared bat was determined to be present within the Project Corridor during additional bat

habitat assessments conducted by the Project sponsor (Greene County) in 2015. In addition, forested habitat was present that could be used for foraging by the gray bat.

A preliminary geologic evaluation was completed in January 2016 by Palmerton and Parrish, Inc. (documentation previously submitted to USFWS, incorporated in NEPA document appendices, and accompanying this letter). Several karst features were identified in and near the Study Corridor with a recommendation for further investigation of several features (see Fig. 3). The following information is included in the Environmental Assessment NEPA document, submitted by Burns & McDonnell on behalf of Greene County, LPA sponsor, currently under review by FHWA.

3.9.4.1 Karst Habitat

A Preliminary Geologic Evaluation of the Project Corridor was performed by Palmerton & Parrish, Inc. (PPI) in January 2016. A total of 23 karst features were visually identified within or in the vicinity of the Project. Karst features identified included 16 depressions (shallow and deep), 3 open voids, 1 collapse, 1 surface opening, 1 spring, and 1 cave. A copy of PPI's Preliminary Geologic Evaluation is provided in [Appendix].

Some karst features, such as caves and mines, can be used by Indiana and northern long-eared bats for hibernation and by gray bats throughout the year. Ozark cavefish are also known to inhabit caves, streams, and springs in Greene County. There are no known mines in or near the project area. Information provided by MoDOT in December 2016 (Missouri Speleological Survey [MSS] database, 2015 data) indicated four to six known caves within 0.5 miles of the Study Corridor. There is some information available at this time for two of those features, one of which is the cave feature described in the PPI geologic evaluation.

The one cave feature identified in the PPI geologic investigation ([Appendix]; KE21, see Fig. 3) coincides with a known cave in the MSS database (MSS, 2016). The entrance to this cave is outside and adjacent to the Study Corridor near the proposed crossing of Ward Branch. MSS conducted an investigation of this cave in February 2016. It has a mapped passage that extends approximately 140 feet and crosses under the proposed alignment. There is a stream flowing at the far end of the passage and there were no signs of winter bat use by any common or protected bat species or cavefish at the time of the investigation. A follow-up survey in the summer to determine any use by northern long-eared bats, gray bats, or Ozark cavefish is warranted.

Outside the Study Corridor to the southwest an opening into a cave (subsequently named Riverbluff Cave) was accidentally uncovered on September 11, 2001, during construction of Cox Road in Greene County which is near the proposed southern terminus of the Project at Farm Road 190. Excavation of the roadway created a 40-foot wide by 20-foot high fissure that led into a large cave. Five days later, the cave was sealed off with plate steel, and three airtight lockable gates were installed to control access to the cave and maintain the cave's natural environmental conditions. Seven months later, after road construction was completed and the last section of the access tunnel was installed, the cave was reopened for mapping and scientific study.

The system was completed in April 2002, and the cave became open to the public for tours, but access is controlled by the Missouri Institute of Natural Science. Since the cave entrance is permanently sealed off, bats cannot use the cave for roosting. Riverbluff Cave is approximately 2,000 feet long from the entrance to the back room. The main passageway trends in a north-northeast direction from the entrance. There is one short side passageway, which extends northward away from the current Project Study Corridor southern terminus. Given the location of the protected and managed entrance outside of the Study Corridor and that the cave passages extend away from the Project area, the construction of this Project is not anticipated to impact Riverbluff Cave.

Although there were numerous other sinkholes and collapsed areas noted in the PPI geologic investigation, no additional cave features were identified with entrances in the 2.3-mile long, 200-foot wide Study Corridor. This project is expected to avoid direct adverse impacts to caves which could be used by protected bat species. During future geotechnical and subsequent investigations necessary for final design and construction, any karst features identified as possible cave habitat in or near the Project will be investigated for the potential use by any protected bat species or cavefish. Known caves within 0.5 miles of the Study Corridor that could provide habitat for protected bats or Ozark cavefish that could be indirectly disturbed or affected by construction activity will also be investigated. If appropriate, conservation measures will be implemented under consultation with USFWS to protect any karst habitats shown to be used by protected species. Such conservation measures for caves could include blasting restrictions or alignment adjustments if deemed appropriate in consultation with USFWS.

Impact Assessments and Affects Determinations

The following information is included in the Environmental Assessment NEPA document, submitted by Burns & McDonnell on behalf of Greene County, LPA sponsor, currently under review by FHWA.

3.9.4.2 Indiana Bat

Summer roosting sites for the Indiana bat include dead or dying trees with loose bark (i.e., live trees and/or snags greater than 5 inches dbh that have exfoliating bark, cracks, crevices, and/or hollows) and tree cavities, with mature trees greater than 9 inches dbh more likely to provide optimal roosting sites. Foraging habitat includes riparian areas, upland forests, fencerows, linear corridors, ponds, fields, and even developed areas (e.g., Indianapolis International Airport area). Indiana bats have been reported foraging in a wide variety of habitat throughout their range. It is commonly accepted among Indiana bat authorities that bats may have several foraging areas that they move sequentially between, depending upon food availability and their current roost location. In areas of new construction, temporary effects (e.g., displacement and loss of foraging habitat) may occur during construction and vegetation clearing. However, one conservation measure that could be employed is to only clear potentially suitable bat roost trees for Indiana bats and northern long-eared bats between November 1 and March 31 to avoid direct mortality of females and non-flying juveniles in maternity roosts (USFWS, 2009).

Within karst regions, limestone caves or mines with pools of water are the preferred hibernacula for this bat species. Bats occupying winter hibernacula or transient spring or fall caves could be affected by the removal of suitable roost or foraging habitat within 0.5 mile of the resource. Information provided by MoDOT in December 2016 does not indicate any known Indiana bat cave resources within 5.0 miles of the Project. There are several known caves features within 0.5 mile of the Study Corridor, however, none of these are known to shelter protected bat species. Riverbluff Cave is not suitable habitat for bats. The cave identified adjacent to the Study Corridor had no signs of winter bat use in February 2016. There are no known cave entrances in the limits of the Study Corridor, though there are several sinkholes in addition to the adjacent cave feature. During future investigations during Project design, these features and known caves within 0.5 mile of the Study Corridor that could be indirectly disturbed or affected by construction activity will be evaluated for potential use by Indiana bats. Appropriate conservation measures will be implemented under consultation with USFWS to protect any karst habitats shown to be used by protected species.

Although August 2015 acoustic surveys did not show the Indiana bat to be present in the Study Corridor at Workman Branch, there is still suitable roost and foraging habitat in the Project limits. There are also karst features that need to be investigated further for the presence or absence of bat use near the Study Corridor. At this time, with no known Indiana bat hibernacula, summer roost, or maternity sites within several miles of the Project area and the commitment to only remove suitable summer roost habitat during the hibernation season, Greene County and FHWA have determined this Project may affect, but is not likely to adversely affect, the Indiana bat. Further karst investigations and consultation with USFWS will be coordinated by Greene County, FHWA, and MoDOT.

3.9.4.3 Northern Long-Eared Bat

There is much similarity in summer habitat use between the northern long-eared bat and the Indiana bat. Summer roost sites for the northern long-eared bat include live and dead or dying trees with loose bark, cavities, or crevices, but they seem to prefer trees that have hollows and larger crevices. During summer, northern long-eared bats roost singly or in colonies. Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat seems opportunistic in selecting roosts, and is known to use anthropogenic structures such as old buildings and tight spaces such as behind shutters and signage (roost sites not typically used by Indiana bats). Similar to the Indiana bat, this species' foraging sites include riparian areas, upland forests, fencerows, linear corridors, ponds, and fields. The northern long-eared bat also forages within the understory of forested hillsides and ridges. In areas of new construction, temporary effects (e.g., displacement from foraging habitat) may occur during construction and vegetation clearing. Northern long-eared bat were detected during acoustic surveys within the Study Corridor in the summer of 2015 (Armstrong and Robbins, 2015). Bats present in the Study Corridor could be foraging for food in the corridor as well as using areas of suitable habitat identified within the corridor during field surveys in 2015. Like the Indiana bat, one conservation measure that could be employed is to only clear potentially suitable bat roost trees for Indiana bats

and northern long-eared bats between November 1 and March 31 to avoid direct mortality of females and non-flying juveniles in maternity roosts (USFWS, 2009).

Within karst regions, caves are used for both summer and winter roosts. Bats occupying winter hibernacula or non-breeding caves at any time of the year could be affected by the removal of suitable roost or foraging habitat within 0.5 mile of the resource. Information provided by MoDOT in December 2016 indicates one known northern long-eared bat cave resources within 5.0 miles of the Project. There are several known caves features within 0.5 mile of the Study Corridor, however, none of these are known to shelter protected bat species. Riverbluff Cave is not suitable habitat for bats. The cave identified adjacent to the Study Corridor had no signs of winter bat use in February 2016. There are no known mines or cave entrances present within the Study Corridor, though there are several sinkholes in addition to the adjacent cave feature. During future investigations for design, these features and known caves within 0.5 mile of the Study Corridor that could be indirectly disturbed or affected by construction activity will be evaluated for potential use by northern long-eared bats. Appropriate conservation measures will be implemented under consultation with USFWS to protect any karst habitats shown to be used by protected species.

As noted, August 2015 acoustic surveys identified northern long-eared bats in the Study Corridor at Workman Branch. Suitable roost and foraging habitat was identified within the Study Corridor limits. There are also karst features that need to be investigated further for the presence or absence of bat use near the Study Corridor. At this time, with no known northern long-eared bat hibernacula or other cave use, summer roosts, or maternity sites within several miles of the Project area and the commitment to only remove suitable summer roost habitat during the hibernation season, Greene County and FHWA have determined this Project may affect, but is not likely to adversely affect, the northern long-eared bat. Further karst investigations and consultation with USFWS will be coordinated by Greene County, FHWA, and MoDOT.

3.9.4.4 Gray Bat

Gray bats live in caves year-round. During the winter, gray bats hibernate in deep, vertical caves. In the summer, they roost in caves with domed ceilings that allow clustering of large maternity colonies or smaller bachelor and non-breeding colonies which can be scattered along rivers. Gray bats eat a variety of flying aquatic and terrestrial insects present along rivers or lakes, and occasionally forage within forested areas on ridgetops and slopes. Bats present in the Study Corridor are likely foraging for food in the corridor. Removal of riparian forest could affect the amount of cover and indirectly affect diversity of aquatic insects available by degrading stream quality. To provide cover and protection between known bat caves and aquatic foraging sites, mature forested corridors should be maintained. Riparian areas disturbed during construction would be restored following or concurrent with Project implementation, and follow-up efforts would be implemented to establish permanent vegetation.

Within karst regions, caves are used for both summer and winter roosts. Bats occupying caves at any time of the year could be affected by forest removal and

construction within 0.5 mile of the resource. Information provided by MoDOT in December 2016 indicates two known gray bat cave resources within 5.0 miles of the Project. There are several known caves features within 0.5 mile of the Study Corridor, however, none of these are known to shelter protected bat species. Riverbluff Cave is not suitable habitat for bats. The cave identified adjacent to the Study Corridor had no signs of winter bat use in February 2016. There are no known mines or cave entrances present within the Study Corridor, though there are several sinkholes and at least one adjacent cave feature. During future investigations for design, these features and known caves within 0.5 mile of the Study Corridor that could be indirectly disturbed or affected by construction activity will be evaluated for potential use by gray bats. Although not specific to gray bats, the potential conservation measure for Indiana and northern-long eared bats to clear potentially suitable foraging areas between November 1 and March 31 would avoid loss of foraging habitat during summer activity also for gray bats. Other appropriate conservation measures will be implemented under consultation with USFWS to protect any karst habitats shown to be used by protected species.

August 2015 acoustic surveys identified the presence of gray bats in the Study Corridor. Suitable foraging habitat likely occurs within the Study Corridor limits. There are also karst features that need to be investigated further for the presence or absence of bat use adjacent to and near the Study Corridor. At this time, with no known gray bat cave sites within several miles of the Study Corridor and the commitment to limit tree clearing and revegetate riparian areas as soon as possible (at Ward Branch and Workman Branch bridge locations), Greene County and FHWA have determined this Project may affect, but is not likely to adversely affect the gray bat. Further karst investigations and consultation with USFWS will be coordinated by Greene County, FHWA, and MoDOT.

3.9.4.5 Ozark Cavefish

The Project is not anticipated to adversely affect the Ozark cavefish. The Ozark cavefish occurs in caves within the Springfield Plateau of the Ozark Highlands in northwest Arkansas, southwest Missouri, and northeast Oklahoma. They occur in cave streams with chert rubble substrate and pool areas that receive groundwater recharge, but have also been collected from springs and wells. Ozark cavefish require a pristine water source, so they typically occupy caves whose water source comes from swelling groundwater, as opposed to surface-running streams. The Ozark cavefish was listed as threatened on November 1, 1984, due to habitat alteration and over-collecting. Conservation efforts include protecting caves and adopting land management practices that protect groundwater quality in the recharge area of caves, springs, and wells they inhabit.

The Study Corridor occurs within the Springfield Plain Ecological Subsection, which is a large, smooth plain that is underlain by Mississippian cherty limestones characterized by areas of well-developed karst and numerous springs. Sinkholes, springs, and caves are especially prominent in the Springfield area. Groundwater is very abundant and generally of high quality, although the urbanized Springfield area experiences serious problems with groundwater contamination that are complicated by well-developed underground karst with rapid groundwater movement. Of the seven caves, one spring, and three wells in Greene County where this species has been

historically reported, only four sites still contain cavefish (Graening et al., 2010). Although there is one spring identified from the PPI geologic evaluation near the Project area, none of the known protected recharge areas or species records are within the Study Corridor, or in close proximity to it. The nearest protected area is just under 2.0 miles to the southeast of the Project in Christian County, across the James River floodplain (MoDOT Environmental, 2016). There are no known groundwater connections from either Workman Branch or Ward Branch to any occupied cavefish sites.

As a precaution during construction, appropriate containment basins, silt fences, filter strips, and other appropriate measures as outlined in the SWPPP approved for the Project would be employed for retention of stormwater runoff as a means of avoiding and reducing sedimentation introduction into karst features (e.g., caves, springs, and sinkholes) and associated groundwater. Construction debris would be contained and disposed of properly to prevent accidental introduction into karst features as a result of clean-up activities, run-off, flooding, wind, or other natural forces. Excess concrete and wash water from trucks and other concrete mixing equipment would be disposed of in an area well away from karst features, streams, and wetlands. Disturbed areas would be revegetated promptly to limit erosion. Stationary fuel and oil storage containers would remain within a staging area or another confined area to avoid accidental introduction into the groundwater. In the event that roadway construction requires filling a sinkhole, guidelines from Greene County would be employed (Greene County, 1999). Therefore, as proposed, the Project will not adversely affect the Ozark cavefish. At this time, with no known Ozark cavefish recharge protection areas delineated near the Project area and the commitment to incorporate appropriate erosion and sediment controls in karst areas, Greene County and FHWA have determined this Project may affect, but is not likely to adversely affect, the Ozark cavefish. Consultation with USFWS will be coordinated by Greene County, FHWA, and MoDOT.

The proposed footprint for this project includes the removal of approximately 45 acres of trees. Mature trees will be removed from narrow riparian corridors and in upland areas. A site visit in October 2015 by the consultant revealed that there is suitable roost habitat in the project impact area which could be used by either Indiana bats or northern long-eared bats. However, there was no indication of the location or amount of suitable summer roost habitat at that time. The majority of the tree clearing will be more than one hundred feet from the existing road which is outside the maximum distance in the Programmatic Range-wide Consultation for Indiana and northern long-eared bat guidelines. The LPA sponsor has agreed to remove these suitable trees only between November 1 and March 31 and will limit the tree clearing to only what is necessary to complete the project. Several other conservation measures to minimize impacts on all listed species are included in the commitments section of the NEPA document (see accompanying documentation).

There will be a follow up karst and further summer bat roost habitat evaluation of forested areas during the design phases of this project. The construction timeline for this project has not been set, though it will likely begin by calendar year 2019. Though there are no design plans to review at this time, it is anticipated that design will begin after the approval of the

NEPA document which is expected to be in the spring of 2017. If the footprint increases during the design phase for road construction, consultation will need to be re-evaluated. Additionally, if there are any new listings of species that were not addressed in the NEPA EA document, effects to listed species will have to be re-evaluated and consultation may need to be revised or reinitiated.

Acting as the designated non-federal representative on behalf of Federal Highway Administration for the purpose of USFWS Section 7 consultation, MoDOT agrees so far with the effects determinations in the NEPA documentation. Based on all the evidence and conservation measure commitments so far, FHWA is requesting concurrence at the NEPA document stage with the determination that the construction of this project **May Affect, but is Not Likely to Adversely Affect Indiana bat, northern long-eared bat, gray bat, or Ozark cavefish**. If the Service concurs, that documentation will become part of the Finding of No Significant Impact (FONSI) for this project in spring 2017. MoDOT and FHWA acknowledge that this is not final Section 7 ESA concurrence. Additional impact analysis will be performed and presented to the Service with a request for final concurrence based on verification of effects determinations at that time.

Please do not hesitate to contact me with any questions or concerns at (573) 526-0606.

Cordially,



Bree K. McMurray
Senior Environmental Specialist

cc: Raegan Ball, FHWA
Richard Moore, DE
Matt Burcham, DE
Steve Thornhill, Burns & McDonnell
Adam Humphrey, Greene County

Attachments

Service Layer Credits:
 Path: Z:\Client\TRN\GreeneCounty\GIS\MapServer\GreeneCounty_Kansas_Expressway_A1_OC.mxd cacklark 11/20/2015
 COPYRIGHT © 2015 BURNS & MCDONNELL ENGINEERING COMPANY, INC.

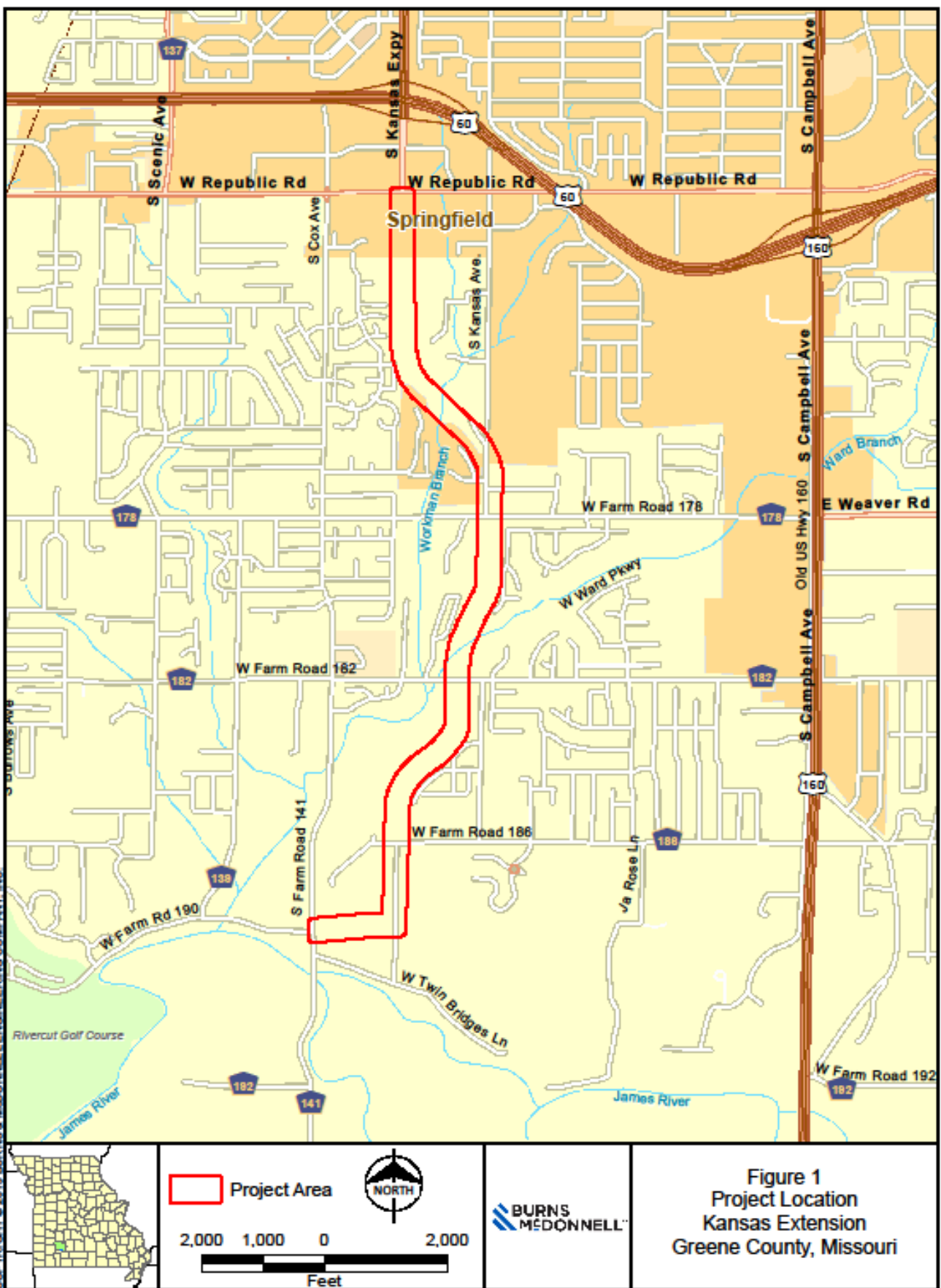


Fig. 1. Project limits, LPA Project Greene County, STP-5909(802), Kansas Expressway Extension.

Service Layer Credits:
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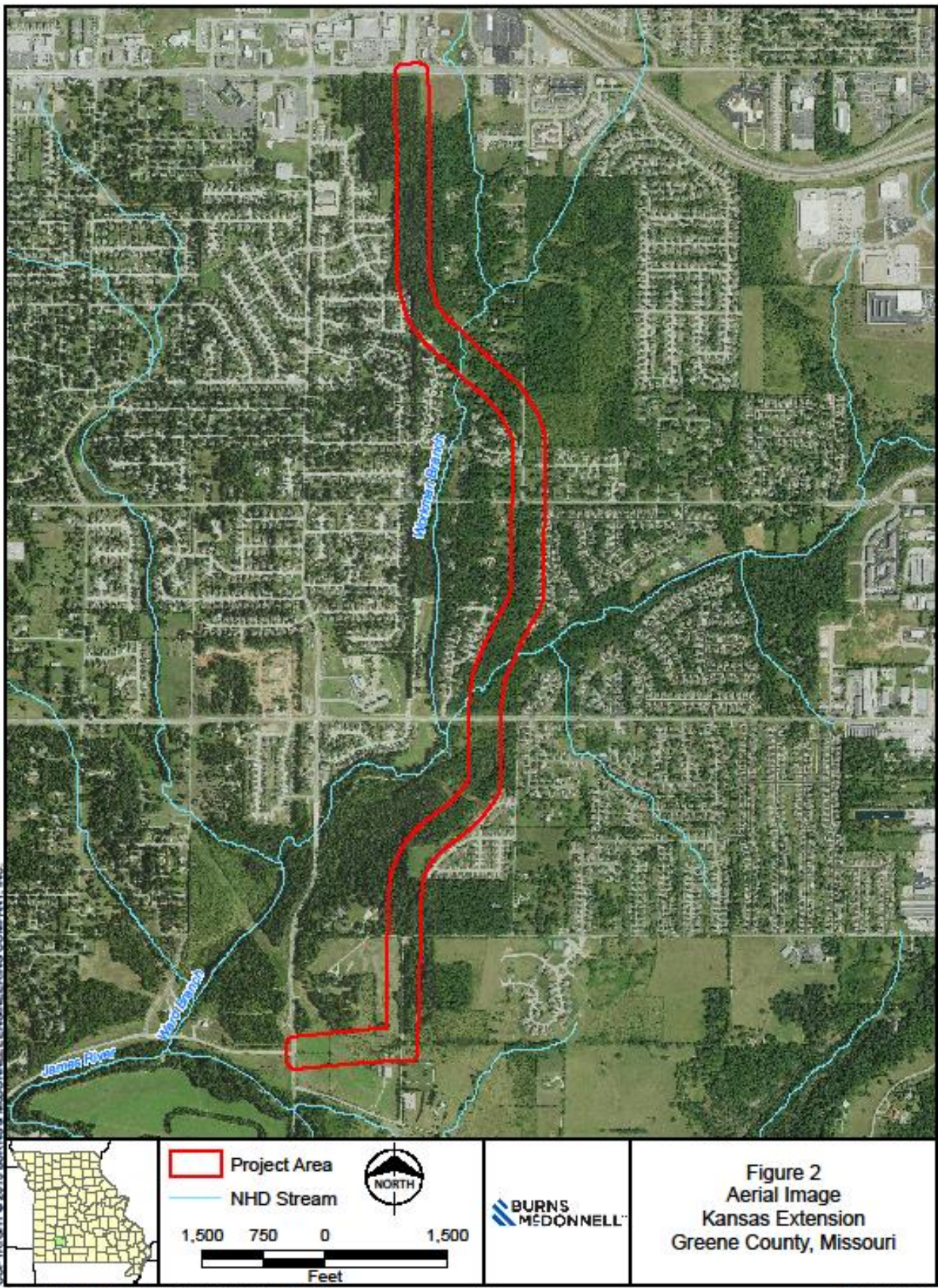


Fig 2. Aerial imagery of existing conditions, LPA Project Greene County STP-5909(802), Kansas Expressway Extension.

Thornhill, Steve

From: Roberts, Andy <andy_roberts@fws.gov>
Sent: Thursday, January 26, 2017 2:45 PM
To: Bree K. McMurray
Cc: karen_herrington@fws.gov; Adam Humphrey (AHumphrey@greenecountymo.gov); Thornhill, Steve; Matthew Burcham; raegan.ball.dot.gov; Richard Moore
Subject: Re: request for concurrence_LPA NEPA-EA Stage Section 7 effects determinations
Greene Co, KS Expressway Extension STP-5909(802)

Dear Ms. McMurray:

The U.S. Fish and Wildlife Service (Service) has reviewed the information provided with your January 10, 2017, letter and e-mail (below) regarding the proposed Kansas Expressway Extension in Greene County, Missouri. We offer the following comments pursuant to the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.), National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347), and the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1544).

We understand that this project is currently at the NEPA-EA phase. Additional survey work, effects analysis, and Section 7 coordination with the Service will be completed at a later date as outlined in your letter. Based on this plan for future coordination, your current effects analysis, and the proposed conservation measures, we concur that the proposed project may affect, but is not likely to adversely affect the Indiana bat, gray bat, northern long-eared bat, or Ozark Cavefish. We appreciate your efforts to conserve these species and look forward to working with you on the remaining phases of this project.

Sincerely,

Andy Roberts

On Tue, Jan 10, 2017 at 6:26 PM, Bree K. McMurray <Bree.McMurray@modot.mo.gov> wrote:

Request for concurrence on the NEPA stage determinations and submission of Section 7 preliminary consultation for NLAA Indiana bats, northern long-eared bats, gray bats, and Ozark cavefish.

FHWA kindly requests a written reply regarding concurrence at the NEPA stage for the effects determination with supporting information in the Environmental Assessment NEPA document, under review. MoDOT is submitting preliminary Section 7 consultation, in full recognition that final concurrence will not be concluded until after further field investigations for listed species.

Consultation Code: **03E14000-2016-SLI-0920 updated November 7, 2016**

Species listed: Indiana, northern long-eared, gray bats, and Ozark cavefish

Good afternoon Mr. Roberts and Ms. Herrington,

I am transmitting Section 7 consultation for **NLAA determination for Indiana bats, northern long-eared bats, gray bats, and Ozark cavefish and requesting concurrence from the Service at the NEPA Document stage on effects determinations.** Attached and incorporated please find the preliminary consultation letter, updated IPaC OSL, project location maps/aerials, excerpts for karst and T&E evaluations from the NEPA document, geologic investigation by Palmerton & Parrish, and NEPA commitments list (excerpt). This project is currently under review by FHWA. There are no plans developed yet for this project, but plans development on the preferred alternate will begin after publication of the finalized Environmental Assessment and Finding of No Significant Impact, set for spring 2017.

This 2.3-mile new urban arterial roadway will be constructed in southern Springfield, MO and unincorporated portions of southern Greene County. Greene County is the LPA sponsor receiving FHWA funds. MoDOT is coordinating the review of the NEPA documentation and will continue to facilitate environmental clearances for this project with the sponsor. Burns & McDonnell Engineering Company, Inc. is the consultant for the sponsor and produced the NEPA document. MoDOT has been in close contact with the consultant through the final stages of impact assessment for endangered species at the NEPA stage.

In total, **45 acres of tree clearing** is possible for the full construction of this project. The NEPA document proposes a four-lane, divided road with sidewalk, multi-use trail, and 3 bridges crossing Ward Branch and Workman Branch. The initial construction phase to accomplish the purpose and need for the document will be a two-lane facility, likely with the pedestrian accommodations. The full build-out will be constructed as the County/City re-addresses traffic capacity needs in the future. The assumption is that the full corridor for the four-lane facility will be cleared and graded all at once in during the initial construction phase.

During an acoustic bat survey in Aug 2015, investigators noted gray bats and northern long-eared bats using the area of Workman Branch near the project limits (separate correspondence to follow-sensitive information). During field investigations in 2015-2016, several karst features, including at least one nearby cave and one spring and suitable summer bat roost habitat was identified in or near the Study Corridor. Further investigation of karst and forested habitat is needed to validate the effected determinations presented in this preliminary Section 7 consultation assessment.

Acting as the designated non-federal representative on behalf of Federal Highway Administration for the purpose of USFWS Section 7 consultation, MoDOT agrees so far with the effects determinations in the NEPA documentation. Based on all the evidence and conservation measure commitments so far, FHWA is requesting concurrence at the NEPA document stage with the determination that the construction of this project **May Affect, but is Not Likely to Adversely Affect Indiana bat, northern long-eared bat, gray bat, or Ozark cavefish.** If the Service concurs, that documentation

will become part of the Finding of No Significant Impact (FONSI) for this project in spring 2017. MoDOT and FHWA acknowledge that this is not final Section 7 ESA concurrence. Additional impact analysis will be performed and presented to the Service with a request for final concurrence based on verification of effects determinations at that time.

Please get in touch with me for any clarifications or comments. Thank you very much in advance for your attention to this matter.

Bree K. McMurray

Threatened and Endangered Species Specialist

Missouri Dept. of Transportation

Design-Environmental and Historic Preservation

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(573) 526-0606

Email: bree.mcmurray@modot.mo.gov

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Andy Roberts

U.S. Fish and Wildlife Service

Ecological Services

101 Park DeVille Drive, Suite A

Columbia, Missouri 65203

573-234-2132 x 110

573-234-2181 (fax)

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APPENDIX F - FARMLAND INFORMATION

**FARMLAND CONVERSION IMPACT RATING
FOR CORRIDOR TYPE PROJECTS**

PART I (To be completed by Federal Agency)		3. Date of Land Evaluation Request 12/18/15	4. Sheet 1 of 2
1. Name of Project Kansas Extension		5. Federal Agency Involved Federal Highway Administration	
2. Type of Project Roadway		6. County and State Greene County, Missouri	
PART II (To be completed by NRCS)		1. Date Request Received by NRCS 12/18/15	2. Person Completing Form Allan Johnston
3. Does the corridor contain prime, unique statewide or local important farmland? (If no, the FPPA does not apply - Do not complete additional parts of this form). YES <input type="checkbox"/> NO <input type="checkbox"/>		4. Acres Irrigated Average Farm Size N/A 139 Ac	
5. Major Crop(s) forage and small grains	6. Farmable Land in Government Jurisdiction Acres: 431,122 % 99.4		7. Amount of Farmland As Defined in FPPA Acres: 368,604 % 85
8. Name Of Land Evaluation System Used Greene Co.	9. Name of Local Site Assessment System N/A		10. Date Land Evaluation Returned by NRCS 1/28/16

PART III (To be completed by Federal Agency)		Alternative Corridor For Segment			
		Corridor A	Corridor B	Corridor C	Corridor D
A. Total Acres To Be Converted Directly	20				
B. Total Acres To Be Converted Indirectly, Or To Receive Services	0				
C. Total Acres In Corridor	20				
PART IV (To be completed by NRCS) Land Evaluation Information					
A. Total Acres Prime And Unique Farmland	20				
B. Total Acres Statewide And Local Important Farmland	0				
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted	.01				
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value	43.7				
PART V (To be completed by NRCS) Land Evaluation Information Criterion Relative value of Farmland to Be Serviced or Converted (Scale of 0 - 100 Points)		69			
PART VI (To be completed by Federal Agency) Corridor Assessment Criteria (These criteria are explained in 7 CFR 658.5(c))		Maximum Points			
1. Area in Nonurban Use	15	3			
2. Perimeter in Nonurban Use	10	1			
3. Percent Of Corridor Being Farmed	20	1			
4. Protection Provided By State And Local Government	20	0			
5. Size of Present Farm Unit Compared To Average	10	10			
6. Creation Of Nonfarmable Farmland	25	2			
7. Availability Of Farm Support Services	5	5			
8. On-Farm Investments	20	10			
9. Effects Of Conversion On Farm Support Services	25	1			
10. Compatibility With Existing Agricultural Use	10	8			
TOTAL CORRIDOR ASSESSMENT POINTS		160	41	0	0
PART VII (To be completed by Federal Agency)					
Relative Value Of Farmland (From Part V)	100	69	0	0	0
Total Corridor Assessment (From Part VI above or a local site assessment)	160	41	0	0	0
TOTAL POINTS (Total of above 2 lines)		260	110	0	0
1. Corridor Selected:	2. Total Acres of Farmlands to be Converted by Project:	3. Date Of Selection:	4. Was A Local Site Assessment Used? YES <input type="checkbox"/> NO <input type="checkbox"/>		

5. Reason For Selection:

Signature of Person Completing this Part:

DATE

NOTE: Complete a form for each segment with more than one Alternate Corridor

CORRIDOR - TYPE SITE ASSESSMENT CRITERIA

The following criteria are to be used for projects that have a linear or corridor - type site configuration connecting two distant points, and crossing several different tracts of land. These include utility lines, highways, railroads, stream improvements, and flood control systems. Federal agencies are to assess the suitability of each corridor - type site or design alternative for protection as farmland along with the land evaluation information.

- (1) How much land is in nonurban use within a radius of 1.0 mile from where the project is intended?

More than 90 percent - 15 points

90 to 20 percent - 14 to 1 point(s)

Less than 20 percent - 0 points

- (2) How much of the perimeter of the site borders on land in nonurban use?

More than 90 percent - 10 points

90 to 20 percent - 9 to 1 point(s)

Less than 20 percent - 0 points

- (3) How much of the site has been farmed (managed for a scheduled harvest or timber activity) more than five of the last 10 years?

More than 90 percent - 20 points

90 to 20 percent - 19 to 1 point(s)

Less than 20 percent - 0 points

- (4) Is the site subject to state or unit of local government policies or programs to protect farmland or covered by private programs to protect farmland?

Site is protected - 20 points

Site is not protected - 0 points

- (5) Is the farm unit(s) containing the site (before the project) as large as the average - size farming unit in the County?

(Average farm sizes in each county are available from the NRCS field offices in each state. Data are from the latest available Census of Agriculture, Acreage or Farm Units in Operation with \$1,000 or more in sales.)

As large or larger - 10 points

Below average - deduct 1 point for each 5 percent below the average, down to 0 points if 50 percent or more below average - 9 to 0 points

- (6) If the site is chosen for the project, how much of the remaining land on the farm will become non-farmable because of interference with land patterns?

Acreage equal to more than 25 percent of acres directly converted by the project - 25 points

Acreage equal to between 25 and 5 percent of the acres directly converted by the project - 1 to 24 point(s)

Acreage equal to less than 5 percent of the acres directly converted by the project - 0 points

- (7) Does the site have available adequate supply of farm support services and markets, i.e., farm suppliers, equipment dealers, processing and storage facilities and farmer's markets?

All required services are available - 5 points

Some required services are available - 4 to 1 point(s)

No required services are available - 0 points

- (8) Does the site have substantial and well-maintained on-farm investments such as barns, other storage building, fruit trees and vines, field terraces, drainage, irrigation, waterways, or other soil and water conservation measures?

High amount of on-farm investment - 20 points

Moderate amount of on-farm investment - 19 to 1 point(s)

No on-farm investment - 0 points

- (9) Would the project at this site, by converting farmland to nonagricultural use, reduce the demand for farm support services so as to jeopardize the continued existence of these support services and thus, the viability of the farms remaining in the area?

Substantial reduction in demand for support services if the site is converted - 25 points

Some reduction in demand for support services if the site is converted - 1 to 24 point(s)

No significant reduction in demand for support services if the site is converted - 0 points

- (10) Is the kind and intensity of the proposed use of the site sufficiently incompatible with agriculture that it is likely to contribute to the eventual conversion of surrounding farmland to nonagricultural use?

Proposed project is incompatible to existing agricultural use of surrounding farmland - 10 points

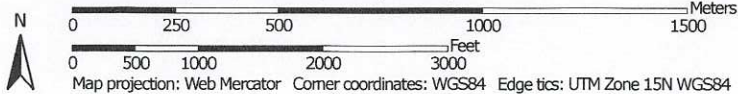
Proposed project is tolerable to existing agricultural use of surrounding farmland - 9 to 1 point(s)

Proposed project is fully compatible with existing agricultural use of surrounding farmland - 0 points

Farmland Classification—Greene County, Missouri
(Kansas Expressway Extn.)



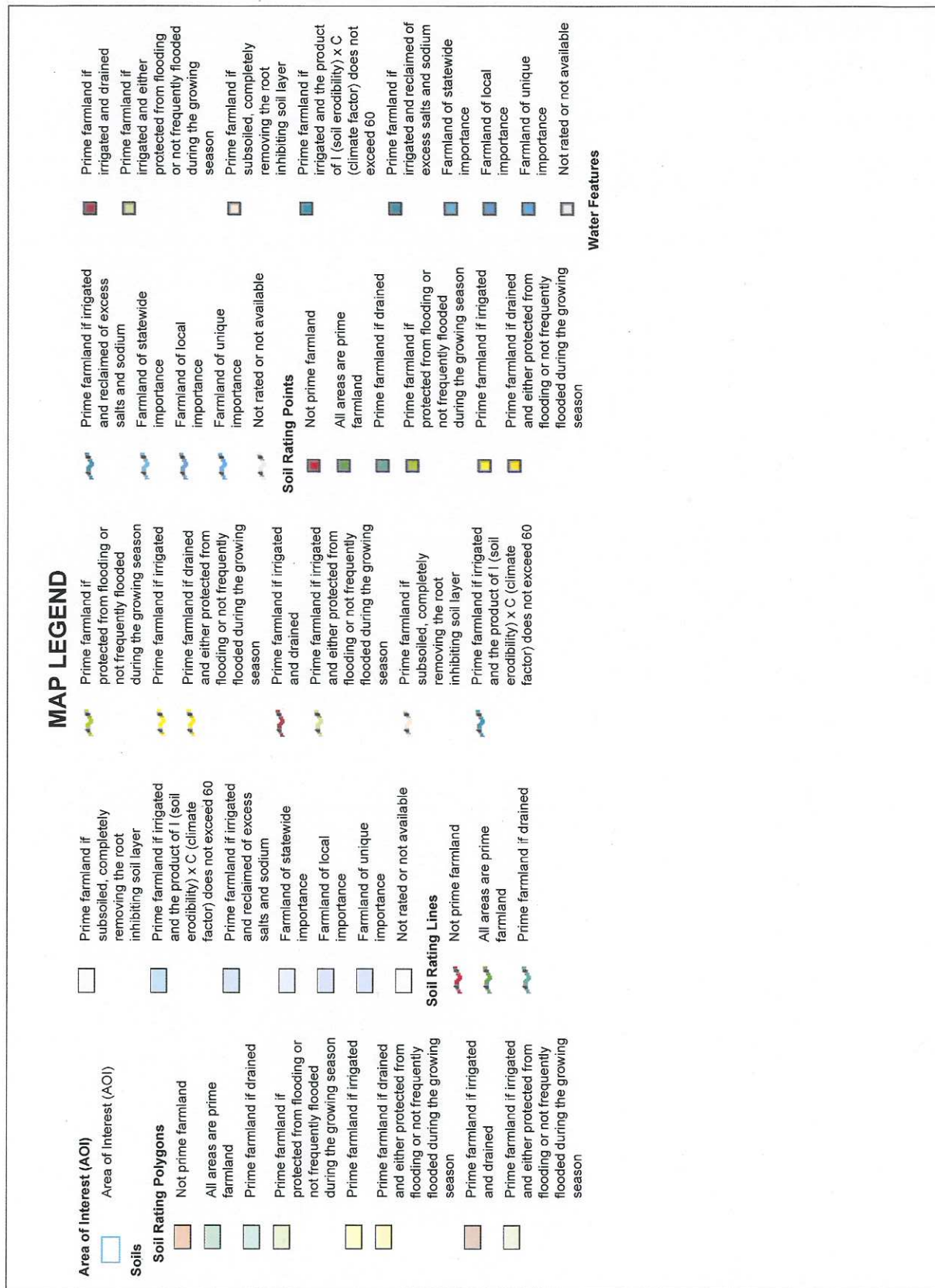
Map Scale: 1:17,800 if printed on A portrait (8.5" x 11") sheet.



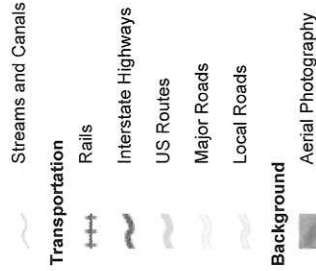
Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

1/27/2016
Page 1 of 5



MAP INFORMATION



The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Greene County, Missouri
Survey Area Data: Version 19, Sep 10, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 29, 2013—Jul 13, 2013

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Farmland Classification— Summary by Map Unit — Greene County, Missouri (MO077)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
70009	Goss gravelly silt loam, 8 to 15 percent slopes	Not prime farmland	161.8	27.9%
70047	Wanda silt loam, 2 to 5 percent slopes	All areas are prime farmland	42.1	7.3%
70124	Goss-Gasconade complex, 3 to 50 percent slopes	Farmland of statewide importance	4.7	0.8%
70145	Keeno-Bona complex, 2 to 5 percent slopes	Not prime farmland	19.1	3.3%
71758	Secesh-Cedargap complex, 1 to 3 percent slopes, frequently flooded	All areas are prime farmland	35.3	6.1%
73008	Viraton silt loam, 2 to 5 percent slopes	All areas are prime farmland	58.3	10.1%
73010	Wilderness gravelly silt loam, 3 to 8 percent slopes	Not prime farmland	6.6	1.1%
73029	Gasconade-Gatewood-Rock outcrop complex, 3 to 15 percent slopes	Not prime farmland	61.7	10.6%
73051	Winnipeg silt loam, 2 to 5 percent slopes	All areas are prime farmland	11.5	2.0%
73450	Goss-Wilderness complex, 3 to 8 percent slopes	Not prime farmland	121.9	21.0%
75383	Cedargap silt loam, 1 to 3 percent slopes, frequently flooded	All areas are prime farmland	26.1	4.5%
76758	Secesh-Cedargap complex, 0 to 2 percent slopes, frequently flooded	All areas are prime farmland	30.4	5.2%
Totals for Area of Interest			579.4	100.0%

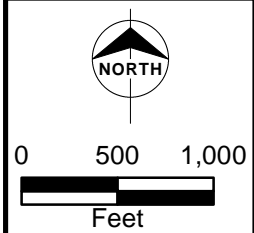
Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower



APPENDIX G - GEOLOGICAL STUDY

Date: January 22, 2016
To: Burns & McDonnell
Attn: Mr. Michael Herleth
From: Palmerton & Parrish, Inc.
Subject: Kansas Expressway Extension – Preliminary Geologic Evaluation
PPI Project No: 229804

Attached, please find a summary of the results of the Preliminary Geologic Evaluation performed by PPI for the above referenced project. Map and database research was performed by PPI on January 11 through 12, 2016, while a field site reconnaissance was performed on January 14 through 20, 2016. All geologic features that were observed/identified along or adjacent to the proposed alignment through map research and/or site reconnaissance were assigned a feature number. In addition, the latitude/longitude of the feature was determined using a handheld GPS unit, photographs of the feature were taken and dimensions and observations regarding the feature were recorded. Several different geologic features were observed on the subject property, including caves, springs, sinkhole collapses and depressions. Features of concern that may pose a potential roadway/development design hazard or environmental hazard are summarized below according to feature number. In addition, a .kmz file presenting the location of each feature described below has been included electronically with this memo submission.

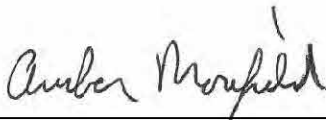
It should be noted that most, if not all, of the geologic features identified may require some degree of additional investigation, i.e. drilling of geotechnical sample borings, geophysical survey, excavation of test pits, etc., once a more refined alignment is identified. PPI can prepare a feature specific work plan for additional investigation for each feature, if required, following review/comments by Burns & McDonnell.

Palmerton & Parrish, Inc. observed that degree of care and skill generally exercised by other consultants under similar circumstances and conditions. Palmerton & Parrish's findings and conclusions must be considered not as scientific certainties, but as opinions based on our professional judgment concerning the significance of the data gathered during the course of this investigation. Other than this, no warranty is implied or intended.

If you have any questions regarding this technical memo, please feel free to contact our office.

PALMERTON & PARRISH, INC.

By:



Amber N. Morefield
Geologist

ANM/BRP/brp

cc: Ms. Renee Kuruc - Burns & McDonnell

PALMERTON & PARRISH, INC.

By:



Brandon R. Parrish, P.E.
Vice-President



Location: KE 1

Latitude/Longitude: [REDACTED]

Feature Type: Large Depression

Feature Details: Approximately 20' wide by 30' long and shallow.

Picture not taken due to thick vegetation.

Potential Design Hazard: Possible solution feature with the potential for future karst collapse and environmental concerns, depending upon actual proximity to the proposed roadway alignment and surrounding grading.

Additional Investigation Recommendations: Yes. Possibly drilling, scope TBD.

Location: KE 2

Latitude/Longitude: [REDACTED]

Feature Type: Small Depression

Feature Details: Approximately 10' wide by 8' long and 1' deep.

Picture not taken due to thick vegetation.

Potential Design Hazard: Possible solution feature with the potential for future karst collapse and environmental concerns, depending upon actual proximity to the proposed roadway alignment and surrounding grading.

Additional Investigation Recommendations: Yes. Possibly drilling, scope TBD.

Location: KE 3

Latitude/Longitude: [REDACTED]

Feature Type: Karst Collapse

Feature Details: Open void, approximately 7' wide by 10' long. Top of limestone approximately 8' below ground surface, weathered and pinnacled. A karst conduit or "eye" is present at the bottom of hole and appears to lead deeper.

Pictures:



Potential Design Hazard: Potential for further collapse in and around the surrounding area as more sediment is removed, as well as groundwater contamination.

Additional Investigation Recommendations: Yes. Possibly drilling & geophysics, and possibly test pit excavation with backhoe.

Location: KE 4

Latitude/Longitude: [REDACTED]

Feature Type: Small Depression

Feature Details: Elongated depression approximately 2' wide by 5' long located along a small outflow pathway.

Picture:



Potential Design Hazard: Possible solution feature with the potential for future karst collapse and environmental concerns, depending upon actual proximity to the proposed roadway alignment and surrounding grading.

Additional Investigation Recommendations: Yes. Additional site reconnaissance and possibly drilling.

Location: KE 5

Latitude/Longitude: [REDACTED]

Feature Type: Karst Collapse

Feature Details: Open void approximately 9' in diameter and 8' deep with possible limestone at the bottom. The bottom of the collapse could not be observed due to debris.

Picture:



Potential Design Hazard: Potential for future collapses in and around the surrounding area as more sediment is removed, as well as groundwater contamination.

Additional Investigation Recommendations: Yes. Drilling and geophysics, and possibly test pit excavation with backhoe.



Location: KE 6

Latitude/Longitude: [REDACTED]

Feature Type: Small Depression

Feature Details: Approximately 2' wide by 5' long and 1' deep.

Picture: Left

Potential Design Hazard: Possible solution feature with the potential for future karst collapse and environmental concerns, depending upon actual proximity to the proposed roadway alignment and surrounding grading.

Additional Investigation Recommendations: Yes. Additional site reconnaissance and possibly drilling.

Location: KE 7

Latitude/Longitude: [REDACTED]

Feature Type: Small Depression

Feature Details: Circular depression approximately 5' in diameter and shallow.

Picture not taken due to thick vegetation.

Potential Design Hazard: Possible solution feature with the potential for future karst collapse and environmental concerns, depending upon actual proximity to the proposed roadway alignment and surrounding grading.

Additional Investigation Recommendations: Yes. Possibly drilling, scope TBD.

Location: KE 8

Latitude/Longitude: [REDACTED]

Feature Type: Small Depression

Feature Details: Approximately 5' wide by 6' long and shallow.

Picture not taken due to thick vegetation.

Potential Design Hazard: Possible solution feature with the potential for future karst collapse and environmental concerns, depending upon actual proximity to the proposed roadway alignment and surrounding grading.

Additional Investigation Recommendations: Yes. Additional site reconnaissance and possibly drilling.

Location: KE 9

Latitude/Longitude: [REDACTED]

Feature Type: Karst Collapse

Feature Details: Circular opening approximately 7' wide by 8' long and 1' to 2' deep.

Picture:



Potential Design Hazard: Potential for future collapses in and around surrounding area as more sediment is removed, as well as groundwater contamination.

Additional Investigation Recommendations: Yes. Possibly drilling & geophysics, and possibly test pit excavation with backhoe.

Location: KE 10

Latitude/Longitude: [REDACTED]

Feature Type: Spring

Feature Details: Groundwater coming up to the surface originating from underground, possibly from the NW. The spring joins into Workman Branch to the south.

Picture:



Potential Design Hazard: Indication of underground stream and karst system.

Additional Investigation Recommendations: Will depend on proposed roadway alignment and site grading. Design and construction of a spring box to maintain and control spring flow could be required.

Location: KE 11

Latitude/Longitude: [REDACTED]

Feature Type: Large Depression

Feature Details: Depression approximately 14' wide by 16' long filled with trees and vegetation.

Potential Design Hazard: Possible solution feature with the potential for future karst collapse and environmental concerns, depending upon actual proximity to the proposed roadway alignment and surrounding grading.

Additional Investigation Recommendations: Yes. Possibly drilling, scope TBD.

Location: KE 12

Latitude/Longitude: [REDACTED]

Feature Type: Small Depression

Feature Details: Circular depression with some collapse around parts of the perimeter. Approximately 6' in diameter with the collapsed areas approx. 1' deep.

Picture not taken due to thick vegetation.

Potential Design Hazard: Possible solution feature with the potential for future karst collapse and environmental concerns, depending upon actual proximity to the proposed roadway alignment and surrounding grading.

Additional Investigation Recommendations: Yes. Possibly drilling, scope TBD.

Location: KE 13

Latitude/Longitude: [REDACTED]



Feature Type: Small Opening

Feature Details: Small opening just off the east side of Farm Road 145. Approximately 1' wide by 2' long and 2' deep with a small opening in the bottom possibly leading to a larger feature.

Picture: Left

Potential Design Hazard: Possible solution feature with the potential for future karst collapse and environmental concerns.

Additional Investigation Recommendations: Yes. Possibly drilling & geophysics, or test pit excavation with backhoe.

Location: KE 14

Feature Type: Small Depression

Feature Details: Approximately 1' wide by 2' long and shallow.

Picture:



Potential Design Hazard: Possible solution feature with the potential for future karst collapse and environmental concerns, depending upon actual proximity to the proposed roadway alignment and surrounding grading. Possible former site of a tree that has been removed.

Additional Investigation Recommendations: Yes. Additional Site Recon or possibly drilling/geophysics, scope TBD.

Location: KE 15

Latitude/Longitude: [REDACTED]

Feature Type: Small Depression

Feature Details: Circular depression approximately 3' in diameter and 1' to 2' deep.

Potential Design Hazard: Possible solution feature with the potential for future karst collapse and environmental concerns. However, surrounding area affected by flooding – several fallen trees and bent bushes and the hole may possibly have been caused by a falling tree.

Additional Investigation Recommendations: Yes. Possibly drilling/geophysics, scope TBD.

Location: KE 16

Latitude/Longitude: [REDACTED]

Feature Type: Oval Depression

Feature Details: Oval shaped depression approximately 5' wide by 15' long. The floor of the depression slopes down from the NE to the SW so that it is approximately 4' deep at the SW end. Some overhanging rocks have collapsed into it.

Pictures:



Potential Design Hazard: Possible solution feature with the potential for future karst collapse and environmental concerns.

Additional Investigation Recommendations: Yes. Drilling or geophysics.

Location: KE 17

Latitude/Longitude: [REDACTED]

Feature Type: Small Depression

Feature Details: Circular depression approximately 4' in diameter and 1' deep filled with vegetation on a hillside.



Picture: Left

Potential Design Hazard: Possible solution feature with the potential for future karst collapse and environmental concerns, depending upon actual proximity to the proposed roadway alignment and surrounding grading.

Additional Investigation Recommendations: Yes. Possibly drilling, scope TBD.

Location: KE 18

Latitude/Longitude: [REDACTED]

Feature Type: Small Depression

Feature Details: Circular depression approximately 3' in diameter and shallow.

Picture not included due to thick vegetation obscuring the feature.

Potential Design Hazard: Possible solution feature with the potential for future karst collapse and environmental concerns, depending upon actual proximity to the proposed roadway alignment and surrounding grading.

Additional Investigation Recommendations: Yes. Possibly drilling, scope TBD.

Location: KE 19

Latitude/Longitude: [REDACTED]

Feature Type: Karst Collapse

Feature Details: Oval shaped collapse approximately 7' wide and 12' long. Feature was at least 10' deep but the fog which could be seen coming from the bottom suggests it goes deeper. The collapse is currently filled with vegetation and other debris.

Picture:



Potential Design Hazard: Potential for future collapses in and around the surrounding area as more sediment is removed, as well as groundwater contamination.

Additional Investigation Recommendations: Yes. Drilling and geophysics, but will depend on proposed roadway alignment and site grading.

Location: KE 20

Latitude/Longitude: [REDACTED]

Feature Type: Large Depression

Feature Details: Circular depression approximately 70' in diameter

Picture:



Potential Design Hazard: Possible solution feature with the potential for future karst collapse and environmental concerns, depending upon actual proximity to the proposed roadway alignment and surrounding grading.

Additional Investigation Recommendations: Yes. Possibly drilling and geophysics, scope TBD.

Location: KE 21

Latitude/Longitude: [REDACTED]

Feature Type: Cave

Feature Details: Located on a hillside. Limestone cap rock approximately 8' thick where visible. One large and one small opening. Cave widens out once inside and the full extent could not be determined at the time of this initial investigation. It appears to extend farther in an arc starting to the NE and ending to the SW. Water could be heard dripping and pooling farther into the interior to the south.

Pictures:





Potential Design Hazard: The limestone ceiling could be too thin to provide an adequate base for the planned roadway. The extent of the cave is currently unknown and construction could disturb the structural integrity. Risk of groundwater contamination and disturbance of cave dwelling species (if present) must also be considered.

Additional Investigation Recommendations: Yes. Drilling, geophysics, dye tracing, cave exploration and evaluation by Environmental Consultants.



Location: KE 22

Latitude/Longitude: [REDACTED]

Feature Type: Large Depression

Feature Details: A large shallow depression approximately 20' wide by 35' long.

Picture not included due to ground cover obscuring the view of the feature.

Potential Design Hazard: Possible solution feature with the potential for future karst collapse and environmental concerns, depending upon actual proximity to the proposed roadway alignment and surrounding grading.

Additional Investigation Recommendations: Yes. Possibly drilling, scope TBD.

Location: KE 23

Latitude/Longitude: [REDACTED]

Feature Type: Large Depression

Feature Details: Shallow depression approximately 12' wide by 15' long.

Picture not included due to thick vegetation obscuring the feature.

Potential Design Hazard: Possible solution feature with the potential for future karst collapse and environmental concerns, depending upon actual proximity to the proposed roadway alignment and surrounding grading.

Additional Investigation Recommendations: Yes. Possibly drilling, scope TBD.

Date: February 24, 2016
To: Burns & McDonnell
Attn: Mr. Steven Beam, P.E.
From: Palmerton & Parrish, Inc.

Subject: Kansas Extension – Geologic Feature Investigation Work Plan
PPI Project No: 229804

As you know, a Preliminary Geologic Evaluation was performed by PPI for the above referenced project alignment with a summary memo submitted January 22, 2016. A total of twenty-three (23) karst features were identified on or near the project alignment. At the time of the evaluation, the proposed roadway alignment was unknown. Since submission of the Preliminary Geologic Evaluation, the roadway limits have been provided to PPI in .kmz format. Using this file, each documented karst feature was re-evaluated based upon the proximity to the planned roadway limits. As you know, grading beyond the roadway limits will be performed in some areas, and may affect additional features. It is understood that roadway cross sections will be provided at a later date, which may or may not affect additional geologic features.

The table below summarizes the secondary evaluation, including information for each feature, proximity to the roadway, primary design hazard and recommended additional investigation. As the table presents, of the 23 features, additional field investigation is recommended for 15 of the features. Additional field investigation ranges from additional site reconnaissance to geotechnical drilling, or seismic geophysics. A total of 11 of the 15 features recommended for additional field investigation are located within the alignment, or within a distance of 50 ft. away from the edge of shoulder/sidewalk. Only limited additional investigation was recommended for the larger features located greater than 50 ft. away from the planned improvements, and pose the potential for a point source of groundwater contamination.

Special attention will be required for the large cave feature (KE-21) and the spring feature (KE-10). Although all of the karst features recommended for additional investigation are addressed within the Greene County Design Standards (Section 107), special considerations are required for springs and caves. The additional work for these features was included during the proposal phase of this project and is part of the executed contract between Burns & McDonnell and PPI. In order to obtain additional information for these noted karst features, and provide design recommendations for each, PPI requests to begin field work as soon as possible. Depending upon the conditions encountered, some features may significantly affect roadway design and possibly alignment.

Feature No.	Feature Type	Proximity to Roadway	Primary Design Hazard	Add'l Investigation & Type Recommended
KE-1	Shallow Depression	SB Inside Lane	Structural Collapse & Groundwater Contamination	Drilling & Geophysics*
KE-2	Shallow Depression	SB Shoulder	Structural Collapse & Groundwater Contamination	Drilling & Geophysics*
KE-3	Open Void	75' W of SB Shoulder	Groundwater Contamination	Add'l Site Recon for Graded Filter
KE-4	Shallow Depression	220' W of SB Shoulder	Groundwater Contamination	None – Confirm Grading Limits
KE-5	Open Void	160' W of SB Shoulder	Groundwater Contamination	Add'l Site Recon for Graded Filter
KE-6	Shallow Depression	100' W of SB Shoulder	Groundwater Contamination	None – Confirm Grading Limits
KE-7	Shallow Depression	SB Inside Lane	Structural Collapse & Groundwater Contamination	Drilling & Geophysics*
KE-8	Shallow Depression	30' W of SB Shoulder	Structural Collapse & Groundwater Contamination	Drilling
KE-9	Shallow Collapse	83' E of NB Shoulder	Groundwater Contamination	Limited Drilling for Design of Graded Filter
KE-10	Spring	50' SW of SB Shoulder	Groundwater Contamination	None – Confirm Grading Limits – Spring Box Design May Be Required
KE-11	Depression	W Shoulder of SB Lane	Structural Collapse & Groundwater Contamination	Drilling & Geophysics*
KE-12	Shallow Depression	Centerline of NB Lanes	Structural Collapse & Groundwater Contamination	Drilling & Geophysics*
KE-13	Small Surface Opening	16' W of SB Shoulder	Structural Collapse & Groundwater Contamination	Drilling & Geophysics* & Additional Site Recon
KE-14	Shallow Depression	Centerline of SB Lanes	Structural Collapse & Groundwater Contamination	Drilling
KE-15	Shallow Depression	80' W of SB Shoulder	Groundwater Contamination	None – Confirm Grading Limits
KE-16	Shallow Depression	SB Shoulder	Structural Collapse & Groundwater Contamination	Drilling & Geophysics*
KE-17	Shallow Depression	135' of SB Shoulder	Groundwater Contamination	None – Confirm Grading Limits
KE-18	Shallow Depression	150' W of SB Shoulder	Groundwater Contamination	None – Confirm Grading Limits
KE-19	Open Void	500' W of SB Shoulder	Structural Collapse & Groundwater Contamination	None – Confirm Grading Limits. May warrant additional discussion due to size/depth.
KE-20	Large Depression	300' E of NB Shoulder	Groundwater Contamination	None – Confirm Grading Limits
KE-21	Cave	290' W of SB Shoulder	Structural Collapse & Groundwater Contamination	Cave Mapping needed to assess. One approach would be to just drill 50' W of Roadway or utilize geophysics* to look for voids.
KE-22	Shallow Depression	26' W of SB Shoulder	Structural Collapse & Groundwater Contamination	Drilling & Geophysics*
KE-23	Shallow Depression	Centerline of NB Lanes	Structural Collapse & Groundwater Contamination	Drilling & Geophysics*


*Geophysics will only be utilized when shallow bedrock is not encountered in preliminary borings, or when above a cave.

Palmerton & Parrish, Inc. observed that degree of care and skill generally exercised by other consultants under similar circumstances and conditions. Palmerton & Parrish's findings and conclusions must be considered not as scientific certainties, but as opinions based on our professional judgment concerning the significance of the data gathered during the course of this investigation. Other than this, no warranty is implied or intended.

If you have any questions regarding this technical memo, please feel free to contact our office.

PALMERTON & PARRISH, INC.

By:


Brandon R. Parrish, P.E.
Vice-President



BRP/brp

cc: Ms. Renee Kuruc
Mr. David Hurt
Mr. Michael Herleth

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**APPENDIX H - HISTORIC RESOURCE RECONNAISSANCE AND ARCHAEOLOGICAL
BACKGROUND STUDY**

**PROGRAMMATIC AGREEMENT
AMONG
THE FEDERAL HIGHWAY ADMINISTRATION,
THE MISSOURI HIGHWAY AND TRANSPORTATION COMMISSION,
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION, AND
THE MISSOURI STATE HISTORIC PRESERVATION OFFICE
FOR THE PHASED IDENTIFICATION AND EVALUATION OF
HISTORIC PROPERTIES**

Whereas, the Missouri Division Administrator, Federal Highway Administration (FHWA), is the “Agency Official” responsible for compliance with Section 106 of the *National Historic Preservation Act of 1966* (NHPA), as amended (*16.U.S.C. 470 et seq.*) and implementing regulations (*36 CFR Part 800*) regarding the Federal Aid Highway Program (Program) in the State of Missouri; and

Whereas, the Missouri Highway and Transportation Commission (MHTC), acting through the Missouri Department of Transportation (MoDOT), in consultation and partnership with the FHWA, administers Federal-aid highway projects (undertakings) throughout the State of Missouri as authorized by Title 23, U.S.C. 470 et seq.; and

Whereas, the Missouri State Historic Preservation Officer’s (SHPO) responsibilities, under Section 106 of the NHPA and 36 CFR Part 800, are to advise, assist, and consult with federal agencies as they carry out their historic preservation responsibilities and to respond to federal agencies’ requests within a specified period of time; and

Whereas, FHWA has determined that certain transportation projects constitute “undertakings” which may have an effect upon properties included in, or eligible for inclusion in, the *National Register of Historic Places* (Register); and

Whereas, such undertakings commonly require the acquisition of lands for new rights-of-way (ROW), where access for completing Section 106 inventory, eligibility, and effect determinations may not be possible until after MoDOT has purchased the ROW; and

Whereas, FHWA has consulted with the SHPO and the Advisory Council on Historic Preservation (ACHP) pursuant to 36 CFR 800.14(b) to develop this Programmatic Agreement (PA) in order to establish a more effective and predictable approach for phasing the identification and evaluation of historic properties consistent with the regulations at 36 CFR Part 800; and

Whereas, MoDOT has participated in consultation and has been invited to be a signatory to this PA; and

Whereas, FHWA has consulted with Federally-recognized Indian tribes with historical ties to the state of Missouri, Certified Local Governments, and the public in developing this PA and has taken their views into account in finalizing this PA; and

Whereas, the Peoria Tribe of Indians of Oklahoma and the Ponca Tribe of Nebraska have

commented on this PA, and the Peoria Tribe has requested to be a concurring party; and

Whereas, MoDOT employs qualified professional staff and consultants capable of completing many of the steps of the Section 106 review and compliance process on behalf of the FHWA;

Now, therefore, FHWA, SHPO, ACHP, and MHTC, as signatories to this PA, agree that MODOT may use a phased process to conduct identification and evaluation efforts in accordance with the following measures for Program undertakings.

Stipulations

FHWA shall ensure that the following measures are carried out:

I. Applicability

- A. This PA allows for phasing the identification and evaluation of effects to historic properties pursuant to 36 CFR 800.4(b)(2) when MoDOT is unable to gain access for the completion of cultural resources investigations prior to acquisition of new ROW needed for project development. In such cases, FHWA may use the procedures in this PA to satisfy its Section 106 responsibilities for historic property identification, evaluation, and consideration of project effects.
- B. Conditions for the early acquisition of new ROW prior to the completion of the concluding phase of identification and evaluation:
 - 1. MoDOT will phase the identification of historic properties following the procedures in Stipulations II and III below;
 - 2. MoDOT will ensure that no construction or activities that could affect historic properties occur until all Section 106 review and consultation have been completed and FHWA has issued a decision to proceed with the undertaking; and
 - 3. Acquisition of ROW will not limit FHWA's later consideration of reasonable alternatives for the project or otherwise prevent FHWA from making an impartial decision as to whether or not to proceed with an alternative that adversely affects one or more historic properties.
- C. This PA applies to projects of any National Environmental Policy Act (NEPA) class of action, whether Environmental Impact Statement, Environmental Assessment, or Categorical Exclusion.
- D. This process may be used only for activities funded under the Federal Aid Highway Program which are administered by MoDOT.
- E. Except as specifically provided in Stipulations II and III below, FHWA will comply with the requirements of 36 CFR Part 800.3 – 800.6 for all undertakings covered by this PA. To the maximum extent possible, FHWA, with the assistance of MoDOT, will integrate historic properties preservation planning and management decisions with other policy and program requirements (such as those of NEPA) consistent with

the NHPA. FHWA is committed to involving consulting parties and the public in the Section 106 process through direct contact to consulting parties and the use of the DOT's existing NEPA and project public notification procedures.

II. Initial Phase for Identification and Evaluation of Historic Properties

MoDOT shall carry out the identification and evaluation of historic properties as part of its Section 106 review process in accordance with 36 CFR 800.4. Pursuant to 36 CFR 800.4(b)(2), a phased process may be applied under any of the following conditions:

- when access to the property is restricted to prevent a standard Section 106 investigation;
- large or complex projects where multiple alternatives are under consideration; or
- when the area of potential effects cannot be fully determined until later in project development for the location of elements of the project (e.g., bridge piers, storm water detention facilities, etc.) typically included as part of final design and permitting.

A. For the initial phase for identification of historic properties, MoDOT will:

1. Determine the undertaking's area of potential effects (APE) as defined in 36 CFR 800.16(d).
2. Prepare or cause to be prepared, a literature review, a reconnaissance survey, and/or an archaeological predictive model or archaeological sensitivity study, as appropriate. Reconnaissance surveys, archaeological predictive models or sensitivity studies will establish the likely presence of historic properties within each alternative under consideration or within each inaccessible area, and will be documented in accordance with Stipulation II.B.
3. Notify FHWA of the identification of any historic properties and archaeological sites with more than minimal value for preservation in place.
4. Consult with the consulting parties, individuals, and organizations likely to have knowledge of, or concerns with, cultural resources in the area, review existing information on cultural resources within the APE and seek information from Indian tribes who may ascribe traditional religious and cultural significance to historic properties in the APE.
5. To the extent possible, identify preliminary project effects pursuant to 36 CFR 800.5 based on information from accessible parcels.

B. Upon completion of II.A, MoDOT will send a letter notifying the SHPO, with copies to consulting parties, if any, that it has completed the initial phase for identification and evaluation, and that Section 106 review for the project will be completed using the phased process contained in this PA. The notification will include the following documentation:

1. A brief summary of the project's scope and that this project requires the application of this PA for phased identification and evaluation.
2. An identification of the following:
 - a. consulting parties,
 - b. area of potential effect, and

- c. any concerns or controversy on matters related to historic properties identified through consultation or public involvement.
 - 3. Register eligibility recommendations for all identified properties (including buildings and bridges) within the APE.
 - 4. If possible, any preliminary effect recommendations for the project and, if appropriate, effect findings for any individual historic properties.
 - 5. Identification of the potential for any archeological properties that might have importance chiefly for other than what can be learned from data recovery and have more than minimal value for preservation in place.
 - 6. A description of any archaeological or architectural surveys that will be completed after ROW acquisition, or access to the property, on currently inaccessible parcels.
- C. The SHPO will have 15 calendar days from receipt to review the Stipulation II(B) letter and to respond with any comments or concerns about proceeding according to this PA. If SHPO fails to respond within 15 days from the receipt of the Stipulation II(B) letter, MoDOT may assume SHPO has no objections and may proceed to acquire needed ROW. Any concerns raised by other consulting parties shall be taken into account by MoDOT and FHWA in completing the requirements of Stipulation III below.

III. Concluding Phase for Identification and Evaluation of Historic Properties

For undertakings requiring phased identification, MoDOT will complete cultural resource investigations after the ROW has been obtained, or permission to access is given, but prior to project approval and authorization for construction on the project to proceed.

- A. In the concluding phase of identification and evaluation MoDOT shall complete the needed identification and evaluation as proposed in the Initial Phase notification letter, taking into account any input received from SHPO and other consulting parties.
- B. MoDOT will prepare a final report of its efforts to identify and evaluate historic properties in the APE, including any properties identified during the initial phase of identification. MoDOT will transmit the final inventory report and determination of effect for the undertaking to the FHWA, SHPO, and consulting parties.
- C. Based on the results of identification, FHWA will conclude Section 106 review for the undertaking in accordance with 36 CFR 800.4-800.6.

IV. Guidelines, Standards, and Regulations

MoDOT will ensure that cultural resources work carried out under the term of this PA are conducted by, or under the direct supervision of an individual or individuals that meet the Secretary of the Interior's Qualifications Standards for Historic Preservation. In addition, the following standards, guidelines and regulations will be applied to all cultural resources work:

- *Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation: Identification (1983);*

- *36 CFR 800: Protection of Historic Properties*
- *SHPO's Guidelines for Phase I Archaeological Surveys and Reports.*
- *The ACHP's Consultation with Indian tribes in the Section 106 Review Process: A Handbook. (2012).*

V. Amendment

Any party to this PA may request that it be amended, whereupon the parties will consult to consider such an amendment. Amendments to this PA will require review by all signatories. This PA may only be amended upon the written agreement of the FHWA, MHTC, SHPO, and the ACHP.

VI. Termination

Any party to this PA may terminate it by providing 30-calendar days notice in writing to the other parties, provided that the parties will consult during the period prior to termination to seek agreement on amendments and other actions that would avoid termination. In the event of termination, the FHWA will comply with 36 CFR 800.3 through 36 CFR 800.6 with regard to individual undertakings covered by this PA.

VII. Dispute Resolution

Should the SHPO or ACHP object within 30 days to any documentation submitted or actions proposed pursuant to this PA, the FHWA will ensure that the MoDOT consults with the objecting party to resolve the objections. If the objection cannot be resolved, the FHWA will comply in accordance with 36 CFR 800.4 through 36 CFR 800.6. FHWA's responsibility to comply with the stipulations of the PA for all other projects that are not the subject of the dispute will remain unchanged. When requested by any consulting party, the ACHP will consider FHWA's findings under this PA. The provisions of 36 CFR 800.9(a) on public requests to the ACHP will apply.

VIII. Duration

This PA will have an initial term of five (5) years from the date of the last signature and will be renewable. MHTC, acting through MoDOT, will coordinate a meeting of the signatories to periodically review implementation of the terms of this PA: one (1) year after the date of execution and at 2 year intervals after the initial review for the initial 5 year term. If no amendments are proposed and the signatories do not object, written lack of objection by the signatories will be the basis for the PA to remain in effect for the next period of five (5) years until it is superseded or is terminated according to Stipulation VI.

VIII. Execution and Implementation

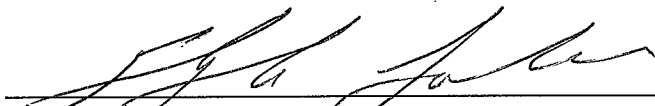
The execution of this PA and implementation of its terms evidences that the FHWA has afforded the ACHP a reasonable opportunity to comment on the use of a phased approach to identification and evaluation for the Federal-Aid Highway Program in Missouri, and

that the FHWA has taken into account the effects of this Program on historic properties.

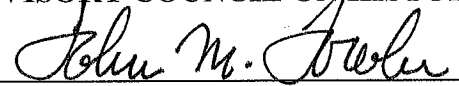
This PA is binding upon the signatories hereto not as individuals, but solely in their capacities as officials of their respective organizations, and acknowledges proper action of the (MHTC, SHPO, FHWA, ACHP) to enter into the same.

Signed:

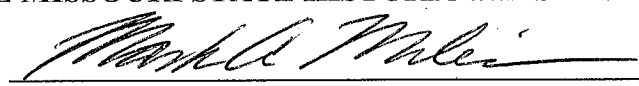
FEDERAL HIGHWAY ADMINISTRATION:

By:  Date: 7/10/2014
Title: Assistant Division Administrator

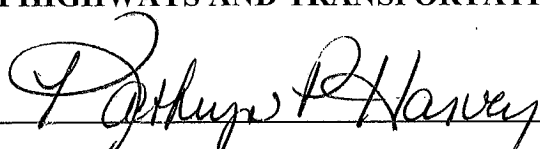
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION:

By:  Date: 7/29/14
Title: John M. Fowler, Executive Director


THE MISSOURI STATE HISTORIC PRESERVATION OFFICE:

By:  Date: 6/24/14
Title: DSTIPO


MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION:

By:  Date: 6-19-14
Title: Assistant Chief Engineer

Attest:


Commission Secretary

Approved as to form:


Commission Counsel

Concur:

PEORIA TRIBE OF INDIANS OF OKLAHOMA

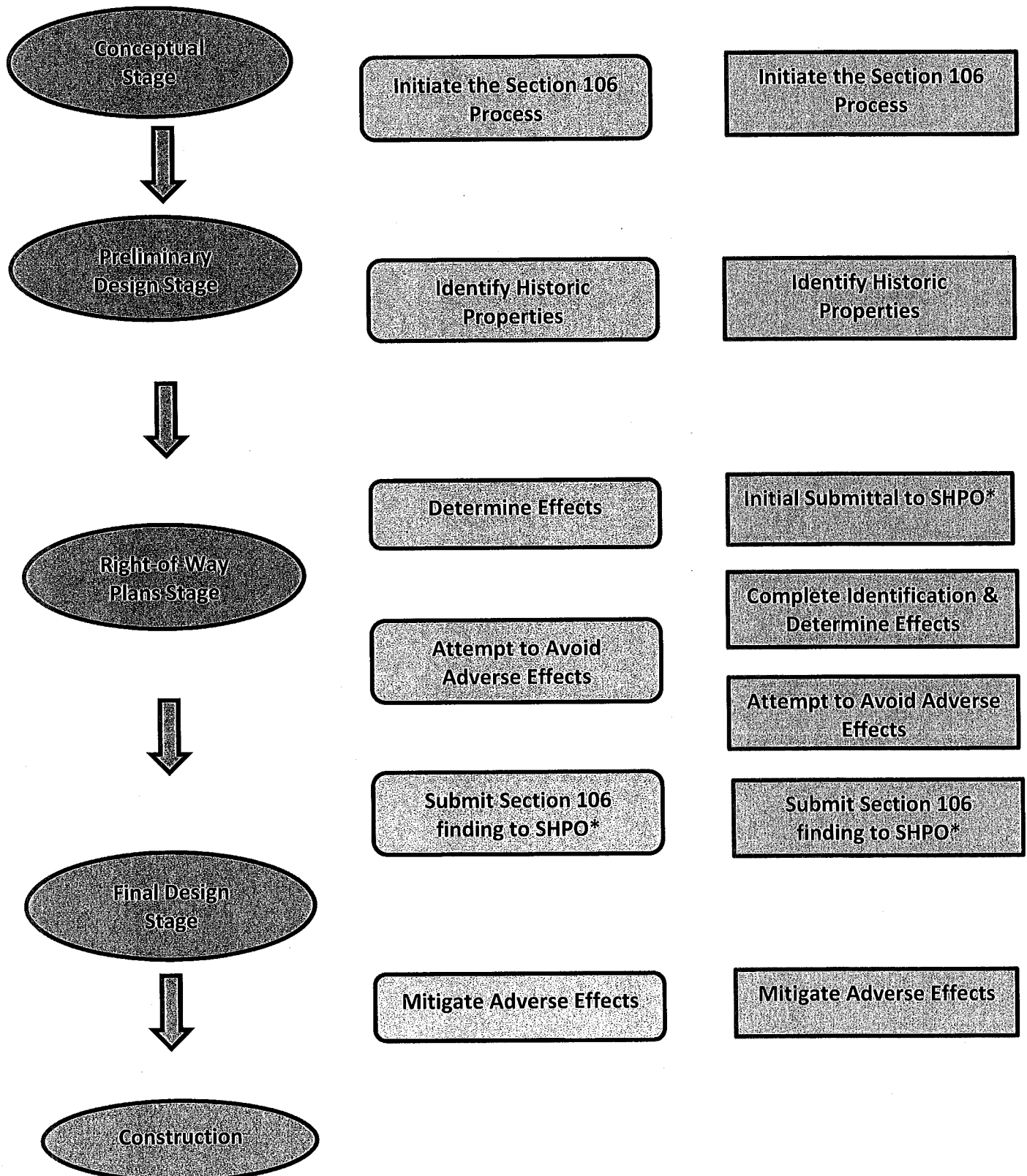
By: _____ **Date:** _____

Title: _____

MoDOT Project Development Milestones

Standard Section 106 Milestones

Phased Section 106 Milestones



*An agreement document to mitigate known adverse effects to a historic property can be negotiated at these stages



Jeremiah W. (Jay) Nixon, Governor • Sara Parker Pauley, Director

DEPARTMENT OF NATURAL RESOURCES

www.dnr.mo.gov

August 31, 2016

John Fulmer
Cultural Resources Department Manager
Burns & McDonnell
9400 Ward Parkway
Kansas City, Missouri 64114

Re: Kansas Extension Project (FHWA) Springfield, Greene County, Missouri

Dear Mr. Fulmer:

Thank you for submitting information on the above referenced project for our review pursuant to Section 106 of the National Historic Preservation Act (P.L. 89-665, as amended) and the Advisory Council on Historic Preservation's regulation 36 CFR Part 800, which requires identification and evaluation of cultural resources.

We have reviewed the June 2016 report entitled *Historic Resources Reconnaissance Survey and Archaeology Review for the Kansa Extension Project, Greene County, Missouri*. Based on this review it is evident that a thorough and adequate records review has been conducted of the project area. We concur with your recommendations for archaeological methodology. No all of the architectural resources were clearly represented, and additional photographs will be required before we can comment on eligibility and effect

Based on the information presented, we do not concur with your recommendation for the Patterson Cemetery. It is our opinion that this property is not eligible for inclusion in the National Register of Historic Places, due to the significant number of modern tombstones and the changes in landscape. We also ask that you complete a Cemetery Survey Form, sent to you by e-mail, for this property.

Please be advised that, should project plans change, information documenting the revisions should be submitted to this office for further review. In the event that cultural materials are encountered during project activities, all construction should be halted, and this office notified as soon as possible in order to determine the appropriate course of action.

If you have any questions, please write Judith Deel at State Historic Preservation Office, P.O. Box 176, Jefferson City, Missouri 65102 or call 573/751-7862. Please be sure to include the SHPO Log Number (109-GR-16) on all future correspondence or inquiries relating to this project.

Sincerely,

STATE HISTORIC PRESERVATION OFFICE

Toni M. Prawl, Ph.D.
Director and Deputy State
Historic Preservation Officer

TMP:jd

c Raegan Ball, FHWA
Roopa Banerjee, FHWA
Michael Meinkoth, MoDOT



Promoting, Protecting and Enjoying our Natural Resources. Learn more at dnr.mo.gov



U.S. Department
of Transportation
**Federal Highway
Administration**

Missouri Division

September 26, 2016

3220 W. Edgewood, Suite H
Jefferson City, Missouri 65109
(573) 636-7104
Fax (573) 636-9283
Missouri.FHWA@fhwa.dot.gov

Ms. Sheila Bird
Tribal Historic Preservation Officer
Cherokee Nation
P.O. Box 948
Tahlequah, OK 74464

Dear Ms. Bird:

Subject: KANSAS EXTENSION PROJECT, SPRINGFIELD, MO, INITIATING SECTION 106

The Federal Highway Administration, in cooperation with the Missouri Department of Transportation (MoDOT), is initiating consultation pursuant to Section 106 of the National Historic Preservation Act for proposed construction that would extend Kansas Expressway to the south from Republic Road approximately 2.3 miles to a new connection with Cox Road at West Farm Road 190 in Springfield. The primary purpose of the project is to improve traffic flow in southern Greene County.

Preliminary research indicates that there are three recorded prehistoric archaeological sites and two historic archaeological sites within 500 feet of the proposed construction limits. An archaeological survey has been recommended for the project. A reconnaissance level historic resources survey has been conducted during which 11 resources were recorded and evaluated. None are recommended as being eligible for the National Register of Historic Places.

Attached are maps showing the location of the proposed Kansas Extension Project and the areas of potential effects for archaeological and for historic resources. If you or any of your staff have any comments or questions, please contact me at raegan.ball@dot.gov or (573) 638-2620, or Mike Meinkoth, MoDOT Historic Preservation Manager, at michael.meinkoth@modot.mo.gov or (573) 526-3593.

Sincerely yours,

Raegan Ball
Program Development Team Leader
Missouri Division
Federal Highway Administration

Attachments

Copies: Dr. Toni Prawl – MDNR
Mr. Michael Meinkoth – MoDOT



U.S. Department
of Transportation
**Federal Highway
Administration**

Missouri Division

September 26, 2016

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Fax (573) 636-9283
Missouri.FHWA@fhwa.dot.gov

Dr. Brice Obermeyer
Director, Historic Preservation Office
Delaware Tribe of Indians
1 Kellogg Circle
Roosevelt Hall, Rm 212
Emporia, KS 66801

Dear Dr. Obermeyer:

Subject: KANSAS EXTENSION PROJECT, SPRINGFIELD, MO, INITIATING SECTION 106

The Federal Highway Administration, in cooperation with the Missouri Department of Transportation (MoDOT), is initiating consultation pursuant to Section 106 of the National Historic Preservation Act for proposed construction that would extend Kansas Expressway to the south from Republic Road approximately 2.3 miles to a new connection with Cox Road at West Farm Road 190 in Springfield. The primary purpose of the project is to improve traffic flow in southern Greene County.

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Sincerely yours,

Raegan Ball
Program Development Team Leader
Missouri Division
Federal Highway Administration

Attachments

Copies: Dr. Toni Prawl – MDNR
Mr. Michael Meinkoth – MoDOT



U.S. Department
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**Federal Highway
Administration**

Missouri Division

September 26, 2016

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Jefferson City, Missouri 65109
(573) 636-7104
Fax (573) 636-9283
Missouri.FHWA@fhwa.dot.gov

Mr. Jason Ross
Section 106 Manager
Delaware Nation
P.O. Box 825
Anadarko, OK 73005

Dear Mr. Ross:

Subject: KANSAS EXTENSION PROJECT, SPRINGFIELD, MO, INITIATING SECTION 106

The Federal Highway Administration, in cooperation with the Missouri Department of Transportation (MoDOT), is initiating consultation pursuant to Section 106 of the National Historic Preservation Act for proposed construction that would extend Kansas Expressway to the south from Republic Road approximately 2.3 miles to a new connection with Cox Road at West Farm Road 190 in Springfield. The primary purpose of the project is to improve traffic flow in southern Greene County.

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Sincerely yours,

Raegan Ball
Program Development Team Leader
Missouri Division
Federal Highway Administration

Attachments

Copies: Dr. Toni Prawl – MDNR
Mr. Michael Meinkoth – MoDOT



U.S. Department
of Transportation
**Federal Highway
Administration**

Missouri Division

September 26, 2016

3220 W. Edgewood, Suite H
Jefferson City, Missouri 65109
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Fax (573) 636-9283
Missouri.FHWA@fhwa.dot.gov

Ms. Robin Dushane
Cultural Preservation Director
Eastern Shawnee Tribe of Oklahoma
127 West Oneida
P.O. Box 350
Seneca, MO 64865

Dear Ms. Dushane:

Subject: KANSAS EXTENSION PROJECT, SPRINGFIELD, MO, INITIATING SECTION 106

The Federal Highway Administration, in cooperation with the Missouri Department of Transportation (MoDOT), is initiating consultation pursuant to Section 106 of the National Historic Preservation Act for proposed construction that would extend Kansas Expressway to the south from Republic Road approximately 2.3 miles to a new connection with Cox Road at West Farm Road 190 in Springfield. The primary purpose of the project is to improve traffic flow in southern Greene County.

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Sincerely yours,

Raegan Ball
Program Development Team Leader
Missouri Division
Federal Highway Administration

Attachments

Copies: Dr. Toni Prawl – MDNR
Mr. Michael Meinkoth – MoDOT



U.S. Department
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September 26, 2016

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Fax (573) 636-9283
Missouri.FHWA@fhwa.dot.gov

Mr. Kent Collier
Tribal Historic Preservation Officer
Kickapoo Tribe of Oklahoma
P.O. Box 70
McCloud, Oklahoma 74851

Dear Mr. Collier:

Subject: KANSAS EXTENSION PROJECT, SPRINGFIELD, MO, INITIATING SECTION 106

The Federal Highway Administration, in cooperation with the Missouri Department of Transportation (MoDOT), is initiating consultation pursuant to Section 106 of the National Historic Preservation Act for proposed construction that would extend Kansas Expressway to the south from Republic Road approximately 2.3 miles to a new connection with Cox Road at West Farm Road 190 in Springfield. The primary purpose of the project is to improve traffic flow in southern Greene County.

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Sincerely yours,

Raegan Ball
Program Development Team Leader
Missouri Division
Federal Highway Administration

Attachments

Copies: Dr. Toni Prawl – MDNR
Mr. Michael Meinkoth – MoDOT



U.S. Department
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Missouri Division

September 26, 2016

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Missouri.FHWA@fhwa.dot.gov

Mr. Kent Collier
Tribal Historic Preservation Officer
Kickapoo Tribe of Oklahoma
P.O. Box 70
McCloud, Oklahoma 74851

Dear Mr. Collier:

Subject: KANSAS EXTENSION PROJECT, SPRINGFIELD, MO, INITIATING SECTION 106

The Federal Highway Administration, in cooperation with the Missouri Department of Transportation (MoDOT), is initiating consultation pursuant to Section 106 of the National Historic Preservation Act for proposed construction that would extend Kansas Expressway to the south from Republic Road approximately 2.3 miles to a new connection with Cox Road at West Farm Road 190 in Springfield. The primary purpose of the project is to improve traffic flow in southern Greene County.

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Sincerely yours,

Raegan Ball
Program Development Team Leader
Missouri Division
Federal Highway Administration

Attachments

Copies: Dr. Toni Prawl – MDNR
Mr. Michael Meinkoth – MoDOT



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**Federal Highway
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September 26, 2016

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Jefferson City, Missouri 65109
(573) 636-7104
Fax (573) 636-9283
Missouri.FHWA@fhwa.dot.gov

Ms. Nellie Cadue
NAGPRA Director
Kickapoo Tribe in Kansas
1107 Goldfinch Road
Horton, KS 66439

Dear Ms. Cadue:

Subject: KANSAS EXTENSION PROJECT, SPRINGFIELD, MO, INITIATING SECTION 106

The Federal Highway Administration, in cooperation with the Missouri Department of Transportation (MoDOT), is initiating consultation pursuant to Section 106 of the National Historic Preservation Act for proposed construction that would extend Kansas Expressway to the south from Republic Road approximately 2.3 miles to a new connection with Cox Road at West Farm Road 190 in Springfield. The primary purpose of the project is to improve traffic flow in southern Greene County.

Preliminary research indicates that there are three recorded prehistoric archaeological sites and two historic archaeological sites within 500 feet of the proposed construction limits. An archaeological survey has been recommended for the project. A reconnaissance level historic resources survey has been conducted during which 11 resources were recorded and evaluated. None are recommended as being eligible for the National Register of Historic Places.

Attached are maps showing the location of the proposed Kansas Extension Project and the areas of potential effects for archaeological and for historic resources. If you or any of your staff have any comments or questions, please contact me at raegan.ball@dot.gov or (573) 638-2620, or Mike Meinkoth, MoDOT Historic Preservation Manager, at michael.meinkoth@modot.mo.gov or (573) 526-3593.

Sincerely yours,

Raegan Ball
Program Development Team Leader
Missouri Division
Federal Highway Administration

Attachments

Copies: Dr. Toni Prawl – MDNR
Mr. Michael Meinkoth – MoDOT



U.S. Department
of Transportation
**Federal Highway
Administration**

Missouri Division

September 26, 2016

3220 W. Edgewood, Suite H
Jefferson City, Missouri 65109
(573) 636-7104
Fax (573) 636-9283
Missouri.FHWA@fhwa.dot.gov

Ms. Diane Hunter
Tribal Historic Preservation Officer
Miami Tribe of Oklahoma
P.O. Box 1326
Miami, OK 74355

Dear Ms. Hunter:

Subject: KANSAS EXTENSION PROJECT, SPRINGFIELD, MO, INITIATING SECTION 106

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Raegan Ball
Program Development Team Leader
Missouri Division
Federal Highway Administration

Attachments

Copies: Dr. Toni Prawl – MDNR
Mr. Michael Meinkoth – MoDOT



U.S. Department
of Transportation
**Federal Highway
Administration**

Missouri Division

September 26, 2016

3220 W. Edgewood, Suite H
Jefferson City, Missouri 65109
(573) 636-7104
Fax (573) 636-9283
Missouri.FHWA@fhwa.dot.gov

Dr. Andrea A. Hunter
Director/THPO, Historic Preservation Office
Osage Nation
627 Grandview Avenue
Pawhuska, OK 74056

Dear Dr. Hunter:

Subject: KANSAS EXTENSION PROJECT, SPRINGFIELD, MO, INITIATING SECTION 106

The Federal Highway Administration, in cooperation with the Missouri Department of Transportation (MoDOT), is initiating consultation pursuant to Section 106 of the National Historic Preservation Act for proposed construction that would extend Kansas Expressway to the south from Republic Road approximately 2.3 miles to a new connection with Cox Road at West Farm Road 190 in Springfield. The primary purpose of the project is to improve traffic flow in southern Greene County.

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Sincerely yours,

Raegan Ball
Program Development Team Leader
Missouri Division
Federal Highway Administration

Attachments

Copies: Dr. Toni Prawl – MDNR
Mr. Michael Meinkoth – MoDOT



U.S. Department
of Transportation
**Federal Highway
Administration**

Missouri Division

September 26, 2016

3220 W. Edgewood, Suite H
Jefferson City, Missouri 65109
(573) 636-7104
Fax (573) 636-9283
Missouri.FHWA@fhwa.dot.gov

Eric Oosahwee-Voss
Tribal Historic Preservation Officer
United Keetoowah Band of Cherokee Indians in Oklahoma
PO Box 1245
Tahlequah, OK 74465

Dear Mr. Oosahwee-Voss:

Subject: KANSAS EXTENSION PROJECT, SPRINGFIELD, MO, INITIATING SECTION 106

The Federal Highway Administration, in cooperation with the Missouri Department of Transportation (MoDOT), is initiating consultation pursuant to Section 106 of the National Historic Preservation Act for proposed construction that would extend Kansas Expressway to the south from Republic Road approximately 2.3 miles to a new connection with Cox Road at West Farm Road 190 in Springfield. The primary purpose of the project is to improve traffic flow in southern Greene County.

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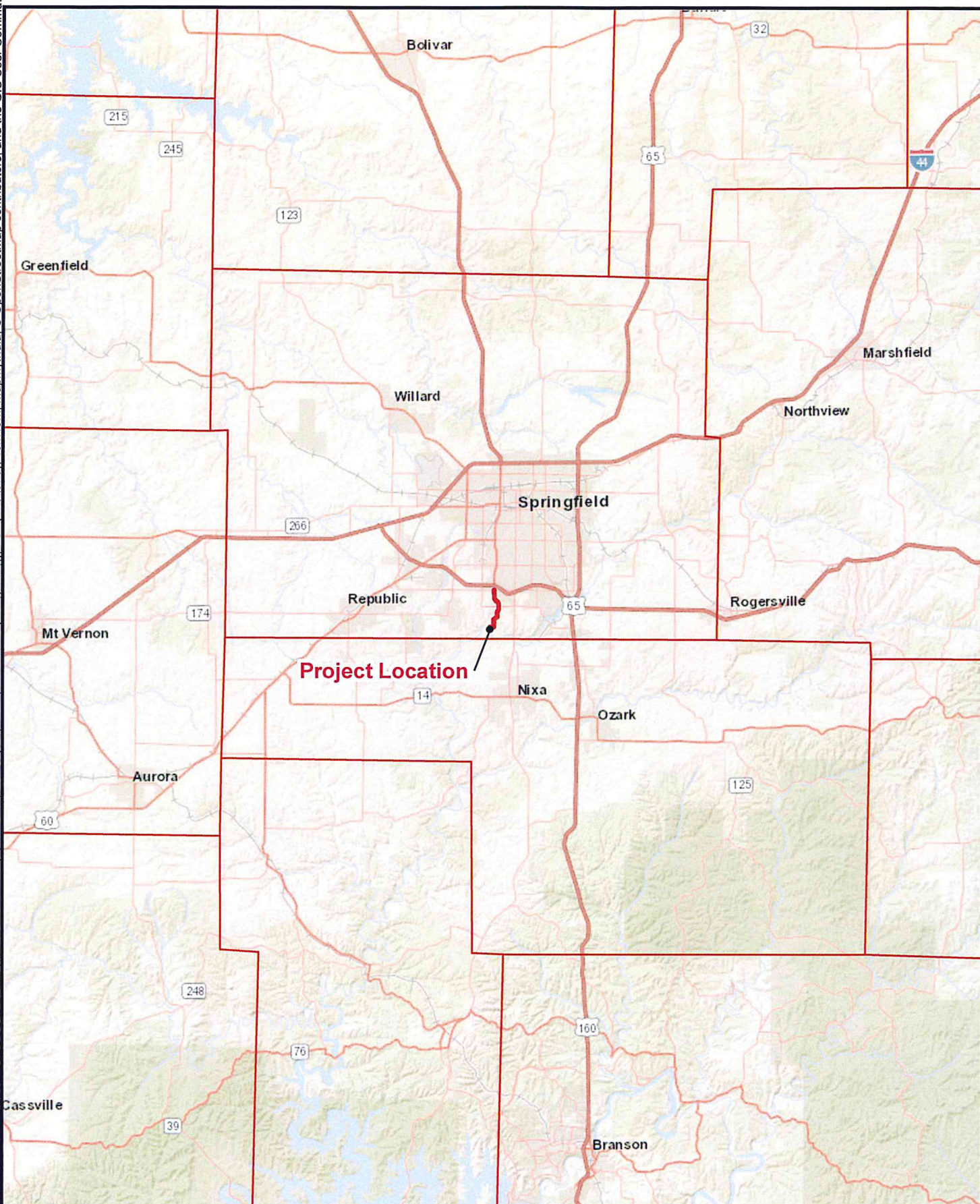
Sincerely yours,

Raegan Ball
Program Development Team Leader
Missouri Division
Federal Highway Administration

Attachments

Copies: Dr. Toni Prawl – MDNR
Mr. Michael Meinkoth – MoDOT

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Locator Map

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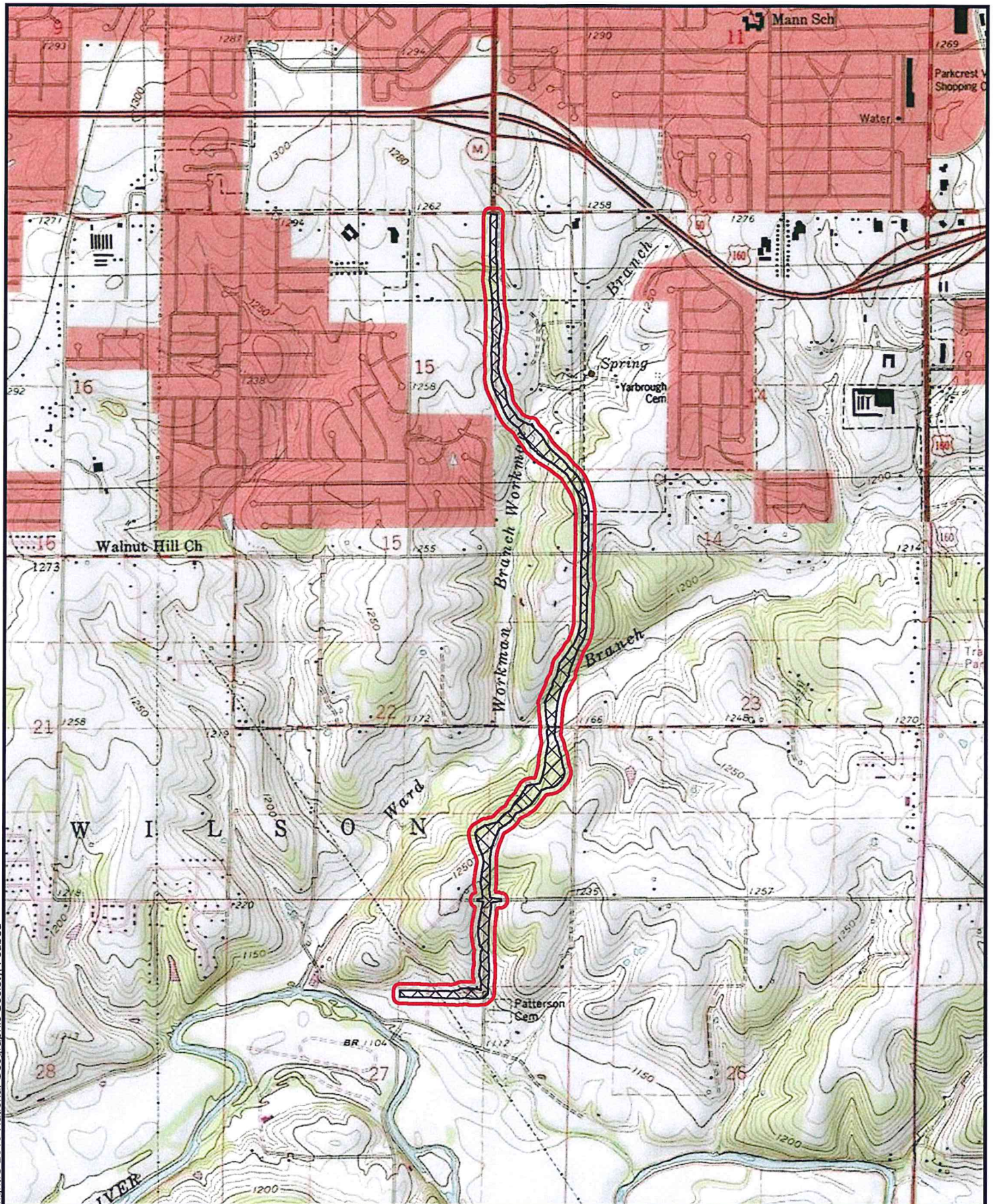
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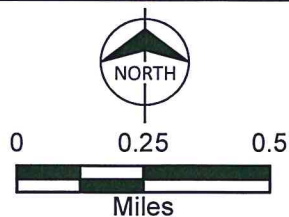


Figure 1
Project Location
Kansas Extension
Greene County, Missouri

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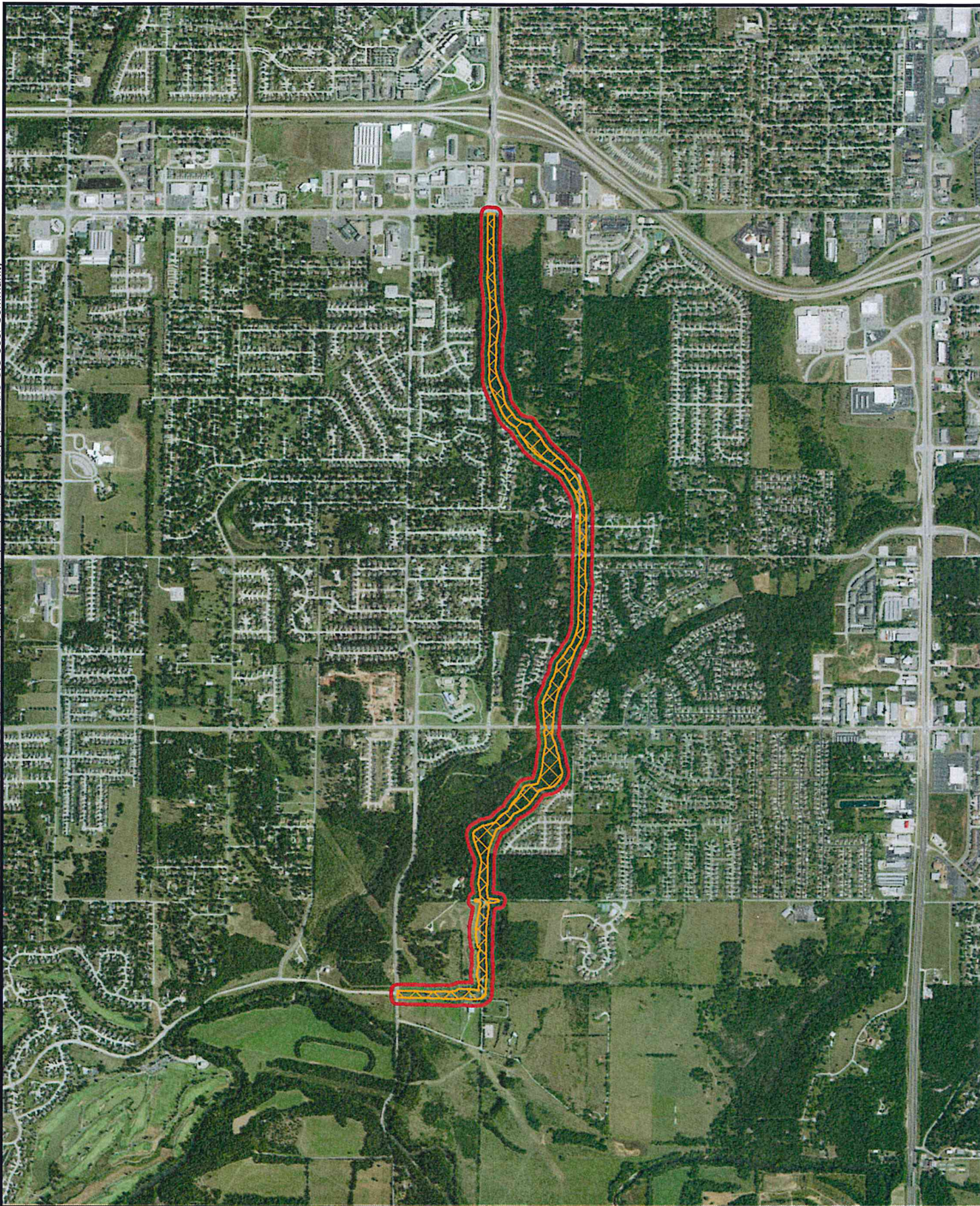




 Archaeological APE
 Visual APE

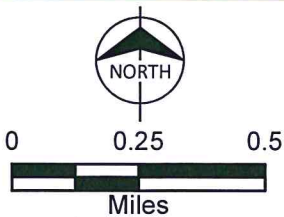


 BURNS
McDONNELL

Figure 2
 1:24,000 Topographic Map
 Kansas Extension
 Greene County, Missouri



 Archaeological APE
 Visual APE



 **BURNS
MCDONNELL**

Figure 3
1:24,000 Aerial Image
Kansas Extension
Greene County, Missouri



Delaware Tribe Historic Preservation Office

1 Kellogg Circle
Roosevelt Hall, RM 212
Emporia State University
Emporia, KS 66801
(620) 341-6699

bobermeyer@delawaretribe.org

October 4, 2016

U.S. Department of Transportation
Federal Highway Administration
Attn: Raegan Bell
3220 W. Edgewood, Suite H
Jefferson City, Missouri 65109

Re: Kansas Extension Project, Springfield, MO

Dear Raegan Bell,

Thank you for providing the report documenting the location of the archaeological site(s) during the planning for the above referenced project. We agree that the site(s) should either be avoided or further investigated if it will be impacted by the construction project and we look forward to reviewing the results of any archaeological survey that is potentially performed. However, our review does indicate that there are no religious or culturally significant sites in the proposed project area and we have no objection to the proposed project.

We do ask that if any human remains are accidentally unearthed during the course of the project that you cease development immediately and inform the Delaware Tribe of Indians of the inadvertent discovery.

If you have any questions, feel free to contact this office by phone at (620) 341-6699 or by e-mail at bobermeyer@delawaretribe.org.

Sincerely,

Brice Obermeyer
Delaware Tribe Historic Preservation Office
1200 Commercial St
Roosevelt Hall, RM 212
Emporia State University
Emporia, KS 66801

Samuelson, Kathryn A (Kate)

From: Thornhill, Steve
Sent: Thursday, October 06, 2016 8:55 AM
To: Samuelson, Kathryn A (Kate)
Subject: Fwd: Kansas Extension Project

Sent via the Samsung GALAXY S®4, an AT&T 4G LTE smartphone

----- Original message -----

From: Matthew Burcham <Matthew.Burcham@modot.mo.gov>
Date: 10/06/2016 8:49 AM (GMT-06:00)
To: "DeBacker, Michael" <mdebacker@burnsmcd.com>, "Thornhill, Steve" <sthornh@burnsmcd.com>
Subject: FW: Kansas Extension Project

FYI

From: raegan.ball.dot.gov
Sent: Thursday, October 06, 2016 8:22 AM
To: Matthew Burcham
Cc: Michael Meinkoth
Subject: FW: Kansas Extension Project

fyi

Raegan Ball
Program Development Team Leader
FHWA, Missouri Division
573-638-2620

From: Diane Hunter [<mailto:dhunter@miamination.com>]
Sent: Thursday, October 06, 2016 8:21 AM
To: Ball, Raegan (FHWA)
Subject: Kansas Extension Project

Dear Ms. Ball:

Aya, kikwehsitoole. My name is Diane Hunter, and I am the Tribal Historic Preservation Officer for the Federally Recognized Miami Tribe of Oklahoma. In this capacity, I am the Miami Tribe's point of contact for all Section 106 issues.

The Miami Tribe offers no objection to the above-mentioned project at this time, as we are not currently aware of existing documentation directly linking a specific Miami cultural or historic site to the project site. However, as this site is within the aboriginal homelands of the Miami Tribe, if any human remains or Native American cultural items falling under the Native American Graves Protection and Repatriation Act (NAGPRA) or

archaeological evidence is discovered during any phase of this project, the Miami Tribe requests immediate consultation with the entity of jurisdiction for the location of discovery. In such a case, please contact me at 918-541-8966, or by email at dhunter@miamination.com to initiate consultation.

The Miami Tribe requests to serve as an interested party to the proposed project. In my capacity as Tribal Historic Preservation Officer I am the point of contact for consultation.

Respectfully,

Diane Hunter
Tribal Historic Preservation Officer
Miami Tribe of Oklahoma
P.O. Box 1326
Miami, OK 74355

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APPENDIX I - AGENCY AND PUBLIC OUTREACH



Kansas Extension Project Public Open House Summary

Overview

Date: Tuesday, February 2, 2016

Location: The Library Center – Springfield, MO

Attendees: 229

As a part of the Kansas Extension project, the Greene County Highway Department and the consultant team conducted a public open house meeting to display project information and collect public input. The meeting followed an open house format that allowed stakeholders to come and go throughout the evening.

Upon arrival to the meeting, stakeholders signed in at a welcome table. Stakeholders received a handout that outlined general information about the Kansas Extension project, including a project overview, a map of the right-of-way along the corridor, a short explanation of the Environmental Assessment process, a list of project milestones, a project timeline and contact information. Stakeholders were then encouraged to make their way around the room to view the informational project display boards and maps. Information covered on the displays included a project overview, a timeline history of Kansas Extension alternatives, short explanations of the Environmental Assessment process, a project timeline, a resource map of the project area, a vicinity map of the project area, a map of the Ozarks Transportation Organization's Major Thoroughfare Plan, roadway concept designs of the initial and ultimate project design, an illustration of roadway design concepts and a conceptual video animation of the proposed project.

In addition to sharing information about the Kansas Extension project, the consultant team provided stakeholders with comment cards to gather public input on the project. The comment cards asked stakeholders the following questions:

1. What benefits do you see in building the Kansas Extension?
2. What drawbacks do you see in building the Kansas Extension?
3. On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project? (1 = not at all important, 3 = somewhat important, 5 = extremely important)
 - a. Amount of traffic on existing roadways in the area
 - b. Safety on existing roadways
 - c. Traffic noise along the proposed Kansas Extension corridor
 - d. Air quality along the proposed Kansas Extension corridor
 - e. Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife
 - f. Additional economic development opportunities along the proposed Kansas Extension corridor
 - g. The inclusion of bicycle/pedestrian accommodations and connections to the trail system
4. What resources would you want to be considered in the Environmental Assessment?
5. What would you want project designers to take into consideration in the design of the Kansas Extension?

6. What other questions or comments do you have about the Kansas Extension?

A summary of stakeholder responses to each question follows. Stakeholders could complete and submit the comment card during the meeting or mail it to the Greene County Highway Department after completing it at home. Stakeholders also had the opportunity to provide their name and email address if they wished to be added to the project mailing list to receive updates on the project.

Comment Card Summary

A total of 51 comment cards were completed at the public open house meeting or mailed to the Greene County Highway Department. Below is a summary of the responses from submitted comment cards.

Q1: What benefits do you see in building the Kansas Extension?

A majority of stakeholders identified the relief of traffic congestion on existing roads (Campbell Avenue, Cox Road, and National Avenue) as a key benefit of the Kansas Extension, especially during rush hour. Other traffic-related benefits included:

- The Kansas Extension will provide a good route for Nixa residents to use when traveling to/from Springfield.
- The Extension will allow for a faster response time for emergency vehicles responding to calls in the area.
- Improvements to the west side of the north-south traffic corridor.
- Lower commute times for the labor force could raise the housing value in the corridor.

In addition to traffic-related benefits, stakeholders identified other benefits, such as the potential for future development and additional tax revenue, safer travel due to less stopping and a limited number of access points and the addition of more bike and jogging trails for recreation.

Q2: What drawbacks do you see in building the Kansas Extension?

Many of the drawbacks mentioned by stakeholders centered on potential impacts to the neighborhoods near the proposed Kansas Extension corridor. Potential impacts that stakeholders expressed concern about included:

- Noise and air pollution caused by cars using the roadway
- Damage to natural habitats and animals:
 - Motorists hitting deer
 - Sinkholes/caves
 - Increased flooding on roadway
- Decrease in quality of life of area residents
 - “Some people thought they were living in a dream home that was secluded in the woods. They will now live in the middle of noisy, busy traffic.”
- Increased traffic on roads near residential areas (Plainview Road and Weaver Road)

- Increased traffic could slow commute for those who live in the area and make it more difficult to exit their neighborhoods
- Increased crime in neighborhoods near the corridor
 - Trespassing in yards of private properties
- Transportation issues for area residents during construction
- Dangerous conditions for children walking to/from school
- Loss of privacy for homes near the corridor
- Dangers of a 40 mph speed limit in a residential neighborhood

In addition to concerns relating to the neighborhoods near the corridor, stakeholders also shared some more general potential drawbacks of the project. These included:

- Ability to fund the project
- Insufficient public input/consent
- Concerns about the potential roadway design
 - Corridor should continue to Nixa area/have east-west connections to Evans
 - Still have congestion issues on Republic Road
 - Moves congestion point south to intersection of Cox Road and Farm Road 190
 - Current designed end of road forces traffic to travel over narrow and dangerous bridge across the James River which is subject to closure during flood events
 - Connecting back to Cox Road at the end of the extension
- Negative impacts of potential commercial development near residential neighborhoods
- Traffic on Cox Road is only bad during peak rush hour times
- Plan lacks clarity around impact to existing roads
 - Not enough clear evidence supporting the need for the project
- Concerns about the phased construction to complete the project and the issues that it may cause
- The reduction of developable land for homes in a fast growing area of Greene county could affect tax base for property taxes in the future

Q3: On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project? (1 = not at all important 3 = somewhat important 5 = extremely important)

The following table displays what percentage of stakeholders selected each option for the various categories.

	1 Not at all important	2	3 Somewhat important	4	5 Extremely important
Amount of traffic on existing roadways in the area	6%	2%	8%	12%	72%
Safety on existing roadways	4%	8%	10%	22%	56%
Traffic noise along the proposed Kansas Extension corridor	0%	6%	18%	18%	58%
Air quality along the proposed Kansas Extension corridor	4%	10%	27%	10%	49%
Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife	4%	10%	18%	22%	46%
Additional economic development opportunities along the proposed Kansas Extension corridor	24%	11%	20%	9%	36%
The inclusion of bicycle/pedestrian accommodations and connections to the trail system	10%	2%	19%	21%	48%

Q4: What resources would you want to be considered in the Environmental Assessment?

Stakeholders shared a variety of resources that they would like considered in the Environmental Assessment. These resources included:

- Water runoff
 - Impacts of roadway drainage into Ward Branch
 - Concerns about floodplains
 - Inclusion of water retention areas
- Preservation
 - Karst topography
 - Glades
 - Sinkholes
 - James River and surrounding area
- Wildlife population
 - Deer
 - Bats
 - Cavefish
 - Owls
- Impact on trees and nature, including:
 - Park development
 - Protecting the woodlands
 - Maintaining a tree buffer on either side of the roadway
- Concerns about harm caused by trash left in the area by road users

Q5: What would you want project designers to take into consideration in the design of the Kansas Extension?

Stakeholders shared a wide variety of things they wanted project designers to take into consideration. Considerations included design-specific comments as well as more general comments about the greater project area. Design-specific comments included:

- Eliminating numerous turn-offs and stops
 - Minimize intersections, stoplights and traffic control
 - Limit interruptions to traffic flow
 - Design roadway with limited access points
- Inclusion of controlled intersections
 - Put stoplights at Cox/Weaver and Weaver/Farm Road 178. The after-school traffic is already bad.
- Plenty of shoulder space for emergency workers
 - Fire hydrants along the right-of-way
- Make sure new roadway is well marked
- Include of sound barriers
 - Sound barriers where multiple houses set within 100 feet of the roadway
 - Plant numerous trees along the whole extension – will provide a sound barrier and beautify the area
- Multiuse biking/jogging trails are vital to include with initial construction
 - Connect both sides of the roadway to bicycling facilities
 - Tunnel a walkway under the road so walkers/bikers don't have to cross traffic on the new road
- Make sidewalks 10 feet wide
- Do not phase construction, build four lanes now
- Move route further from property lines
 - "The curve affects South Elizabeth Avenue in Royal Oaks subdivision to the west. Moving curve further east would help."

More general comments about the project area included:

- Listen to input from the public
- "Allow homeowners associations to own land up to the Kansas Expressway near Swallow Street. It's not right to sell the land to developers."
- No negative impacts on Ward Branch
- Changes to corridor layout
 - "Kansas Avenue should connect to Weaver and Republic, not Kansas Expressway"
 - "First phase should not terminate into Weaver Road. Weaver Road is a farm road with blind hills and is not designed to handle the traffic volumes generated in and around the Kansas Expressway and Republic Road. Plainview should be the first phase, as the road has been improved."
 - Consider future design for merging onto an east/west route

- Traffic concerns
 - “This will change the flow of traffic on Weaver and Plainview. How will the increase be accommodated?”
 - Design for traffic flow in the future to meet the projected population increase
- Safety concerns
 - “Consider people entering and exiting their neighborhoods. The road connecting Plainview and Cox Road (High Point) already has people speeding through and endangering children at play. I believe this extension has the potential to increase that risk.”
 - “Consider the children walking to/from school and the many, many people walking through potential major intersections. Their safety should be protected foremost.”
- Quality of life for nearby residents (noise, air quality, traffic, etc.)
 - Infringement on homeowner privacy
 - “The impact of those houses that back up to the road. We live on Elizabeth Drive and would like to see the road moved a little to the east so there would be less of an impact on the houses on our block.”

Q6: What other questions or comments do you have about the Kansas Extension?

Below is a list of the questions left by stakeholders:

- When would the expansion of the Kansas Expressway over to Campbell Avenue be planned?
- What does the data look like that demonstrated the need and considered alternatives for this project?
- Does available funding cover the cost of sound walls if deemed necessary?
- Has federal/state funding already been allocated?
- How did the data from the traffic modeling counts on Kansas Expressway and Weaver Road determine the need to terminate the first phase at Weaver?
- What is the capacity traffic counts for Weaver and Plainview?
- Will the prospects of city annexation be increased with the completion of this project?
- Will the project decrease the value of our home?
- The connection of the new Kansas Extension to Cox Road at Farm Road 190 is right before the bridge. Are there plans to reinforce, expand or straighten the existing bridge across the James River?
- When will you start?
- Could the community decide their lifestyle and safety in the area of the proposed extension is of greater value? By keeping the traffic flow “as is,” we avoid the greater access of people who do not live there and we keep a more “quiet neighborhood” atmosphere. If Springfield loses more neighborhoods that are like the ones this extension will affect, people will continue to move to the suburbs. It may lose the feeling of seclusion from the more urban area to the north.
- What will be used to close the western end of the 1400 block of W Blakey since the 30 yards of grass field between Blakey and Kansas Avenue is being use?
- What is the timing on the various stages of construction?
- Will there be guard rails if roadway is higher grade than housing and/or walking trails?

- Was there something mentioned about commercial property along the Extension? What type of commercial property would be considered? Who would benefit from commercial property? Who would it hurt?
- What kind of upkeep and cost will this be for Greene County?
- Why couldn't Cox Road or FF be expanded instead of building the new road?
- With the majority of the land north of the Lennox Place subdivision being owned by the county, why does the road have to run right up next to the yards on the back of the subdivision? It would actually appear to straighten the road somewhat to take out the curve right up next to the houses. Why can the route not be moved further west away from the residences of Lennox Place?
- What economic stimulus does this road potentially bring? What jobs or businesses would you foresee coming to this area because of this road?
- What is the next plan to relieve Campbell when this extension fails miserably and Campbell remains a safety and efficacy concern?
- What is your plan to relieve the congestion going east and west along this space and Weaver and Plainview?
- What is your plan to the southwest of Cox Road? This is an area of substantial growth. There is no access except extending Highway M.

Below is a list of comments left by stakeholder:

- Good start to a total program that is needed as soon as possible.
- The county needs to find ways to speed up this process.
- Would like to see Adam spend some time on Weaver Road to see morning and afternoon rush hour traffic to get an understanding of hills on Weaver and impact of one attempting to pull on to road from neighborhoods.
- There was flooding on Cox Road that blocked traffic four times this year.
- We would like a line of arborvitaes trees behind our property to decrease noise and increase privacy.
- On the video, please label subdivisions to give greater perspective.
- If roadway construction begins, I think you need to keep as many trees as possible. Possibly add some evergreen trees to help block sound and keep the area beautiful.

Print Advertisement

Public Meeting for Kansas Expressway Extension Project



Join the Greene County Highway Department for an informational open house meeting for the Kansas Expressway extension project.

Attendees can come and go at any time during the meeting where they can view project information and share their input.

February 2, 2016

5:00 pm - 7:00 pm

**Library Center Auditorium
4653 S. Campbell Avenue
Springfield, MO 65810**

For questions, contact:
KansasExtension@greencountymo.gov

Digital Advertisement

Public Meeting Kansas Expressway Extension Project

Join the Greene County Highway Department for an informational open house meeting for the Kansas Expressway extension project.

Attendees can come and go at any time during the meeting where they can view project information and share their input.

February 2, 2016

5:00 pm - 7:00 pm

**Library Center Auditorium
4653 S. Campbell Avenue
Springfield, MO 65810**



For questions, contact: KansasExtension@greencountymo.gov

Email Invitation



Kansas Extension Project Open House

February

2

**Library Center Auditorium
4653 S Campbell Avenue
Springfield, MO 65810**

5:00 pm - 7:00 pm

The Greene County Highway Department invites you to attend an informational public open house meeting on the Kansas Extension project. The meeting will be held at the Springfield Library Center auditorium on Tuesday, February 2 from 5:00 pm to 7:00 pm.

The meeting is open to the public and will follow an open house format. Attendees can come and go as they wish to view project information and to share their input. The meeting will include information on the history of the project, the results of the recent environmental surveys, and the project timeline.

Questions about the public open house meeting can be sent to:
KansasExtension@greencountymo.gov.

Email Reminder Invitation



Reminder: Kansas Extension Project Open House

February

2

**Library Center Auditorium
4653 S Campbell Avenue
Springfield, MO 65810**

5:00 pm - 7:00 pm

The Greene County Highway Department invites you to attend the upcoming informational public open house meeting for the Kansas Extension project. The meeting will be held at the Springfield Library Center auditorium on Tuesday, February 2 from 5:00 pm to 7:00 pm.

The meeting is open to the public and will follow an open house format. Attendees can come and go as they wish to view project information and to share their input. The meeting will include information on the history of the project, the recent environmental surveys, and the project timeline.

Questions about the public open house meeting can be sent to:
KansasExtension@greencountymo.gov.

Public Meeting

Kansas Expressway Extension

Join the Greene County Highway Department for an informational public open house meeting for the Kansas Expressway extension project.

DATE:
February 2, 2016

TIME:
5:00 pm - 7:00 pm

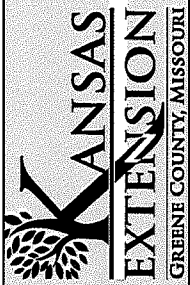
LOCATION:
Library Center Auditorium
4653 S. Campbell Avenue
Springfield, MO 65810

Attendees can see results from the recent environmental study, as well as review information on the history of the project, speak to specialists working on the project, review the project timeline, and share their input.

The meeting will follow an open house format. Attendees can come and go as they wish during the meeting time.

Questions can be sent to: KansasExtension@greencountymo.gov.

	Name	Email Address	Mailing Address
1	Devon Self	devonself@gmail.com	5213 S Nettleton Ave Springfield MO 65810
2	Scott + Stephanie Bottorf	DP	4630 S. Elizabeth Dr. Spfld. MO 65810
3	Bobby Wixson	DRBGWIXSON@AOL.COM	4698 S. Forest Ave Springfield MO 65810
4	Nancy Carlson	nancycarlson@gmail.com	Rivercat
5	Judy Readinger	whisperingparksbb@sbcglobal.net	2228 W. Gengary Ct. Spfg 65810
6	Tim Hill	tim-nancy@sbcglobal.net	1992 W Nottingham Spfld 65810
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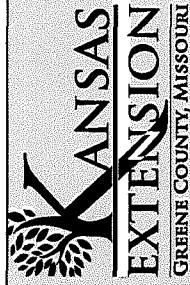


Kansas Extension Project
Public Meeting Sign-in Sheet
February 2, 2016

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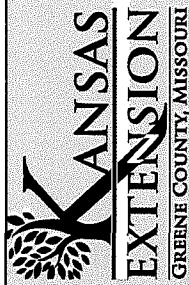
Kansas Extension Project
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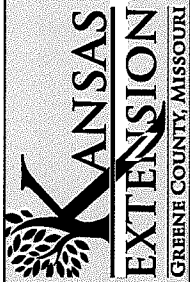
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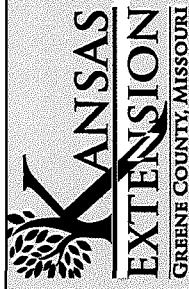
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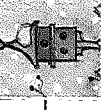
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PROJECT OVERVIEW

30 years of planning to provide an additional north-south corridor in southern Greene County. Plans are to extend the Kansas Expressway 2.3 miles south and connect with Cox Road (FR 141).



Parkway-like design

- Maximum speeds of 40 mph
- Ultimate condition will include two lanes in each direction
- Phased construction approach will be used and initially one lane in each direction will be built
- Intersection improvements and turning lanes
- Grass medians
- Bicycle paths



Example of a parkway design



Builds on existing right of way

- Conceptual planning for this project began in the 1980s
- Public outreach and roadway alignment studies in the 1990s
- Right of way along the proposed corridor was purchased by Greene County
- 90% of the needed right of way is owned and preserved
- Preliminary design and environmental screenings were conducted in the 2000s



Environmental findings incorporated

- Greene County is working with federal and state agencies as part of the NEPA process
- Additional in-depth environmental studies are currently being conducted
- Studies include historical and cultural resources, wetland delineations, noise analysis, habitat assessments, geotechnical surveying
- Roadway design will be engineered to address environmental resources



Ward Branch, Plainview Road

At the conclusion of this environmental study, the roadway design elements can be finalized in anticipation of starting construction in 2018.

KANSAS EXTENSION ALTERNATIVES HISTORY

Over 30 Years of Steady Progress

1980s

- 1984** – City of Springfield and Greene County recommended a major thoroughfare program that provided for the extension of Kansas Expressway south of Route M.
- 1987** – Recommended Major Thoroughfare Program approved showing Kansas Expressway extending south of Route M.
- 1989** – Greene County Planning and Zoning Commission approved the extension of Kansas Expressway to Weaver as a primary arterial with the route south of Weaver to be studied further.
- 1989** – City of Springfield Department of Community Development analyzed the feasibility of using Cox Road (FR 141). Deficiencies eliminated this option.

1990s

- 1990** – South Kansas Expressway/West Highway M study by City of Springfield and Greene County. Recommendations presented to Commission, public hearings held and alignment of Kansas adopted by Commission.
- 1990** – Greene County Planning and Zoning Board unanimously approved extension south of Weaver Road through undeveloped land.
- 1991** – Proposed rule for the extension of Kansas Extension from Republic to Weaver developed.
- 1993** – Extension of Cox Road from Plainview to FR 141 near the James River compared to Kansas Extension.
- 1996** – Public meeting on three Kansas alternative alignments between city limits and Plainview. Kansas alignment from city limits to Plainview adopted.
- 1999** – River Bluff Parkway corridor Concept Study recognized Kansas Expressway as a needed north-south corridor.

2000s

- 2000** – Public meeting held about the proposed alignment of Kansas from Plainview to Steinert Road.
- 2000** – Greene County Highway Department (GCHD) recommended the Commission adopt current corridor based on public preference. GCHD requested Planning Board to amend the County Transportation Plan to provide for the alignment.
- 2001** – Springfield-Greene County “Vision 20/20” Transportation Plan showed Kansas as a future expressway to the county line. The Plan also listed Kansas Expressway as a priority project.
- 2003** – Letter sent from GCHD to property owners on proposed Kansas Extension from Republic to Steinert Road. Preliminary designs for east/west connection on FR 190 from Cox to Campbell.
- 2004** – Public meeting held by Christian County Commission and City of Nixa for proposal of Nicholas Road Corridor to join with Kansas Expressway in Greene County
- 2007** – Ozarks Transportation Organization (OTO) Board of Directors unanimously voted to adopt the North-South Corridor Study, identifying the Kansas Extension as a high priority and to amend the OTO Major Thoroughfare Plan to show the alignments of the corridors in the study.

2010s

- 2014** – Greene County Commissioners issued a Resolution in support of the Kansas Expressway Extension project.

TODAY

Greene County asks for your input as 30 years of planning and study move toward construction.

As part of the environmental study, required as part of the National Environmental Policy Act (NEPA), the project team has surveyed the Kansas Extension corridor and looked at:



Cultural and Historic Resources

To protect these resources, their location is kept confidential, but any effects from the project that are a concern will be taken into account.

The project team conducted a records search for historic resources and a walking survey for archaeological resources. Most of the surveying has already been completed. Very few unknown resources were discovered. If an additional area is identified that needs further analysis, additional surveys will be coordinated with the appropriate state agencies.

The study examined the exploration and settlement in the project vicinity, Civil War battles in the area, agricultural development of the area, and 20th century development.

As part of the environmental study, required as part of the National Environmental Policy Act (NEPA), the project team has surveyed the Kansas Extension corridor and looked at:



Natural Resources

Sensitive Species: Habitat surveys are conducted to characterize wildlife, fisheries, and vegetation resources. Further investigation may be needed and coordinated with federal and state agencies for sensitive species, expected to include the Indiana bat, northern long-eared bat, gray bat, and the Ozark cavefish.

Water Resources: The corridor has one wetland and six streams that were identified. Necessary permits will be obtained for all construction.

Air Quality: If traffic studies indicate the need for an air analysis, one will be conducted to evaluate potential changes in air quality and compliance with the National Ambient Air Quality Standards.

Floodplains: These occur along Ward Branch, Workman Branch, and the James River Basin. The project will be designed for special protection during construction and for vehicle safety following completion. Floodways and floodflows will not be impeded.

Soils: Type and characteristics to be investigated and determined. Appropriate measures designed to address potential erosion and sedimentation during construction and for final stabilization, particularly to protect karst features.

Geology: Areas of geologic interest and karst topography are anticipated within the proposed corridor and will be further investigated.

Climate Change: Closely linked to air quality, potential effects to climate change will be considered and analyzed in the Environmental Assessment.

Hazardous Materials: Surveying to determine potential presence of hazardous materials in the corridor has been done. There are no existing signs of concern. If a concern is identified during construction, applicable safety and mitigation efforts will be implemented.

As part of the environmental study, required as part of the National Environmental Policy Act (NEPA), the project team has surveyed the Kansas Extension corridor and looked at:



Socioeconomics

Title VI and environmental justice: Human health, economic, and social effects on minority populations and low-income populations of the corridor are being analyzed. Opportunities for community input to be considered in this project are an important part of environmental justice.

Land development and future growth: The project team is using the best available technology and resources to predict future economic growth in the corridor. At this point, the analysis indicates that the Kansas Extension will accommodate the future growth for the City of Springfield and Greene County.

Noise analysis: Investigation is currently ongoing and if noise mitigation is needed, federal, state and local agencies will present the public with results and options.

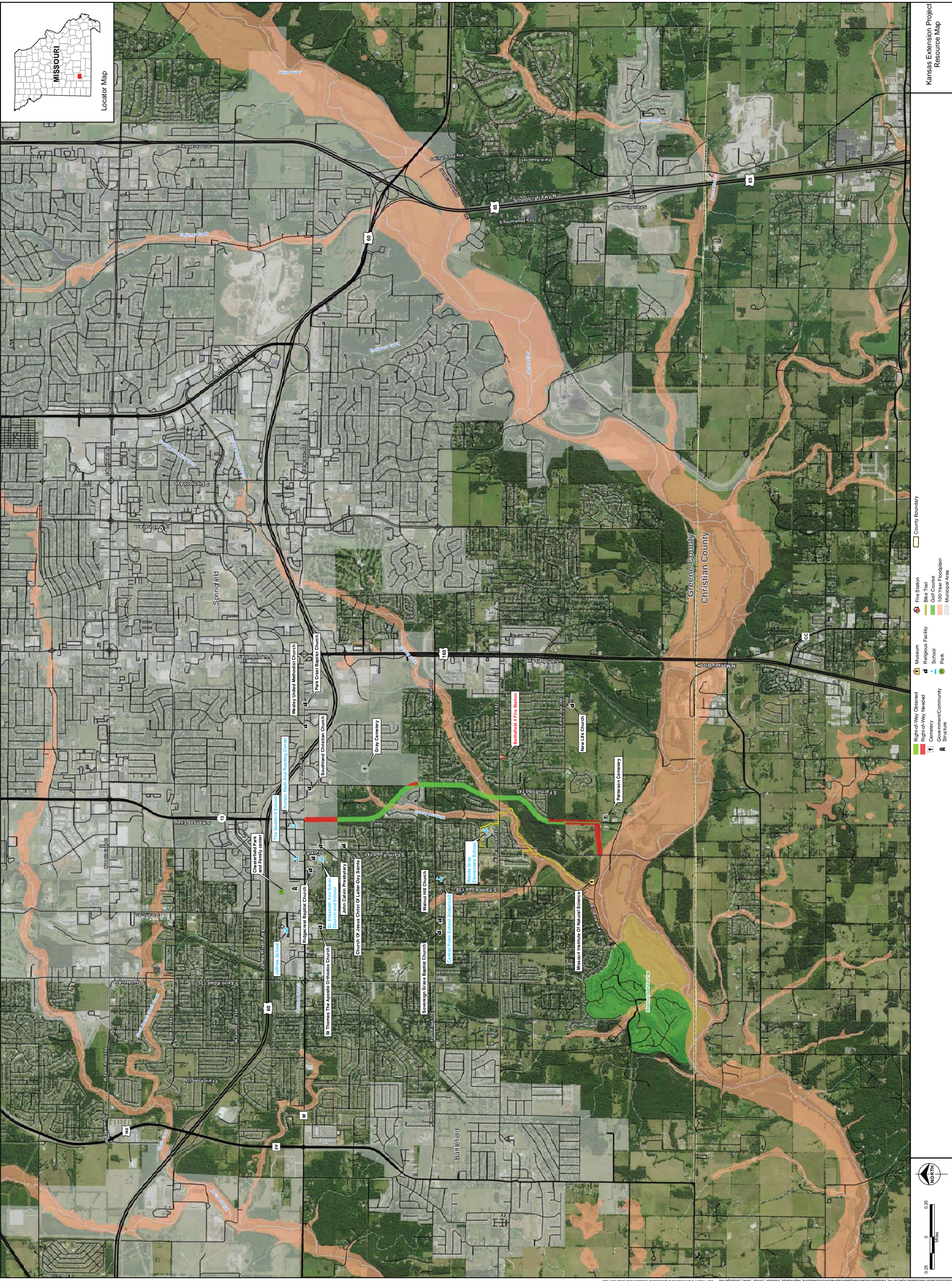
Traffic now and future predictions: Coordination with the Ozarks Transportation Organization (OTO) is ongoing and future traffic and accident predictions are being developed for evaluation.

Parks, recreational areas and civil resources near the corridor: All areas of recreation, civil and religious use are considered in the planning and design of the corridor.

Visual resources: No areas of visual concern have been determined, but if an issue is discovered, further investigation will be conducted.

PROJECT TIMELINE

-  **October 2015 – December 2015**
Conducted environmental surveying
-  **Today**
Public information meeting
-  **February 2016**
 - **Coordinate with federal and state agencies**
 - **Review comments from public meeting**
 - **Finish environmental analyses**
-  **Spring 2016**
Publish draft Environmental Assessment and hold public hearing
-  **Fall 2016**
Final roadway alignment determined
-  **Winter 2017**
Purchase remaining right of way needed (approximately 10% remains)
-  **Spring 2017**
Design of Kansas Extension complete
-  **2018**
Construction could begin



Draft

Major Thoroughfare Plan

Ozarks Transportation Organization

Existing Roads

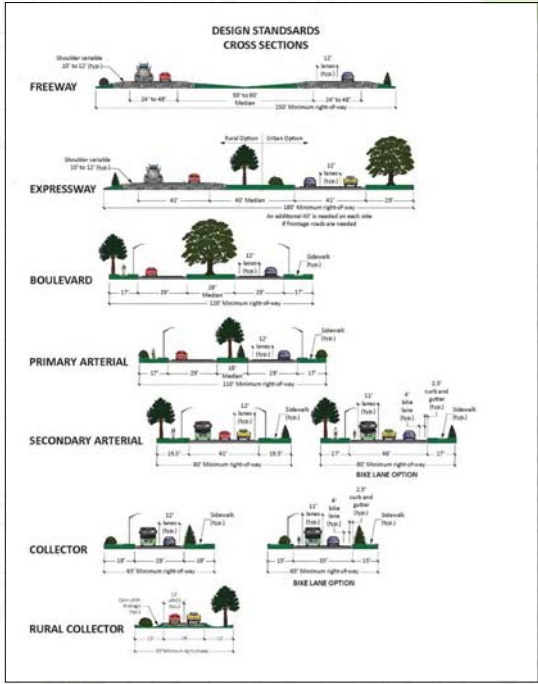
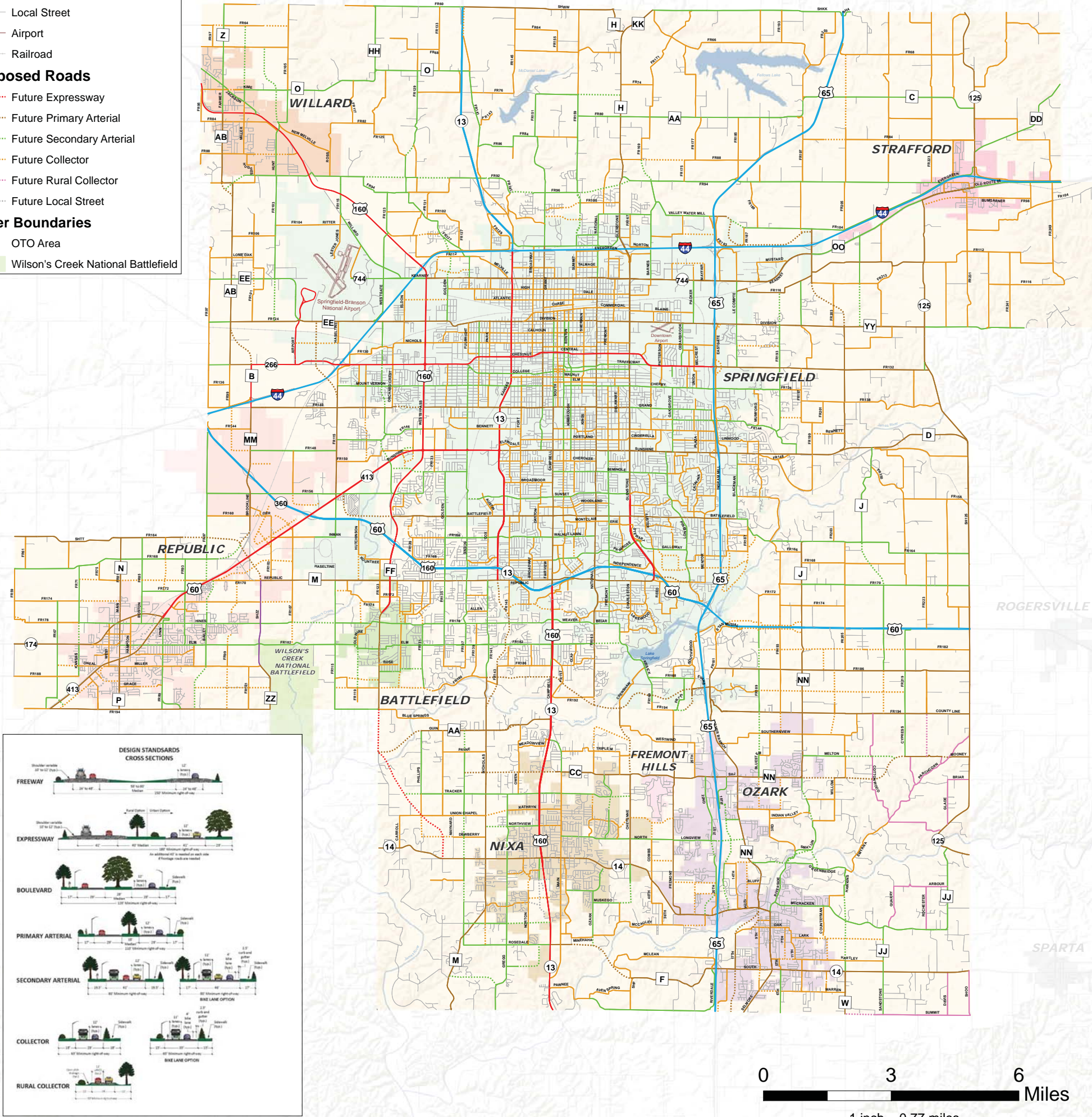
- Freeway
- Expressway
- Primary Arterial
- Secondary Arterial
- Collector
- Rural Collector
- Boulevard
- Local Street
- Airport
- Railroad

Proposed Roads

- Future Expressway
- Future Primary Arterial
- Future Secondary Arterial
- Future Collector
- Future Rural Collector
- Future Local Street

Other Boundaries

- OTO Area
- Wilson's Creek National Battlefield



DISCLAIMER

The Ozarks Transportation Organization is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the Missouri Department of Transportation (MoDOT), or the Ozarks Transportation Organization. This map does not constitute a standard, specification, or regulation.

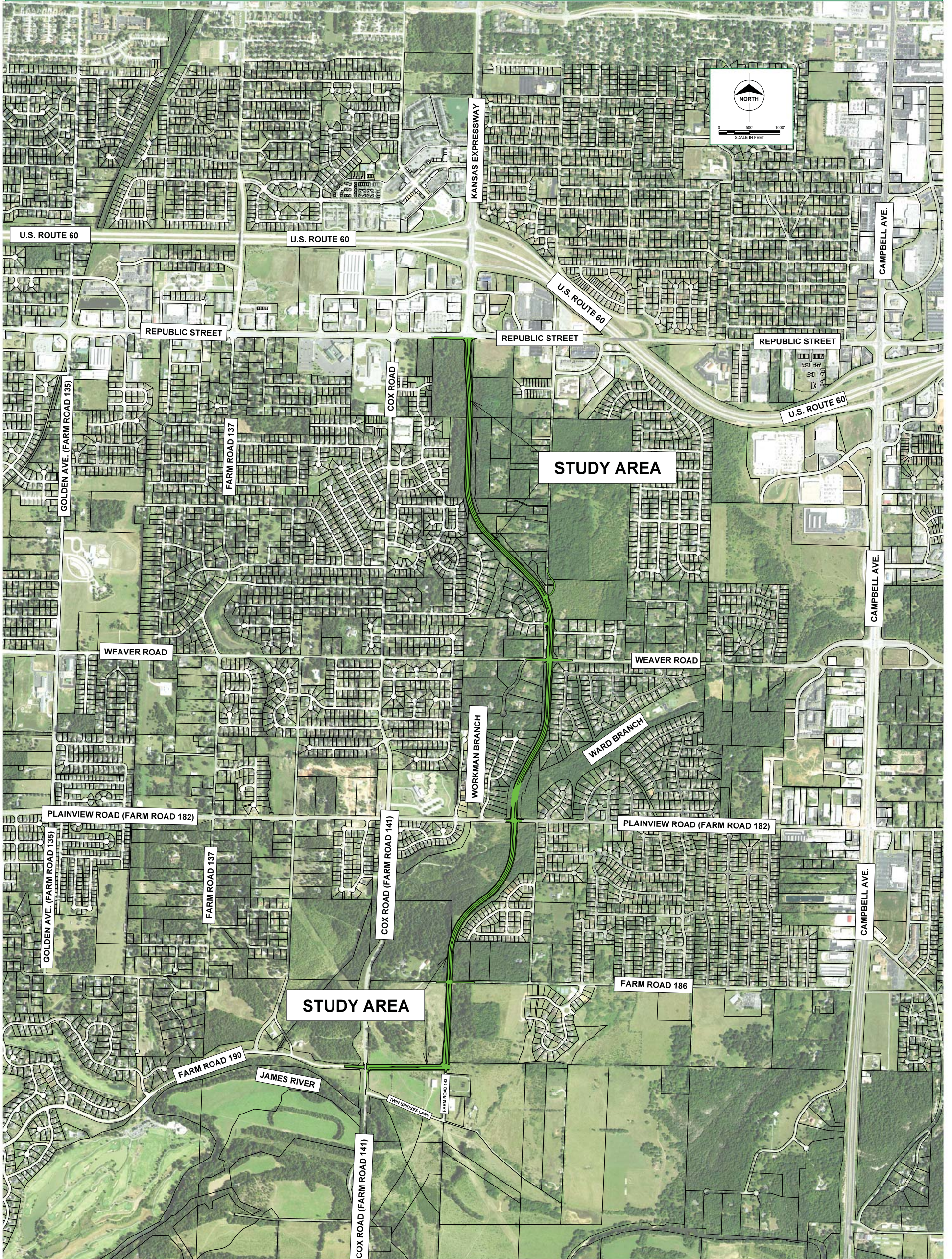
The FHWA, FTA, OR MoDOT acceptance of this map does not constitute endorsement or approval of the need for any recommended improvements nor does it constitute approval of their location and design or a commitment to fund any such improvements. Additional project level environmental impact assessments and/or studies of alternatives may be necessary.

As each of the projects in the Major Thoroughfare Plan (MTP) is implemented, coordination, agreement, and independent approval of the participating local jurisdiction is required. No part of this MTP is to be interpreted as to diminish the authority of local jurisdictions in the areas of land use and transportation.

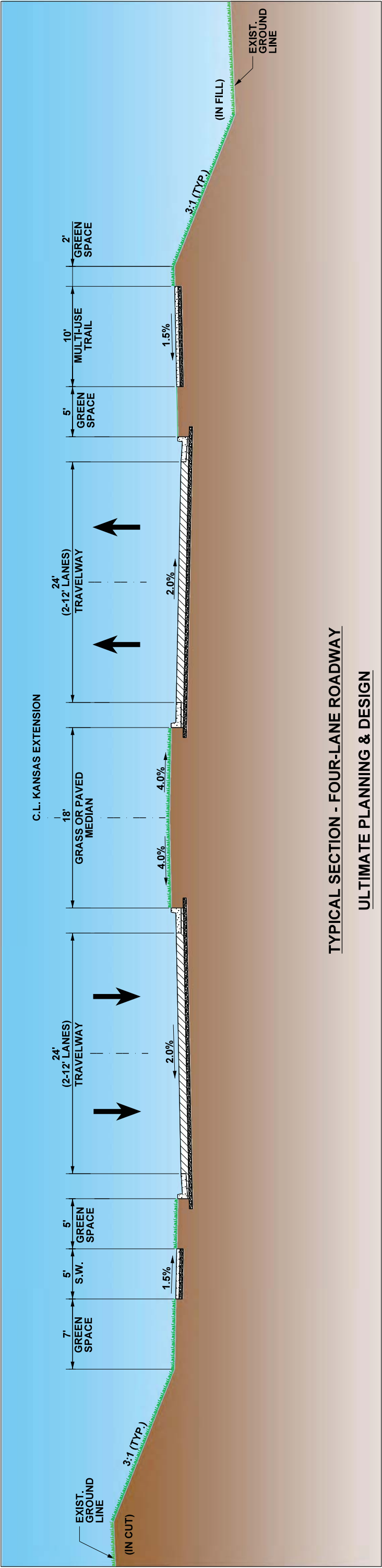
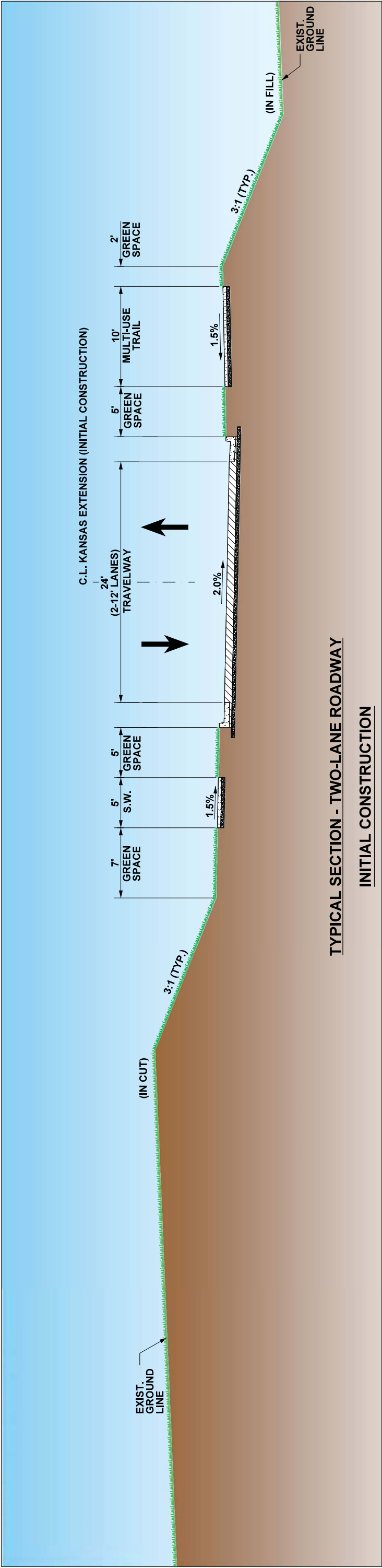


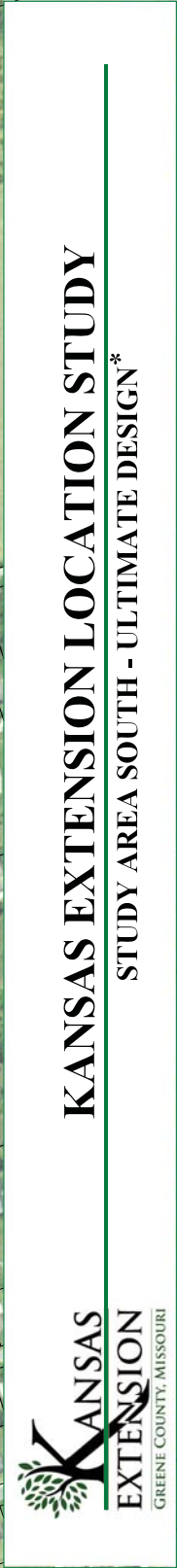
KANSAS EXTENSION LOCATION STUDY

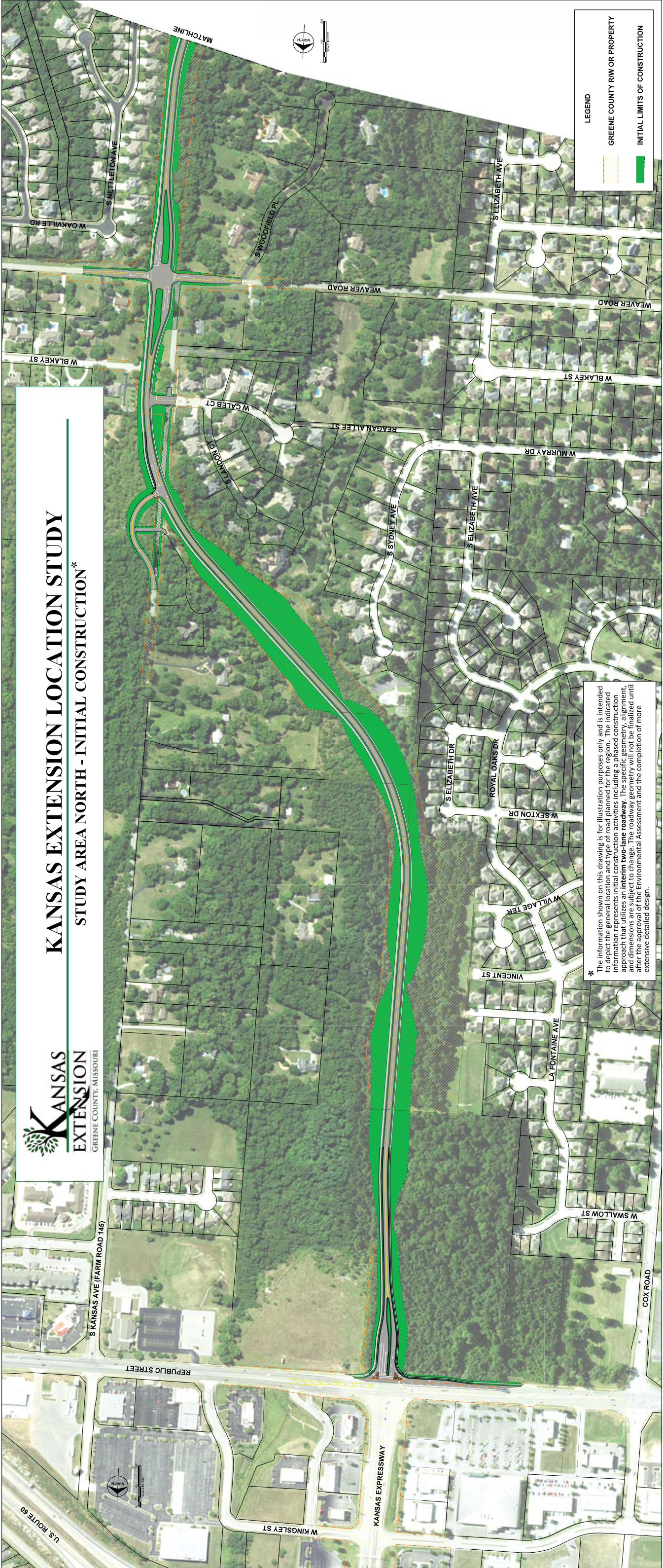
VICINITY MAP

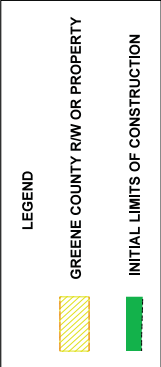


ROADWAY TYPICAL SECTIONS









WE WANT TO HEAR FROM YOU.

PROJECT OVERVIEW

30 years of planning to provide an additional north-south corridor in southern Greene County. Plans are to extend the Kansas Expressway 2.3 miles south and connect with Cox Road (FR 141).



Example of a parkway design



Parkway-like design.

- Maximum speeds of 40 mph
- Ultimate condition will include two lanes in each direction
- Phased construction approach will be used and initially one lane in each direction will be built
- Intersection improvements and turning lanes
- Grass medians
- Bicycle paths



Builds on existing right of way

- Conceptual planning for this project began in the 1980s
- Public outreach and roadway alignment studies in the 1990s
- Right of way along the proposed corridor was purchased by Greene County
- 90% of the needed right of way is owned and preserved
- Preliminary design and environmental screenings were conducted in the 2000s



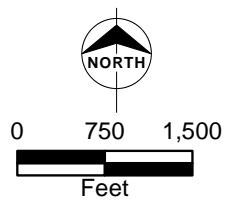
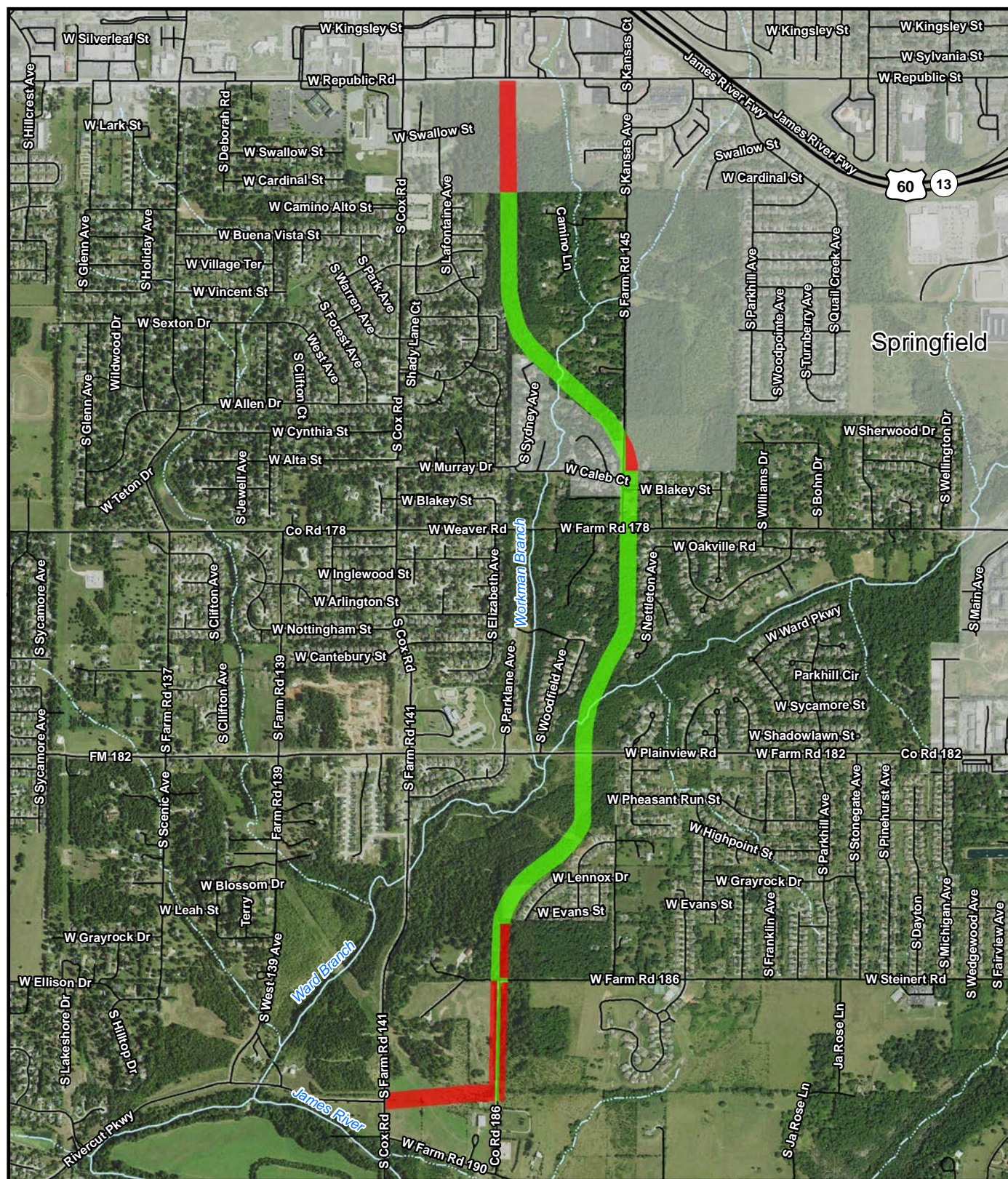
Environmental findings incorporated






- Greene County is working with federal and state agencies as part of the NEPA process
- Additional in-depth environmental studies are currently being done
- Studies include historical and cultural resources, wetland delineations, noise analysis, habitat assessments, geotechnical surveying
- Roadway design will be engineered to address environmental resources



Ward Branch, Plainview Road

At the conclusion of this environmental study, the roadway design elements can be finalized in anticipation of starting construction in 2018.



-  Right-of-Way Obtained
 Right-of-Way Needed
 Municipal Area
 Perennial Stream
 Intermittent Stream

ENVIRONMENTAL ASSESSMENT

As part of the environmental study, required as part of the National Environmental Policy Act (NEPA), the project team has surveyed the Kansas extension corridor and looked at:

Cultural and Historic Resources

To protect these resources, their location is kept confidential, but any effects from the project that are a concern will be taken into account.

The project team conducted a records search for historic resources and a walking survey for archaeological resources. Most of the surveying has already been completed. Very few unknown resources were discovered. If an additional area is identified that needs further analysis, additional surveys will be coordinated with the appropriate state agencies.

The study examined the exploration and settlement in the project vicinity, Civil War battles in the area, agricultural development of the area, and 20th century development.

Natural Resources

Sensitive Species: Habitat surveys are conducted to characterize wildlife, fisheries, and vegetation resources. Further investigation may be needed and coordinated with federal and state agencies for sensitive species, expected to include the Indiana bat, northern long-eared bat, gray bat and the Ozark cavefish.

Water Resources: The corridor has one wetland and six streams that were identified. Necessary permits will be obtained for all construction.

Air Quality: If traffic studies indicate the need for an air analysis, one will be conducted to evaluate potential changes in air quality and compliance with the National Ambient Air Quality Standards.

Floodplains: These occur along Ward Branch, Workman Branch, and the James River Basin. The project will be designed for special protection during construction and for vehicle safety following completion. Floodways and floodflows will not be impeded.

Soils: Type and characteristics to be investigated and determined. Appropriate measures designed to address potential erosion and sedimentation during construction and for final stabilization, particularly to protect karst features.

Geology: Areas of geologic interest and karst topography are anticipated within the proposed corridor and will be further investigated.

Climate Change: Closely linked to air quality, potential effects to climate change will be considered and analyzed in the Environmental Assessment.

Hazardous Materials: Surveying to determine potential presence of hazardous materials in the corridor has been done. There are no existing signs of concern. If a concern is identified during construction, applicable safety and mitigation efforts will be implemented.

Socioeconomics

Title VI and Environmental Justice: Human health, economic, and social effects on minority populations and low-income populations of the corridor are being analyzed. Opportunities for community input to be considered in this project are an important part of environmental justice.

Land Development and Future Growth: The project team is using the best available technology and resources to predict future economic growth in the corridor. At this point, the analysis indicates that the Kansas Extension will accommodate the future growth for the City of Springfield and Greene County.

Noise Analysis: Investigation is currently ongoing and if noise mitigation is needed, federal, state and local agencies will present the public with results and options.

Traffic now and future predictions: Coordination with the Ozarks Transportation Organization (OTO) is ongoing and future traffic and accident predictions are being developed for evaluation.

Parks, recreational areas and civil resources near the corridor: All areas of recreation, civil and religious use are considered in the planning and design of the corridor.

Visual Resources: No areas of visual concern have been determined, but if an issue is discovered, further investigation will be conducted.

KANSAS EXTENSION PROJECT MILESTONES

1980s

1984 – City of Springfield and Greene County recommended a major thoroughfare program that provided for the extension of Kansas Expressway south of Route M.

1987 – Recommended Major Thoroughfare Program approved showing Kansas Expressway extending south of Route M.

1989 – Greene County Planning and Zoning Commission approved the extension of Kansas Expressway to Weaver as a primary arterial with the route south of Weaver to be studied further.

1989 – City of Springfield Department of Community Development analyzed the feasibility of using Cox Road (FR 141). Deficiencies eliminated this option.

1990s

1990 – South Kansas Expressway/West Highway M study by City of Springfield and Greene County. Recommendations presented to Commission, public hearings held and alignment of Kansas adopted by Commission.

1990 – Greene County Planning and Zoning Board unanimously approved extension south of Weaver Road through undeveloped land.

1991 – Proposed rule for the extension of Kansas Extension from Republic to Weaver was developed.

1993 – Extension of Cox Road from Plainview to FR 141 near the James River compared to Kansas Extension.

1996 – Public meeting on three Kansas alternative alignments between city limits and Plainview. Kansas alignment from city limits to Plainview adopted.

1999 – River Bluff Parkway corridor Concept Study recognized Kansas Expressway as a needed north-south corridor.

2000s

2000 – Public meeting held about the proposed alignment of Kansas from Plainview to Steinert Road.

2000 – Greene County Highway Department (GCHD) recommended the Commission adopt current corridor based on public preference. GCHD requested Planning Board to amend the County Transportation Plan to provide for the alignment.

2001 – Springfield-Greene County “Vision 20/20” Transportation Plan showed Kansas as a future expressway to the county line. The Plan also listed Kansas Expressway as a priority project.

2003 – Letter sent from GCHD to property owners on proposed Kansas Extension from Republic to Steinert Road. Preliminary designs for east/west connection on FR 190 from Cox to Campbell.

2004 – Public meeting held by Christian County Commission and City of Nixa for proposal of Nicholas Road Corridor to join with Kansas Expressway in Greene County

2007 – Ozarks Transportation Organization (OTO) Board of Directors unanimously voted to adopt the North-South Corridor Study, identifying the Kansas Extension as a high priority and to amend the OTO Major Thoroughfare Plan to show the alignments of the corridors in the study.

2010s

2014 – Greene County Commissioners issued a Resolution in support of the Kansas Expressway Extension project.

TODAY

Greene County asks for your input as 30 years of planning and study move toward construction.

PROJECT TIMELINE



October 2015 – December 2015

Conducted environmental surveying



Today

Public information meeting



February 2016

- Coordinate with federal and state agencies
- Review comments from public meeting
- Finish environmental analyses



Spring 2016

Publish draft Environmental Assessment and hold public hearing



Fall 2016

Final roadway alignment determined



Winter 2017

Purchase remaining right of way needed (approximately 10% remains)



Spring 2017

Design of Kansas Expressway extension complete



2018

Construction could begin

CONTACT US

For questions or comments email: KansasExtension@greenecountymo.gov





COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

What drawbacks do you see in building the Kansas Extension?

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
<i>Safety on existing roadways</i>	1	2	3	4	5
<i>Traffic noise along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>Air quality along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife</i>	1	2	3	4	5
<i>Additional economic development opportunities along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

What other questions or comments do you have about the Kansas Extension?

To receive updates on the project, please provide your name and email address:

Name: _____

Email: _____

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

NONE UNTIL IT CROSSES THE
JAMES RIVER.

What drawbacks do you see in building the Kansas Extension?

PEOPLE WHO THOUGHT THEY WERE
LIVING IN THEIR DREAM HOME
OF CHASED IN THE WOODS ~~THE~~ WILL
BE IN THE MIDDLE OF NOISY BUSY
TRAFFIC

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area

1 2 3 4 5

Safety on existing roadways

1 2 3 4 5

Traffic noise along the proposed Kansas Extension corridor

1 2 3 4 5

Air quality along the proposed Kansas Extension corridor

1 2 3 4 5

Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife

1 2 3 4 5

Additional economic development opportunities along the proposed Kansas Extension corridor

1 2 3 4 5

The inclusion of bicycle/pedestrian accommodations and connections to the trail system

1 2 3 4 5

What resources would you want to be considered in the Environmental Assessment?

STAN HALL

5285 S. NEWTON AVE

SPRINGFIELD MO 65810

FSAEHALL@SBCGLOBAL.NET

What would you want project designers to take into consideration in the design of the Kansas Extension?

Sound! Sound!

Environmental Impact - G/L/Life.

What other questions or comments do you have about the Kansas Extension?

To receive updates on the project, please provide your name and email address:

Name: _____

Email: _____

**Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.**

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

*I am in favor of it. Kansas Extension would
relieve traffic on South Campbell & 160*

What drawbacks do you see in building the Kansas Extension?

None - The sooner the better

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area

1 2 3 4 5

Safety on existing roadways

1 2 3 4 5

Traffic noise along the proposed Kansas Extension corridor

1 2 3 4 5

Air quality along the proposed Kansas Extension corridor

1 2 3 4 5

Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife

1 2 3 4 5

Additional economic development opportunities along the proposed Kansas Extension corridor

1 2 3 4 5

The inclusion of bicycle/pedestrian accommodations and connections to the trail system

1 2 3 4 5

What resources would you want to be considered in the Environmental Assessment?

None

What would you want project designers to take into consideration in the design of the Kansas Extension?

The display at this meeting looks great

What other questions or comments do you have about the Kansas Extension?

Get it done

To receive updates on the project, please provide your name and email address:

Name: *Darrell Riemann*

Email: *darrellriemann@att.net*

Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

SOCIOECONOMIC BENEFITS OF EXPANDING THE METRO
AREA TO INCLUDE GREATER NUMBER OF ^{HOUSING} DEVELOPMENTS AND
POTENTIAL BUSINESSES. ALSO, THE COMMUTE TIMES FOR
THE LABOR FORCE WILL RAISE THE HOUSING VALUES IN THIS
CORRIDOR I WOULD HOPE.

TRAFFIC CONGESTION TRAVELLING SOUTH IS NO LONGER
SUSTAINABLE REALLY IN TRAFFIC (PEAK TIMES)
OF COMMUTE

What drawbacks do you see in building the Kansas Extension?

THERE ARE NO DOUBT CONCERNS
ABOUT NOISE LEVEL FOR
RESIDENT HOME OWNERS AND
THE ADDITION OF ^{PRIVATE} ~~ENTERIAL~~ ^{PROPERTY}
BUSINESS CONCERNS BUT THE
BENEFITS FAR OUTWEIGH
THE LIABILITIES!

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
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What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

SPEED / PARKWAY SPEEDS 40-45
OF LANES / PAVED IN
TWO LANES
SOONER RATHER THAN LATER?
WOULD REQUIRE SOME INSIGHT
INTO THE PACE
OF ECONOMIC GROWTH
TURN OFFS TO COMMERCIAL
ZONES, ETC.

What other questions or comments do you have about the Kansas Extension?

To receive updates on the project, please provide your name and email address:

Name: KARI HOGGARD

Email: HOGGARDK@11STL.ORG

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

Decreased traffic on Campbell & Cox, maybe

What drawbacks do you see in building the Kansas Extension?

Increased traffic on roads like Plainview & Weaver, near many peoples' homes.

Environmental impacts

Noise problems

Quality of life issues for people in the area

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area

1

2

3

4

5

Safety on existing roadways

1

2

3

4

5

Traffic noise along the proposed Kansas Extension corridor

1

2

3

4

5

Air quality along the proposed Kansas Extension corridor

1

2

3

4

5

Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife

1

2

3

4

5

Additional economic development opportunities along the proposed Kansas Extension corridor

1

2

3

4

5

I hope this doesn't become a commercial area.

The inclusion of bicycle/pedestrian accommodations and connections to the trail system

1

2

3

4

5

What resources would you want to be considered in the Environmental Assessment?

Storm water runoff is already a problem - sewers overflow into greenway trail & into Ward Branch.

What would you want project designers to take into consideration in the design of the Kansas Extension?

Quality of life for nearby residents - noise, air quality,
traffic, etc.

What other questions or comments do you have about the Kansas Extension?

Thanks for the open house -

To receive updates on the project, please provide your name and email address:

Name: Tracy Richter

Email: trichter8@hotmail.com

**Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.**

THANK YOU!



COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

*Reduced traffic on Cox and surrounding residential roads
better access to Kansas Exp + James River*

What drawbacks do you see in building the Kansas Extension?

*Time frame - needs to be done now! The phasing of construction to
complete it*

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

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<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

*Minimize intersections / stoplights / traffic control. Kansas Ave should
connect to Weaver + Republic, not Kansas exp. Likewise w/ Stearns Rd*

What other questions or comments do you have about the Kansas Extension?

Do it!

To receive updates on the project, please provide your name and email address:

Name: _____

Email: _____

**Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.**

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

1. Would relieve the heavy auto traffic on Cox Avenue traveling between Springfield and Nixa.
2. Be safer and faster for drivers between the two cities due to the design flow and lack of stop signs that drivers must presently use.
3. Would assist emergency vehicles and fire department in responding to emergency calls.
4. Is necessary to meet the increased traffic flow in the future as the population in the area increases.

What drawbacks do you see in building the Kansas Extension?

1. Adequate funding to complete the project as soon as possible.
2. Present design end the proposed road at the James River and traffic must then travel over the narrow and dangerous bridge over the James River which is subject to closing during flood events.

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

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The inclusion of bicycle/pedestrian accommodations and connections to the trail system	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

1. Take possible flooding along the Ward Branch Creek into consideration as safety hazard.

What would you want project designers to take into consideration in the design of the Kansas Extension?

1. Design for traffic flow in the future to meet the population increase.
2. Design the expressway as an expressway with limited access.
3. Use good environmental design for aesthetics and environmental impact on area.
4. Make sure new highway is well marked.

What other questions or comments do you have about the Kansas Extension?

1. When would expansion of the Kansas Expressway over to Campbell Avenue be planned.

To receive updates on the project, please provide your name and email address:

Name: Bobby Wixson

Email: DRBGLWIXSON@AOL.COM

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

Improve the west side north/south traffic
corridor that is much needed

What drawbacks do you see in building the Kansas Extension?

It will pose temporary headaches for the
surrounding residents, as all public improvements
do.

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

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What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

What other questions or comments do you have about the Kansas Extension?

To receive updates on the project, please provide your name and email address:

Name: Brandon Parrish

Email: brandonp@ppimo.com

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

Long needed due to Traffic Congestion
@ Republic Road

What drawbacks do you see in building the Kansas Extension?

Moves the congestion point South to
intersection with Cox Road & Farm Rd 190.

The ~~Section~~ Extension of Kansas Expressway
needs to continue to Highway 14 in Nix, to
solve congestion problem.

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
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What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

What other questions or comments do you have about the Kansas Extension?

To receive updates on the project, please provide your name and email address:

Name: _____

Email: _____

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

only if can stay with 2 lanes

What drawbacks do you see in building the Kansas Extension?

HABITAT LOSS, CRIME INCREASE

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area	1	2	3	4	5
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What resources would you want to be considered in the Environmental Assessment?

ENDANGERED SPECIES, WILD LIFE, ~~AND THE~~
ALSO NEED TO STUDY SINKHOLES TO
THE SUBDIVISION. (CANALS)

What would you want project designers to take into consideration in the design of the Kansas Extension?

BETWEEN SWALLOW ST AND BLESABETH ST
ALLOW THE HOA ^{CROWN OAKS HOA} TO OWN THE LAND
UP TO KANSAS BR. IT'S NOT RIGHT
TO SELL THE LAND TO DEVELOPERS.

What other questions or comments do you have about the Kansas Extension?

To receive updates on the project, please provide your name and email address:

Name: LARRY DAVIS

Email: DAVISLM@SBCGLOBAL.NET

Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!



COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

What drawbacks do you see in building the Kansas Extension?

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
<i>Safety on existing roadways</i>	1	2	3	4	5
<i>Traffic noise along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>Air quality along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife</i>	1	2	3	4	5
<i>Additional economic development opportunities along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

The curve affects S. Elizabeth Ave. in Royal Oaks subdivisions to the west. Moving curve further to the east would help.

Put stop lights at Cox + Weaver + Weaver + Rd. 170. The after school traffic is already BAD!!

What other questions or comments do you have about the Kansas Extension?

To receive updates on the project, please provide your name and email address:

Name: _____

Email: _____

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!



COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

Relief of congestion on Campbell. Faster responses for homes on EB 178 west of Campbell. Prompting future development into Christian County.

What drawbacks do you see in building the Kansas Extension?

Still have congestion issues on Republic Rd.
Reduction of developable land for homes in a fast growing area of Greene County which could affect tax base for property tax in the future.

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area

1 2 3 4 5

Safety on existing roadways

1 2 3 4 5

Traffic noise along the proposed Kansas Extension corridor

1 2 3 4 5

Air quality along the proposed Kansas Extension corridor

1 2 3 4 5

Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife

1 2 3 4 5

Additional economic development opportunities along the proposed Kansas Extension corridor

1 2 3 4 5

The inclusion of bicycle/pedestrian accommodations and connections to the trail system

1 2 3 4 5

What resources would you want to be considered in the Environmental Assessment?

Flood center and run-off.

What would you want project designers to take into consideration in the design of the Kansas Extension?

Controlled intersections. Fire hydrants along the right-of-way. Plenty of shoulder space for emergency workers.

What other questions or comments do you have about the Kansas Extension?

Potential for City of Springfield annexation.

To receive updates on the project, please provide your name and email address:

Name: Scott Moore

Email: smoore@bottlefieldfire.com

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

*Take some traffic congestion off Campbell and National
(as well as the primary goal of relieving Cox Rd.)*

What drawbacks do you see in building the Kansas Extension?

*Needs to continue into Nixa area & have E-W connections
ASAP to Evans*

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
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<i>Additional economic development opportunities along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

Safe ingress + egress (I see many turn lanes on the illustrations + that's good)

What other questions or comments do you have about the Kansas Extension?

*Good start to a total program that is needed ASAP.
The county needs to find ways to speed up this process.*

As an aside, the county needs a noise ordinance to address motorized vehicle noise. Along National, on county property, it sounds like a racetrack! Some speed enforcement would also be helpful.

To receive updates on the project, please provide your name and email address:

Name: _____

Email: _____

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

In general that is the outstanding question. Will there be sufficient use to justify the project. It and to settle the justified anger of home owners that will now have a possible 4 lane road right in their back yard.

What drawbacks do you see in building the Kansas Extension?

Insufficient public input before it's a done deal. Asking for the tract does not make for good governance or consider how spend the public. We should have ~~been~~ permitted ~~advanced~~ advice and consent long before now.

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
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<i>Traffic noise along the proposed Kansas Extension corridor</i>	1	2	3	4	5
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<i>Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife</i>	1	2	3	4	5
<i>Additional economic development opportunities along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

Public Input -

What other questions or comments do you have about the Kansas Extension?

SEE All of the above: Myself and neighbors ARE UPSET with the use of funding to build an entirely new road when expansion of existing roads would have been a better option. We were not allowed to voice this input until the decision was made. This is bad governing.

To receive updates on the project, please provide your name and email address:

Name: Jon Fabler

Email: stockboomera@shcglobal.net

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

Traffic on Cox Road has been terrible.
This will help with moving traffic
much faster and more efficiently.
Please start ASAP... Springfield needs
this corridor to the North and South.

What drawbacks do you see in building the Kansas Extension?

"none" Yeah!!

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
<i>Safety on existing roadways</i>	1	2	3	4	5
<i>Traffic noise along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>Air quality along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife</i>	1	2	3	4	5
<i>Additional economic development opportunities along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

Eliminate so many turn-offs and interruptions of traffic flow.

What other questions or comments do you have about the Kansas Extension?

To receive updates on the project, please provide your name and email address:

Name: _____

Email: _____

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

Traffic off Cox Road.

Good for Nixa residents to & from.

What drawbacks do you see in building the Kansas Extension?

none

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area

1 2 3 4 5

Safety on existing roadways

1 2 3 4 5

Traffic noise along the proposed Kansas Extension corridor

1 2 3 4 5

Air quality along the proposed Kansas Extension corridor

1 2 3 4 5

Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife

1 2 3 4 5

Additional economic development opportunities along the proposed Kansas Extension corridor

1 2 3 4 5

The inclusion of bicycle/pedestrian accommodations and connections to the trail system

1 2 3 4 5

What resources would you want to be considered in the Environmental Assessment?

7

What would you want project designers to take into consideration in the design of the Kansas Extension?

Minimal steps.

What other questions or comments do you have about the Kansas Extension?

go for it !!

To receive updates on the project, please provide your name and email address:

Name: _____

Email: _____

Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

I will receive great benefit in
diverting traffic off of my road.

I am looking forward to seeing
this project completed.

Great demonstration today

Thank you for providing a
good understanding of what to expect

What drawbacks do you see in building the Kansas Extension?

None

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area

1

2

3

4

5

Safety on existing roadways

1

2

3

4

5

Traffic noise along the proposed Kansas Extension corridor

1

2

3

4

5

Air quality along the proposed Kansas Extension corridor

1

2

3

4

5

Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife

1

2

3

4

5

Additional economic development opportunities along the proposed Kansas Extension corridor

1

2

3

4

5

The inclusion of bicycle/pedestrian accommodations and connections to the trail system

1

2

3

4

5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

What other questions or comments do you have about the Kansas Extension?

To receive updates on the project, please provide your name and email address:

Name: Gloria Borovsky

Email: gloriaborovsky@yahoo.com

Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

Help w/ Traffic

Very happy to see this happening! I believe it is overdue.

What drawbacks do you see in building the Kansas Extension?

Financing it.

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
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<i>Traffic noise along the proposed Kansas Extension corridor</i>	1	2	3	4	5
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<i>Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife</i>	1	2	3	4	5
<i>Additional economic development opportunities along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

What other questions or comments do you have about the Kansas Extension?

To receive updates on the project, please provide your name and email address:

Name: _____

Email: _____

**Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.**

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

Reduce traffic load (redistribute) between Campbell & KS Exp
Provide a secondary Access to Nixa ↔ Springfield
Add economic development residential/commercial to
new KExtension

What drawbacks do you see in building the Kansas Extension?

Overdue

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area

1 2 3 4 5

Safety on existing roadways

1 2 3 4 5

Traffic noise along the proposed Kansas Extension corridor

1 2 3 4 5

Air quality along the proposed Kansas Extension corridor

1 2 3 4 5

Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife

1 2 3 4 5

Additional economic development opportunities along the proposed Kansas Extension corridor

1 2 3 4 5

The inclusion of bicycle/pedestrian accommodations and connections to the trail system

1 2 3 4 5

What resources would you want to be considered in the Environmental Assessment?

Maintain a Green buffer of remaining land along to corridor.

What would you want project designers to take into consideration in the design of the Kansas Extension?

Multi use trail / Bike Trail / Pedestrian walk vital
to include with initial construction. Rather than
cut and expect to come back and add later.
Could be years or not happen at all.

What other questions or comments do you have about the Kansas Extension?

Excited to ~~just be~~ finally getting done.

To receive updates on the project, please provide your name and email address:

Name: Keith Ernce

Email: ~~Keith~~ kervuce@sbcglobal.net

Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

It will take some traffic off of
Cox Rd.

What drawbacks do you see in building the Kansas Extension?

I am going to be 1000 ft. west
and am concerned about the
noise level. Are they going to
install sound walls?

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
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<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

How Noise levels!

What other questions or comments do you have about the Kansas Extension?

Will this devalue our homes
value?

To receive updates on the project, please provide your name and email address:

Name: Vicki Rossmann

Email: RicRosand@gmail.com

Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!



COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

Less Traffic on Cox RD.
Important To keep up with progress and
more people moving into Springfield &
Nixa ~

What drawbacks do you see in building the Kansas Extension?

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area

1

2

3

4

5

Safety on existing roadways

1

2

3

4

5

Traffic noise along the proposed Kansas Extension corridor

1

2

3

4

5

Air quality along the proposed Kansas Extension corridor

1

2

3

4

5

Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife

1

2

3

4

5

Additional economic development opportunities along the proposed Kansas Extension corridor

1

2

3

4

5

The inclusion of bicycle/pedestrian accommodations and connections to the trail system

1

2

3

4

5

What resources would you want to be considered in the Environmental Assessment?

Trees on either side

What would you want project designers to take into consideration in the design of the Kansas Extension?

Lots of trees planted along the
whole extension — barrier & beauty
Protect noise from homes

What other questions or comments do you have about the Kansas Extension?

To receive updates on the project, please provide your name and email address:

Name: Elizabeth

Email: elizabethlee2050@hotmail.com

Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

I think having an alternative to Campbell between Springfield and Nixa is a good idea - however, I can see potential problems with increased traffic volume on Weaver and Plainview Roads.

What drawbacks do you see in building the Kansas Extension?

As noted above, with the increased traffic on Plainview and Weaver Roads, there would be obvious delays getting onto Campbell - which is already pretty significant at times.

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
<i>Safety on existing roadways</i>	1	2	3	4	5
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<i>Additional economic development opportunities along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

Traffic volume on Plain view and on Weaver.

What other questions or comments do you have about the Kansas Extension?

There was flooding on Cox Road that blocked thru traffic on Cox Road four times this year.

To receive updates on the project, please provide your name and email address:

Name: *William Holtmeyer, Jr.*

Email: *wjhands11@aol.com*

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

More Freeflow of Traffic

Reduced Stress driving on I60 to + From Nixa

What drawbacks do you see in building the Kansas Extension?

Private Homes - reducing traffic noise +
close proximity to their
country quiet environment.

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area	1	2	3	4	5
Safety on existing roadways	1	2	3	4	5
Traffic noise along the proposed Kansas Extension corridor	1	2	3	4	5
Air quality along the proposed Kansas Extension corridor	1	2	3	4	5
Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife	1	2	3	4	5
Additional economic development opportunities along the proposed Kansas Extension corridor	1	2	3	4	5
The inclusion of bicycle/pedestrian accommodations and connections to the trail system	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

(Actual)
James River preservation of surrounding area
Perhaps access + parking around James River
at bridge (FR 190 + Cox)

What would you want project designers to take into consideration in the design of the Kansas Extension?

Infringement on Home owners privacy

What other questions or comments do you have about the Kansas Extension?

The connection of the New Kansas extension to Cox Road at 190 is right before the Bridge. Are there plans to reinforce, expand or straighten the existing Bridge across Jones River?

To receive updates on the project, please provide your name and email address:

Name: B. Petitt

Email: None

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!



COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

less traffic on Cox Road

What drawbacks do you see in building the Kansas Extension?

None

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area	1	2	3	4	5
Safety on existing roadways	1	2	3	4	5
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Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife	1	2	3	4	5
Additional economic development opportunities along the proposed Kansas Extension corridor	1	2	3	4	5
The inclusion of bicycle/pedestrian accommodations and connections to the trail system	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

4 lanes

What other questions or comments do you have about the Kansas Extension?

When will you start? We've been coming to these meetings for years - with no road built.

To receive updates on the project, please provide your name and email address:

Name: Judy Readinger

Email: Whisperingoaksbb@sbcglobal.net

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!



COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

There would only be a benefit of alleviating traffic on
Campbell if the road extended all the way to Nixa

What drawbacks do you see in building the Kansas Extension?

Noise, loss of property value, pollution

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area

① 2 3 4 5

Safety on existing roadways

① 2 3 4 5

Traffic noise along the proposed Kansas Extension corridor

1 2 3 4 ⑤

Air quality along the proposed Kansas Extension corridor

1 2 3 4 ⑤

Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife

1 2 3 4 ⑤

Additional economic development opportunities along the proposed Kansas Extension corridor

① 2 3 4 5

The inclusion of bicycle/pedestrian accommodations and connections to the trail system

① 2 3 4 5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

The impact of those houses that back up to the road.
We live on Elizabeth Dr and would like to see the road
moved a little to the east so there would be less of an
impact on the houses on our block.

What other questions or comments do you have about the Kansas Extension?

We would like a line of Arborvitae trees behind our
property to decrease noise and increase privacy.

To receive updates on the project, please provide your name and email address:

Name: _____

Email: _____

**Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.**

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

The benefits are many.

1. Traffic flow

2. Fewer accidents

3. Cox road can be used as intended - a

What drawbacks do you see in building the Kansas Extension?

None!

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
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<i>Additional economic development opportunities along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

What other questions or comments do you have about the Kansas Extension?

Start const. as soon as possible

To receive updates on the project, please provide your name and email address:

Name: CHARLES READINGER

Email: WHISPERINGWORKSBB@SBCGLOBAL.NET

Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

- ① Improved access to River Cut. Eventually, it would improve the speed of access to Nixa.
- ② More park-like areas for recreation would be created for the public.
- ③ More roadside opportunities for business and more tax revenue for the city.

What drawbacks do you see in building the Kansas Extension?

- ① Increased traffic into the woods by vagrants. We already have more of this due to the archery park/recreation area. — people "living" in the woods. It is dangerous ^{for children at play and people walking trails} in the woods.
- ② It will endanger children walking to/from school if thoughtful consideration is not determined. ^(Intersection at Plainview)
- ③ The addition of traffic lights will slow down the morning commute for people living in the area and make it much more difficult for some to exit their neighborhoods. ^(Intersection of Plainview and Highpoint for instance, but there are other intersections also.)

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area

① 2 3 4 5

Safety on existing roadways

① 2 3 4 5

Traffic noise along the proposed Kansas Extension corridor

1 2 3 4 ⑤

Air quality along the proposed Kansas Extension corridor

1 2 3 4 ⑤

Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife

1 2 3 4 ⑤

Additional economic development opportunities along the proposed Kansas Extension corridor

1 2 ③ 4 5

The inclusion of bicycle/pedestrian accommodations and connections to the trail system

1 2 3 4 ⑤

What resources would you want to be considered in the Environmental Assessment?

- ① Please consider the floodplains and keep the road elevated enough so it is not a danger. Consider ^{there will be more runoff and increased flooding due to less penetrating ground surfaces} ~~runoff and increased flooding due to less penetrating ground surfaces~~
- ② Take care to preserve the Karst topography ^{additionally} especially the glades, caves, and sink holes.
- ③ Keep the woodland—there are many deer seen crossing roads between Republic Road and the extension out to Cox Road, many owls, etc.

What would you want project designers to take into consideration in the design of the Kansas Extension? * As an SPS teacher I know traffic pattern affect ~~bus~~ing, funding for that transportation, and walking routes for children.

① Consider the children walking to/from school and the many, many people walking through ^{potential} major intersections. Their safety should be protected foremost.

② Consider people entering and exiting their neighborhoods. The road connecting Plainview and Cox Rd. (High Point) already has people speeding through and endangering children at play. I believe this extension has the potential to increase that risk. ~~XXXXXX~~

What other questions or comments do you have about the Kansas Extension?

① Could the community decide their lifestyle and safety in the area of the proposed extension is of greater value? By keeping the traffic flow "as is", we avoid the ^{greater} access of people who do not live there and we keep a more "quiet neighborhood" atmosphere.

If Springfield loses more neighborhoods that are ~~like~~ like the ones this extension will affect, people will continue to move to the suburbs. It may lose the feeling of seclusion from the more urban area.

To receive updates on the project, please provide your name and email address: to the north.

Name: Juliana Georgiades

Email: juliana@gx2design.com

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

Thank you for giving us the chance to communicate our concerns!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

As an adjoining resident, I'm aware that additional thoroughfares are desperately needed.

I'm also glad to see that sidewalks are add for access north/south access.

What drawbacks do you see in building the Kansas Extension?

For my individual neighborhood, we are concerned about noise. I'm on Blakey, one block north of Weaver, just east of the original Kansas Ave. It's a very quiet street with over a dozen grade school kids on 2 blocks.

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area	1	2	3	4	5
Safety on existing roadways	1	2	3	4	5
Traffic noise along the proposed Kansas Extension corridor	1	2	3	4	5
Air quality along the proposed Kansas Extension corridor	1	2	3	4	5
Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife	1	2	3	4	5
Additional economic development opportunities along the proposed Kansas Extension corridor	1	2	3	4	5
The inclusion of bicycle/pedestrian accommodations and connections to the trail system	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

There are dozens of deer in the 400 acres east of KS Ave and north of Weaver. They come in my yard to feed and cross KS Ave to feed at all hours. They could pose a risk to drivers.

What would you want project designers to take into consideration in the design of the Kansas Extension?

Noise control for adjoining neighborhoods

What other questions or comments do you have about the Kansas Extension?

What will be used to close the western end of the 1400 block of W Blakey since the 30 yards of grass field between Blakey and K.S Ave is being used?

To receive updates on the project, please provide your name and email address:

Name: Ryan Norman, D.D.

Email: rbikr@hotmail.com

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!



COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

Badly needed to relief traffic of farm Road 137

What drawbacks do you see in building the Kansas Extension?

None

great I hope for the VA to come and build!

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
<i>Safety on existing roadways</i>	1	2	3	4	5
<i>Traffic noise along the proposed Kansas Extension corridor</i>	1	2	3	4	5
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<i>Additional economic development opportunities along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

As part

What would you want project designers to take into consideration in the design of the Kansas Extension?

Looks great what you have projected

What other questions or comments do you have about the Kansas Extension?

Thank you

To receive updates on the project, please provide your name and email address:

Name:

Thomas Conway

Email:

Ozark Time Machine @ gmail.com

**Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.**

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

Farther Drive Times, especially during rush hour.

What drawbacks do you see in building the Kansas Extension?

*Noise, impact on wild life. Motorists
killing deer because we've impacted their
habitat.*

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
<i>Safety on existing roadways</i>	1	2	3	4	5
<i>Traffic noise along the proposed Kansas Extension corridor</i>	1	2	3	4	5
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<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

Flooding / Water Retention Areas need to be put in place.

What would you want project designers to take into consideration in the design of the Kansas Extension?

What other questions or comments do you have about the Kansas Extension?

*On video, please label subdivisions
to give greater perspective.*

To receive updates on the project, please provide your name and email address:

Name: Katherine Tomblitta

Email: KPT12372@yahoo.com

Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!



COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

What drawbacks do you see in building the Kansas Extension?

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
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<i>Additional economic development opportunities along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

Traffic Noise

Environment the Deer & other wild life

What other questions or comments do you have about the Kansas Extension?

I would not want it.

To receive updates on the project, please provide your name and email address:

Name: Theresa Holder

Email: holdertheresa@yahoo.com

Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

Benefit seems to be ease of transportation
for area residents, ~~added~~ I would
like to see the survey or comments
from area residents that support
this.

What drawbacks do you see in building the Kansas Extension?

A concern is that creating four lanes and
ending at Riveract will create a huge problem.
The traffic flowing south on thirteen will
spill over to the expanded service south
of Republic Rd. Without seeing the entire scope
of the project, it is difficult to see the
justification for the expense simply to
take pressure off of Cox road. I travel
it every day and it is busy, but not an manageable.

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area	1	2	3	4	5
Safety on existing roadways	1	2	3	4	5
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Additional economic development opportunities along the proposed Kansas Extension corridor	1	2	3	4	5
The inclusion of bicycle/pedestrian accommodations and connections to the trail system	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

Existing residential and park like
qualities will not interest those
residents in expansion of
Commercial Development.

What would you want project designers to take into consideration in the design of the Kansas Extension?

What other questions or comments do you have about the Kansas Extension?

To receive updates on the project, please provide your name and email address:

Name: Brod GERHARDT

Email: _____

**Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.**

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

- Alleviate traffic on other routes

- Provides bike + jogging trails connecting other trails

What drawbacks do you see in building the Kansas Extension?

- Upsetting current aesthetics of residents along roadway

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
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<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

- Bike + jogging trails

- Sound barriers where multiple houses set within 100' of road way.

What other questions or comments do you have about the Kansas Extension?

- Timing of various stages of construction

To receive updates on the project, please provide your name and email address:

Name: Ken Houston

Email: houstonken@netnet.com

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!



COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

Reduced TRAFFIC on Cox Rd
EASY ACCESS to OTHER PARTS of County +
City.

What drawbacks do you see in building the Kansas Extension?

NONE

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
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<i>Additional economic development opportunities along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

NONE

What would you want project designers to take into consideration in the design of the Kansas Extension?

BEAUTY

What other questions or comments do you have about the Kansas Extension?

NONE Go for it - NEEDED Long time ago

To receive updates on the project, please provide your name and email address:

Name: KAREN SAWYER

Email: RS KSAWYER@GMAIL.COM

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

- Improved ~~road~~ routing for traffic

What drawbacks do you see in building the Kansas Extension?

- Neighborhoods losing privacy
- Any raised section of roads will increase safety issues with houses in lower areas.
- more noise in neighborhood that built and bought for that quiet location.
- Housing with remote backyards wooded areas (country like ~~env~~ environment) with no longer have that piece and quiet
- Home values of existing homes with backyards remote and wooded loose resale potential.

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area	1	2	3	4	5
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The inclusion of bicycle/pedestrian accommodations and connections to the trail system	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

- Caves in the area South of plainview west of Southpines Subdivision
- Streams always get the raw end of the deal. Heavy impact from construction & new coming runoff of project add all of the curb and guttering

What would you want project designers to take into consideration in the design of the Kansas Extension?

- South of Plainview west side of Southpines Subdivision wooded area. That area is used for ~~cross~~ daily walks to get to paved walking trail along creek. Trails used for avoiding taking dogs and kids along Plainview. Now there will be a road to cross.
- ? Tunneling walking under road to avoid crossing traffic?

What other questions or comments do you have about the Kansas Extension?

- Will there be guard rails if roadway is higher grade than housing and/or walking trails?
- Was there something mentioned about commercial property along extension? What type of commercial property, would that be a benefit, who would gain from that and who would it hurt? Land owners + home owners.
- What kind of upkeep and cost will this be for Greene County?

To receive updates on the project, please provide your name and email address:

Name: Clint Bentham

Email: scbentham@hotmail.com

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

What drawbacks do you see in building the Kansas Extension?

Noise level. Loss of property value. Home ~~is~~ is on
S Elizabeth Dr in Royal Oaks and project backs up to
our home. We have a beautiful view of trees and nature and
don't really want a road impacting our view, our enjoyment and
our property value. IF project does proceed would like trees to
remain and noise level be dealt with

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
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<i>Additional economic development opportunities along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5


What resources would you want to be considered in the Environmental Assessment?

The trees and nature impact. Also the people whos life are affected by the road way

What would you want project designers to take into consideration in the design of the Kansas Extension?

Home impacts. Property value. Peoples views and how it affect the peoples lives. Property value is key. Also don't want to listen and look at the road.

What other questions or comments do you have about the Kansas Extension?



If road way construction begins I think keeping as many trees and possible. And possibly adding some evergreen trees to help block sand and keep area beautiful

To receive updates on the project, please provide your name and email address:

Name: SEAN

Email: Sacough71@yahoo.com

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

What drawbacks do you see in building the Kansas Extension?

WATER RUN OFF!
CAVE?

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area	1	2	3	4	5
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Additional economic development opportunities along the proposed Kansas Extension corridor	1	2	3	4	5
The inclusion of bicycle/pedestrian accommodations and connections to the trail system	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

WATER RUNN OFF,
I ALL READY HAVE A FLOODING!
9' WATER IN MY BACK YARD!

What would you want project designers to take into consideration in the design of the Kansas Extension?

DON'T TIE FM 145 INTO NEW ROADWAY

What other questions or comments do you have about the Kansas Extension?

To receive updates on the project, please provide your name and email address:

Name: JOHN F. BROWN 1669 W. CAMINO, LN.
SPRINGFIELD, MO, 65810

Email: _____

Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

None for the homeowners along the highway

What drawbacks do you see in building the Kansas Extension?

Loss of investment, noise, crime, families life long homes being ruined, loss of forest.

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
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<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

Home owners investment and loss covered by the development. Allowing home owner association to purchase land that is next to the new highway.

What other questions or comments do you have about the Kansas Extension?

Why couldn't Cox rd or FF be expanded instead of the new highway

To receive updates on the project, please provide your name and email address:

Name: _____

Email: _____

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!



COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

What drawbacks do you see in building the Kansas Extension?

Dumps Back onto Cox at the end,

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area	1	2	3	4	5
Safety on existing roadways	1	2	3	4	5
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Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife	1	2	3	4	5
Additional economic development opportunities along the proposed Kansas Extension corridor	1	2	3	4	5
The inclusion of bicycle/pedestrian accommodations and connections to the trail system	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

Park Development

What would you want project designers to take into consideration in the design of the Kansas Extension?

What other questions or comments do you have about the Kansas Extension?

To receive updates on the project, please provide your name and email address:

Name: Shawn Jones

Email: Mowing417@yahoo.com

**Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.**

THANK YOU!



COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

Go for it
we need it

What drawbacks do you see in building the Kansas Extension?

None

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
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What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

What other questions or comments do you have about the Kansas Extension?

To receive updates on the project, please provide your name and email address:

Name: Ron Sawyer

Email: rkawyer2@gmail.com

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

It would be nice to reduce traffic at rush hours on S. Campbell

What drawbacks do you see in building the Kansas Extension?

It appears to affect a ~~very~~ majority of neighborhoods in the Wanda Gray school boundaries. So to keep our kids in Wanda Gray we almost have to resign ourselves to living with the highway near a property.

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area

1 2 3 4 5

Safety on existing roadways

1 2 3 4 5

Traffic noise along the proposed Kansas Extension corridor

1 2 3 4 5

Air quality along the proposed Kansas Extension corridor

1 2 3 4 5

Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife

1 2 3 4 5

Additional economic development opportunities along the proposed Kansas Extension corridor

1 2 3 4 5

The inclusion of bicycle/pedestrian accommodations and connections to the trail system

1 2 3 4 5

What resources would you want to be considered in the Environmental Assessment?

The caves in the woods north of the Jannet Place Subdivision and west to the archery complex all the way north to the Ward Branch Creek. The bats, cave fish and owl population.

What would you want project designers to take into consideration in the design of the Kansas Extension?

With the majority of the land north of the Innova Place subdivision being owned by the county, why does the road have to run right up next to the yards on the back of the subdivision? It would actually appear to straighten the road somewhat to take out the curve right up next to the houses.

What other questions or comments do you have about the Kansas Extension?

To receive updates on the project, please provide your name and email address:

Name: Victoria Batchelder

Email: vickie.batchelder@gmail.com

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

Improved flow/access

Improved property values

What drawbacks do you see in building the Kansas Extension?

No current plan for south outlet

Traffic flow on Weaver & Plainview

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
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What resources would you want to be considered in the Environmental Assessment?

Impact of roadway drainage into Ward branch

What would you want project designers to take into consideration in the design of the Kansas Extension?

A plan for the south end of the project. Make sure future design for merging onto an east/west route are considered.

This will change the flow of traffic on Weaver & Plainview, how will the increase be accommodated?

What other questions or comments do you have about the Kansas Extension?

None, we are VERY much in favor of the project!

To receive updates on the project, please provide your name and email address:

Name: James Case

Email: james.case.01@gmail.com

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!



COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

What drawbacks do you see in building the Kansas Extension?

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area

1 2 3 4 5

Safety on existing roadways

1 2 3 4 5

Traffic noise along the proposed Kansas Extension corridor

1 2 3 4 5

Air quality along the proposed Kansas Extension corridor

1 2 3 4 5

Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife

1 2 3 4 5

Additional economic development opportunities along the proposed Kansas Extension corridor

1 2 3 4 5

The inclusion of bicycle/pedestrian accommodations and connections to the trail system

1 2 3 4 5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

As the portion which borders the Lennox Place subdivision is planned, since the county owns all that land, why make the road border the houses? Why not straighten it more from Plainview as it approaches FR. 186? This would give the residents of ~~the~~ Lennox Place a bit more of a buffer.

What other questions or comments do you have about the Kansas Extension?

To receive updates on the project, please provide your name and email address:

Name: Van Batchelder

Email: vlb804s@hotmail.com

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

David A. Anderson, MD
5332 S. Lexington Ave
Springfield, MO 65810



Mr. Adam Humphrey
Greene County Highway Department
2065 N. Clifton
Springfield, MO 65803

Dear Mr. Humphrey,

First of all, thank you for taking the time to seek public opinion regarding the extension of Kansas Expressway. I attended the open forum tonight and found it very helpful and educational. Here are my thoughts as for as the pros and cons of the development project. I think I provide a unique public opinion as I, in the last 10 years of living in Springfield, have lived in six different aspects of south Springfield. I have lived in Rivercut, Rogersville, Millwood, off Republic road and James River Freeway, off south national near Plainview, in north Nixa and now Woodfield Park. As a physician, I am keen to traffic flows as I am always running late and trying to get to and from Cox South and all times of day and night. In addition, I have school age children who need access to the local schools and various sports facilities. Having said all that, I am growing increasingly concerned about the planned extension for a number of reasons. I will try to follow your handout and expand below. Again, thank you for seeking public opinion, its nice to feel like we at least have the opportunity to have a voice.

1. What are the benefits?

In my opinion there really are few. If you look at the major traffic flow problems of southwest Springfield, the main bottleneck is Campbell and the intersection of cox road and republic. The worst thing to try to do is go north at 7:30 a.m. on Campbell or try to get home around 5:00 p.m. on Republic road. The only advantage I see is that it will improve the 5:00 p.m. traffic flow going south on Republic rd. There is no one who will go out of his or her way and go further west to Kansas expressway only to back track back to Campbell to get to Nixa. The majority of the traffic on Campbell seems to be coming from schools in the area and large employers (Cox and Mercy) and those people are trying to get to Nixa and Ozark where the majority of the Nixa and Ozark population is east of Campbell. Again, its unlikely that people will go out of their way to go further west and then back track back east especially when the road doesn't connect back to Campbell until you reach AA south of Greene county. So other than some benefit at 500 to relieve cox road I see no benefit.

2. What are the drawbacks?

As stated above, it simply doesn't improve the traffic flow. This project was initially discussed back in the early 80's. The majority of the south side of

Springfield wasn't even developed at that time. Places like Timberbrooke, Stone Meadow, Woodfield Park, and Rivercut were groves of trees and pastureland. The population of Nixa and Ozark has almost doubled in that time. Now almost 30 years later we are still discussing extending a road that didn't really make sense then and certainly doesn't now? This extension gives no additional relief to Nixa traffic. When I lived in Millwood, the best part of living there was jumping on 65 and being at Cox within minutes. The same existed in Rogersville. Unfortunately the years I spent at Villages of Wicklow in north Nixa were fraught with fighting the 730 and 500 Campbell traffic. This plan does nothing that will improve that. You need a limited access north south thoroughfare much like highway 65 and 60 that can move large amounts of traffic into and out of north Nixa. A simple two lane and ultimately four lane road that ends at Rivercut and doesn't connect to anything doesn't do that. An extension of West bypass that connects to Nixa in a limited access fashion would alleviate much of the burden on Campbell.

It doesn't allow for future growth of the area of the south side of Springfield. If you look at south Hwy 65 and also Hwy 60 there is tremendous commercial growth. Highland Springs, Mercy Orthopedic hospital, and James River Church are all very accessible because of the close proximity to 65 and 60. Extending Kansas Expressway into already overpopulated subdivisions will not allow for and commercial development in that area.

Finally, the property values that will be affected will greatly affect the tax base that Greene County needs. Putting a road through this area will directly affect Timberbrooke, Stone Meadow, Woodfield Park and countless others on the south side. Those tax dollars are not going to be replaced by moving a few cars off Cox road or Campbell. The property values of those homes many never recover.

On a scale of 1-5?

Amount of traffic on existing roadways in area	5, Campbell is overcrowded. This plan does' t solve that
Safety on existing roadways	2, roadways are safe
Traffic Noise	5, see above, property values.
Air quality	5, see above property values
Other environmental impact	5, living on the south side still allows us to enjoy the beauty of nature. All that is destroyed with this road

Additional economic development

5, there is no opportunity for that anywhere except at the interchange of republic road

Inclusion of bicycle/pedestrian walkway

1, its not enjoyable to walk along a road. The Greenways trail is used because it gets you away from traffic

Resources considered for the environment?

It seems like at this point building a road is the last thing someone would do to preserve the environment. You're not talking about improving an existing road. You're talking about destroying the natural habitat of many animals and birds. If there was an endangered bird or animal along this path, would you seek a different route?

What would I want the designers to take into consideration?

I want the designers to recognize that the project that was initially discussed in 1984 in no reflects the needs of the community today. This extension in no way relieves the needs of the traffic flows and is an incredible waste of taxpayer money. I want them to rethink the flow of traffic of the southside of Springfield and north Nixa and Ozark and recognize the need for limited access highway system that will allow the community to grow. I want them to consider the economic impact of this decision both in the loss of existing property values as well as the lack of commercial development opportunities.

What other questions do you have?

1. What economic stimulus does this road potentially bring? What jobs or businesses would you foresee coming to this area because of this road?
2. What is the next plan to relieve Campbell when this extension fails miserably and Campbell remains a safety and efficacy concern?
3. What is your plan to relieve the congestion going east and west along this space and Weaver and Plainview both are grossly undersized the way it is with the multi unit housing that has gone in? You're also now planning to bring further traffic into this area with no mechanism to relieve that traffic along these routes.
4. What is your plan to the south west of Cox Road? This is an area of substantial growth. There is no access except extending M highway.

Again, thank you for taking the time to read my opinions. I would be happy to discuss any of them further. If you have any questions or concerns, please don't hesitate to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'DA Anderson', with a stylized flourish at the end.

David A. Anderson, MD

5332 S. Lexington Ave.

Springfield, MO 65810

Daanderson1@gmail.com

417-773-7711

COMMENT CARD

We want your input



What benefits do you see in building the Kansas Extension?

not enough to warrant intrusion into
existing neighborhoods!

What drawbacks do you see in building the Kansas Extension?

Noise to residential areas
would increase inappropriate access to homeowners
private property (Back yards esp.)
The proposed route is too close to residences.

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area	1	2	3	4	5
Safety on existing roadways	1	2	3	4	5
Traffic noise along the proposed Kansas Extension corridor	1	2	3	4	5
Air quality along the proposed Kansas Extension corridor	1	2	3	4	5
Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife	1	2	3	4	5
Additional economic development opportunities along the proposed Kansas Extension corridor	1	2	3	4	5
The inclusion of bicycle/pedestrian accommodations and connections to the trail system	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

Home owners concerns of vehicle noise

foot traffic into private property.

unwanted trash being left by highway users.

wild life and quietness of area disturbed.

Loss of property value to home owners.

What would you want project designers to take into consideration in the design of the Kansas Extension?

Could the proposed route be moved more into the wooded areas away from existing home and properties?

Consider this route in YOUR Backyard!!!!

What other questions or comments do you have about the Kansas Extension?

Between Plainview Rd. and Farm Rt. 186 it seems the route could be move west away from the residences of Lennox Place and intersect 141 north of 186. Why not??

To receive updates on the project, please provide your name and email address:

Name: Noel Wildhagen

Email: nkwb90r@rocketmail.com

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input



What benefits do you see in building the Kansas Extension?

A great opportunity to connect people, and make all transit welcome, for sustainability, ~~efficiency~~ ~~public~~ public health and the future of transportation. We really need a greenway path on BOTH sides of the road, because there's a divided road situation, with no crossings for bike peds to get to the path if they live on the other side of the new roadway?

What drawbacks do you see in building the Kansas Extension?

That the plan ~~does it go~~ as residents were told. Trust is always an issue. Sometimes things get changed without ~~the~~ input. We need bicycle facilities on both sides of this major roadway opportunity. Why encourage biking for people only on one side, yet not provide access to the other side? Travelers will come from all directions, and proceed in all directions.

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area

1 2 3 4 5

Safety on existing roadways

1 2 3 4 5

Traffic noise along the proposed Kansas Extension corridor

1 2 3 4 5

Air quality along the proposed Kansas Extension corridor

1 2 3 4 5

Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife

1 2 3 4 5

Additional economic development opportunities along the proposed Kansas Extension corridor

1 2 3 4 5

The inclusion of bicycle/pedestrian accommodations and connections to the trail system

1 2 3 4 5

→ Biking infrastructure on both sides of road is needed (sidewalks are intended only for walking or running)

What resources would you want to be considered in the Environmental Assessment?

Actually connecting both sides of the roadway to bicycling facility - OR - provide connections otherwise. Widening the sidewalk to be 10' wide also would be very forward-thinking. Saving a little money now is not worth the pinch in the future.

What would you want project designers to take into consideration in the design of the Kansas Extension?

See previous comments (wide path on both
sides = bike access for both sides)
of road

Where do people cross this big road way
to get to path if it's on the other side?
Then a safety issue is created by the
project.

What other questions or comments do you have about the Kansas Extension?

To receive updates on the project, please provide your name and email address:

Name: _____

Email: _____

**Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.**

THANK YOU!



What benefits do you see in building the Kansas Extension?

None

What drawbacks do you see in building the Kansas Extension?

- ① destruction of "protected" green space
- ② devalued property
- ③ noise and air pollution
- ④ commercial development in residential neighborhoods
- ⑤ displacement of wildlife
- ⑥ proposed speed limit of 40 mph in residential neighborhoods
- ⑦ Affects homeowners, wildlife, green space, which equals quality of life for this neighborhood. There are roads already in place to move traffic. Cox Rd and FF

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area	1	2	3	4	5
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Additional economic development opportunities along the proposed Kansas Extension corridor	1	2	3	4	5
The inclusion of bicycle/pedestrian accommodations and connections to the trail system	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

- ① crime statistics associated with probable retail development along roadway
- ② air and land pollution
- ③ displacement of wildlife

What would you want project designers to take into consideration in the design of the Kansas Extension?

- ① car fumes
- ② Barrier's for sound pollution
- ③ 40 mph proposed speed limit in a neighborhood with a 25mph limit

What other questions or comments do you have about the Kansas Extension?

This road will come up to property lines in Lennox Place. It could go between the rows of trees. That could act as a natural buffer. This project was not declared when we purchased property less then 3 yrs. ago. We were told nothing could be built on protected green space. Cox Rd. already goes through to Nixa. After road goes through our neighborhood, it will turn and connect to Cox Rd. anyway. There is already a road it could connect to (145) and go to Cox.

To receive updates on the project, please provide your name and email address:

Name: Deanna Roudenis

Email: deedle1@hotmail.com

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

Reduction in traffic on Campbell, Plainview, & Cox.
Faster commutes.

What drawbacks do you see in building the Kansas Extension?

Just cost.



On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area

1 2 3 4 5

Safety on existing roadways

1 2 3 4 5

Traffic noise along the proposed Kansas Extension corridor

1 2 3 4 5

Air quality along the proposed Kansas Extension corridor

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Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife

1 2 3 4 5

Additional economic development opportunities along the proposed Kansas Extension corridor

1 2 3 4 5

The inclusion of bicycle/pedestrian accommodations and connections to the trail system

1 2 3 4 5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

The proposed 40 mph speed limit is too slow. The designs shown are limited access and will look more like West Bypass than Kansas Expressway. Therefore it should have a 50 mph limit when completed.

Don't let businesses put a driveway/parking lot on the road.

What other questions or comments do you have about the Kansas Extension?

Sound barriers may be needed where the new road is very close to existing houses.

To be fully effective, Nicholas Road in Christian County needs to be widened or replaced. But, others will have to take that on.

To receive updates on the project, please provide your name and email address:

Name: Ken Wall

Email: ken.wall@~~sb~~sbeglobal.net

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

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<i>Additional economic development opportunities along the proposed Kansas Extension corridor</i>	1	2	3	4	5
<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

All resources seem to be adequately addressed on the brochure.

What would you want project designers to take into consideration in the design of the Kansas Extension?

To design a 4 lane now as proposed,
on the video rather than wait until
a later date.

What other questions or comments do you have about the Kansas Extension?

This project is long overdue.

Focus more attention on when construction
will begin.

To receive updates on the project, please provide your name and email address:

Name: _____

Email: _____

**Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.**

THANK YOU!



COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

Traffic control

reducing congestion on Campbell

Limited access for safer conditions

What drawbacks do you see in building the Kansas Extension?

[Scribbled out text]

[Scribbled out text]

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area

1 2 3 4 5

Safety on existing roadways

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Traffic noise along the proposed Kansas Extension corridor

1 2 3 4 5

Air quality along the proposed Kansas Extension corridor

1 2 3 4 5

Other environmental impacts along the proposed Kansas Extension corridor, such as wildlife

1 2 3 4 5

Additional economic development opportunities along the proposed Kansas Extension corridor

1 2 3 4 5

The inclusion of bicycle/pedestrian accommodations and connections to the trail system

1 2 3 4 5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

*No negative impact on the Ward
Branch*

What other questions or comments do you have about the Kansas Extension?

*Will the prospects of city annexation
be increased w/ the completion of
this project?*

To receive updates on the project, please provide your name and email address:

Name: *Steve Whister*

Email: *swhister@sbuniv.edu*

**Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.**

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

Ultimately better north-south access, takes pressure off
of Campbell.

What drawbacks do you see in building the Kansas Extension?

Phasing and possible terminations into Weaver for
3 years.

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

<i>Amount of traffic on existing roadways in the area</i>	1	2	3	4	5
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<i>The inclusion of bicycle/pedestrian accommodations and connections to the trail system</i>	1	2	3	4	5

What resources would you want to be considered in the Environmental Assessment?

What would you want project designers to take into consideration in the design of the Kansas Extension?

Very disappointed to hear that phase I will terminate into Weaver Road. Weaver is a farm road with blind hills and is not designed to handle the traffic volumes generated in and around Kansas Express Way & Republic. Think Plainview should be first phase as that road has been improved.

What other questions or comments do you have about the Kansas Extension?

- ① Would like to understand modeling of traffic counts on Kansas Expressway and Weaver Roads prior to deciding to terminate first phase at Weaver.
- ② Would like to see Adam spend some time on Weaver Rd to see AM traffic 7/8am and PM traffic 5-6pm to get an understanding of hills on Weaver and impact of one attempting to pull on to road from neighborhoods.
- ③ What is capacity traffic counts for Weaver & Plainview?

To receive updates on the project, please provide your name and email address:

Name: David & Karen Taylor

Email: dktaylorfam06@att.net

Please return comments to: Adam Humphrey, PE, Greene County Highway Department, 2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.

THANK YOU!

COMMENT CARD

We want your input

What benefits do you see in building the Kansas Extension?

None. We were not provided enough data to justify the need. In order to be supportive & collaborative the "Why" should be clearly, confidently & transparently provided.

Whether federal, county or city funded, WE pay for this. The total cost, disruption and subsequent safety & quality of life must be aligned.

With better background data I would be more likely to see some benefits.

What drawbacks do you see in building the Kansas Extension?

Need more paper. Phasing = disruption. Planning lacks clarity around impact to existing (weaver, plan view) to garner confidence in the value & associated transitional safety.

On a scale of 1-5, how important do you think it is for the following to be considered as a part of the Kansas Extension project?

1 = not at all important 3 = somewhat important 5 = extremely important

Amount of traffic on existing roadways in the area	1	2	3	4	5
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The inclusion of bicycle/pedestrian accommodations and connections to the trail system	1	2	3	4	5

why we chose the neighborhood

All Residential. No

What resources would you want to be considered in the Environmental Assessment?

*Sound. Water flow. wetland wildlife, pollution.
Removal of karst landscape likely to
affect natural drainage. Area already floods
easily.*

What would you want project designers to take into consideration in the design of the Kansas Extension?

Mitigation of sand, flow, etc. on weaver - is plan view everything
the phased design. If you can't mitigate existing
funding, should not proceed until you can.

What other questions or comments do you have about the Kansas Extension?

Data that demonstrates the need. Alternatives considered.
Does available funding cover cost of sand/wall?
If deemed needed? Has federal/state funding already
been allocated? If no, anticipated sources and process?
Are sand basins/proj being taken along weaver plan view
also?
I don't see that Christian County is invested in the
need.

To receive updates on the project, please provide your name and email address:

Name: Jennifer McClean

Email: jennifer.mcclean@mercy.net

**Please return comments to: Adam Humphrey, PE, Greene County Highway Department,
2065 N. Clifton, Springfield, MO 65803 by February 19, 2016.**

THANK YOU!

Samuelson, Kathryn A (Kate)

From: Thornhill, Steve
Sent: Monday, March 21, 2016 4:30 PM
To: Samuelson, Kathryn A (Kate)
Subject: FW: Bats

[See below](#)

From: DeBacker, Michael
Sent: Monday, March 14, 2016 6:37 PM
To: Humphrey Adam <AHumphrey@greenecountymo.gov>; Thornhill, Steve <sthornh@burnsmcd.com>; Kocour David (david.kocour@urs.com) <dkocour@hgcons.com>; Beam, Steven R <srbeam@burnsmcd.com>; Doll, Maggie H <mhdoll@burnsmcd.com>
Subject: Fwd: Bats

FYI

Sent from my iPhone

Begin forwarded message:

From: Doug Pitt <dougpitt@icloud.com>
Date: March 14, 2016 at 5:58:12 PM CDT
To: <mdebacker@burnsmcd.com>
Subject: Bats

Hi Michael - I confirmed that the bat report was sent to USFWS and MODOT. Bree McMurray was the individual at MODOT. You will see it is very exhaustive - reviewing 1000's of bats. We definitely have the endangered Gray bat. Oddly - I will need to verify but out of all the bats sampled, I don't remember any Indiana bats so interested to see what your bat pro found and why they were listed in the presentation. They did this study last year and have been able to verify both summer and winter presence. We had threatened northern long eared as well. The principal of the consultant group has authorship in 2 of the 3 main processes used nationally for identifying bats. I personally called a county commissioner around the first of the year to tell you about the study results. I can have the consultant send you a copy if your sources don't have it. Thanks - Doug

Typos courtesy of iPhone

FINAL REPORT REV.1
ACOUSTIC SURVEY FOR LISTED BATS
FOR THE PROPOSED KANSAS EXPRESSWAY EXPANSION
GREENE COUNTY, MISSOURI

3 December 2015

Prepared for:

HOA-D
1409 W. Sunshine
Springfield, Missouri 65807

Prepared by:

Kory Armstrong, and Lynn Robbins, Ph.D.



Environmental Solutions & Innovations, Inc.

4525 Este Ave
Cincinnati, OH 45232
Phone: (513) 451-1777
Fax: (513) 451-3321

Syracuse, NY • Kent, OH • Indianapolis, IN • Orlando, FL • Springfield, MO

Executive Summary

The Greene County Highway Department plans to expand the southern end of Kansas Expressway by approximately 4.0 kilometers. Environmental Solutions & Innovations, Inc. (ESI) was retained by the board of directors on behalf of a homeowners association (HOA-D) to challenge this expansion and determine how a ± 1.4 -kilometer portion of the project in Greene County, Missouri would impact three species protected under the Federal Endangered Species Act (ESA): the endangered gray (*Myotis grisescens*) bat, the endangered Indiana bat (*Myotis sodalis*), and the threatened northern long-eared (*Myotis septentrionalis*) bat.

ESI completed an acoustic survey from 6 to 14 August 2015. Six acoustic detectors were placed within the project area. Thirty-four detector-nights (defined as 1 detector in place for 1 night) of effort were completed exceeding the minimum requirements of the U.S. Fish and Wildlife Service's (USFWS) 2015 *Range-wide Indiana Bat Summer Survey Guidelines*. These guidelines are also used to survey for northern long-eared bats.

Bat detectors allow echolocation calls to be recorded on flash cards which can then be downloaded and analyzed using software packages approved by USFWS. ESI used Kaleidoscope Pro (Kaleidoscope) and Bat Call Identification (BCID) to prescreen the calls. Kaleidoscope identified 6968 calls as produced by echolocating bats, including 12 identified as Indiana bats, 71 as gray bats, and 5 as northern long-eared bats. BCID identified 4528 call sequences including 4 identified as Indiana bats and 37 as gray bats.

Expert visual examination of both BCID and Kaleidoscope identified call files confirmed a total of 9 call sequences consistent in structure with northern long-eared bats and 7 consistent with gray bats. No calls were confirmed as Indiana bats.

This evidence indicates that both the northern long-eared bat and gray bat are present in the project area. Additionally, based on the number of calls consistent with these protected species, it is likely the area provides important summer roosting habitat for northern long-eared bats as well as foraging habitat for both northern long-eared and gray bats. Removal of summer habitat may likely adversely affect both northern long-eared and gray bats.

Further, due to known karst features in the area ESI also recommends additional investigation to determine the potential presence of underground habitat within the project limits and surrounding area that may provide summer and/or winter roosting habitat for gray bats as well as winter roosting habitat for both northern long-eared and Indiana bats.

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1.0 Project Location and Description

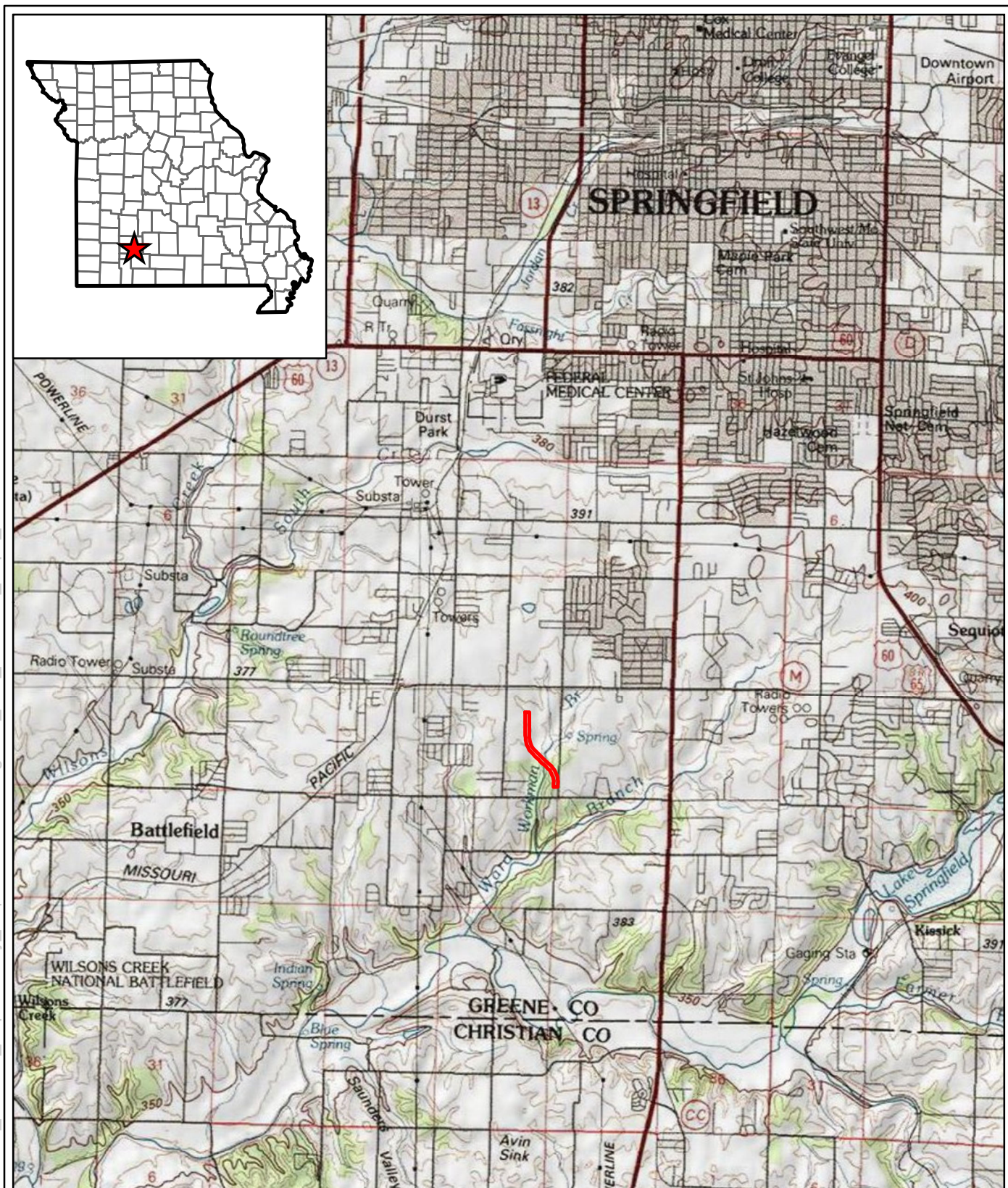
The Greene County Highway Department plans to expand the southern end of Kansas Expressway by approximately 4.0 kilometers (Figure 1). Environmental Solutions & Innovations, Inc. (ESI) was retained by the board of directors on behalf of a homeowners association (HOA-D) to determine how a 1.4-kilometer portion of the project in Greene County, Missouri would impact the federally endangered Indiana (*Myotis sodalis*) and gray (*Myotis grisescens*) bats as well as the federally threatened northern long-eared (*Myotis septentrionalis*) bat.

Study efforts are led by Dr. Lynn Robbins and Mr. Kory Armstrong. Both are extensively experienced in all aspects of acoustic monitoring for bats and U.S. Fish and Wildlife Service (USFWS) qualified to conduct visual vetting of echolocation calls. Resumes are included in Appendix A.

2.0 Regulatory Setting

The Federal Endangered Species Act (ESA) [16 U.S.C. 1531 et seq.] was codified into law in 1973. This law provides for the listing, conservation, and recovery of endangered and threatened species of plants and wildlife. Under the ESA, the U.S. Fish and Wildlife Service (USFWS) is mandated to monitor and protect listed species. Section 7(a)(2) of the ESA states that each federal agency shall insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in destruction or adverse modification of designated critical habitat. Federal actions include (1) expenditure of federal funds for roads, buildings, or other construction projects, and (2) approval of a permit or license, and the activities resulting from such permit or license. Compliance is required regardless of whether involvement is apparent, such as issuance of a federal permit, or less direct, such as federal oversight of a state-operated program.

Section 9 of the ESA prohibits the “take” of listed species. “Take” is defined by the ESA as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect” [16 U.S.C. 1532(19)]. USFWS further defines “harm” to include significant habitat modification or degradation [50 CFR §17.3]. Actions of federal agencies that do not result in jeopardy or adverse modification, but that could result in a take, must also be addressed under Section 7.



Area of Investigation (AOI)

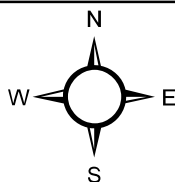


Figure 1. Location of the Kansas Expressway Expansion Project acoustic survey in Greene County, Missouri.

Project No. 683

0 1 2
Miles
Base Map: USGS Topographic Map



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Section 10 of the ESA is designed to regulate a wide range of activities affecting plants and animals designated as endangered or threatened, and the habitats upon which they depend. ESA prohibits activities affecting these protected species and their habitats unless authorized by a permit from USFWS. Permitted activities are designed to be consistent with the conservation of the species.

3.0 Initial Project Screening

3.1 Habitat Assessment

A desktop habitat analysis was completed for the project that initially identified ± 1.4 kilometers of suitable summer habitat for the Indiana and northern long-eared bats. Further, the entire area of interest provides foraging habitat for gray bats.

3.2 Assess Potential for Adverse Effects

As currently designed, the project cannot avoid loss of suitable habitat for Indiana and northern long-eared bats. As such, the project proceeded to Phase 2 of the survey protocol: Presence/Absence Surveys.

4.0 Ecological Setting of the Northern Long-eared, Gray and Indiana Bat

4.1 Northern Long-Eared Bat

4.1.1 Description

The northern long-eared bat ranges from the northern border of Florida north and west to Saskatchewan and east to Labrador. This bat is common to a variety of forest types ranging from intact to small remnants. Although primarily an eastern species, the northern long-eared bat can be found as far west as Montana, and onto the High Plains.



The northern long-eared bat weighs about 5-8 grams (0.17-0.28 oz) at maturity and its right forearm measures about 34-38

millimeters (1.3 – 1.5 in). The wing membrane connects to the foot at the base of the first toe.

The northern long-eared bat is most easily characterized by the long ears (17 mm [0.7 in]), which extend past the muzzle when laid forward, as well as a long and thin tragus (9 mm [0.4 in]) (Whitaker and Mumford 2009). The northern long-eared bats' pelage is typically colored a light to dark brown on the dorsal side and a light brown on the ventral side (Caceres and Barclay 2000, Whitaker and Mumford 2009). Ears and wing membranes are usually a dark brown.

4.1.2 Status

On 2 October 2013, the northern long-eared bat was proposed for listing by USFWS as endangered. On 16 January 2015, USFWS proposed a special 4(d) rule for the northern long-eared bat in the event that the species was ultimately listed as threatened instead. On 2 April 2015, USFWS published notice in the Federal Register of its final decision to list the species as threatened and issue an interim special 4(d) rule exempting certain activities from the ESA's take prohibition. The listing decision and interim 4(d) rule took effect 4 May 2015.

Federal Register Documents

[80 FR 2371 2378](#); 16 January 2015: Proposed Listing: Threatened with a 4(d) Exemption
[80 FR 17973 18033](#); 2 April 2015: Final Rule: Threatened with a 4(d) Exemption

Based on hibernacula studies, the northern long-eared bat has suffered estimated losses of up to 93 to 98 percent in certain areas of the Northeastern U.S. since 2005 (Turner et al. 2011).

4.1.3 Seasonal Ecology

The northern long-eared bat is a "tree bat" in summer and a "cave bat" in winter. During the summer, the species is forest dependent. As with the Indiana bat, there are four ecologically distinct components of the annual life cycle: winter hibernation, spring staging and autumn swarming, spring and autumn migration, and the summer season of reproduction (Figure 2).

4.1.4 Summer Roosting Ecology

The summer range of the northern long-eared bat is large and includes much of the eastern deciduous forestlands from the northern border of Florida north and west to Saskatchewan and east to Labrador (Caceres and Barclay 2000, Whitaker and Mumford 2009) (Figure 3). Distribution throughout the range is not uniform, and summer occurrences are more common in the northern and northeastern portions of the species' range than in southern and western portions (Caceres and Barclay 2000, Amelon and Burhans 2006). Historically, these areas were primarily forested. Through

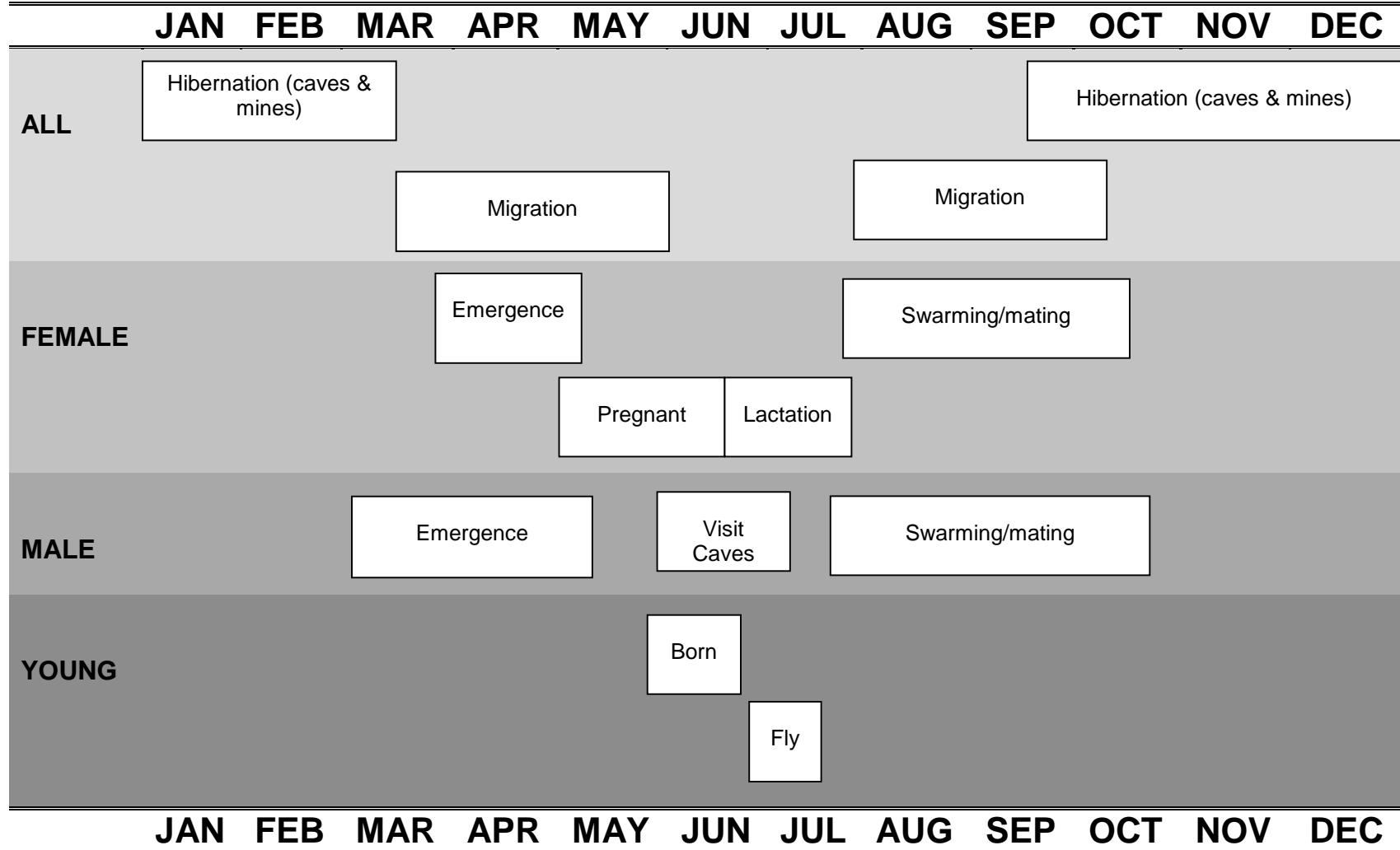
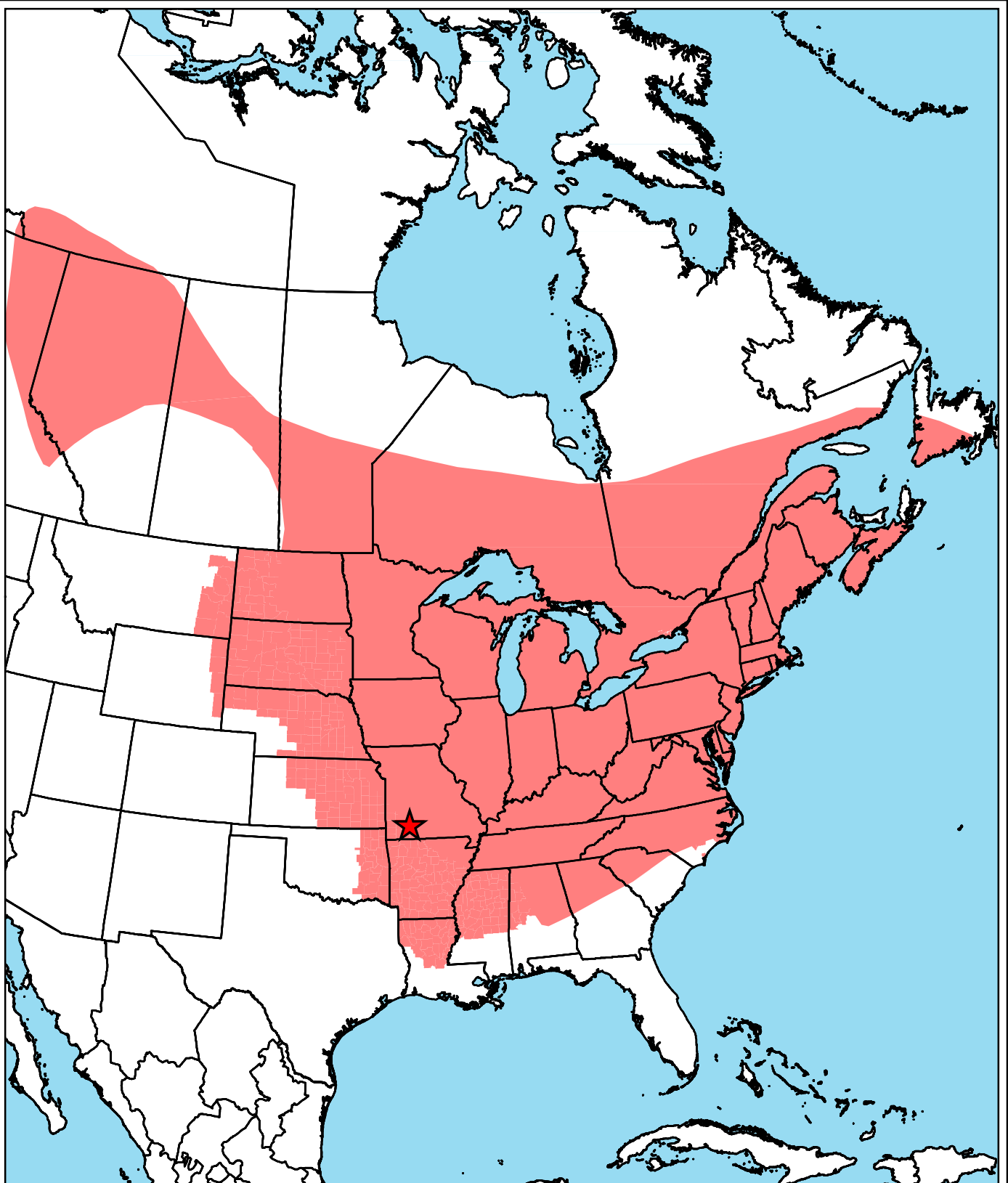


Figure 2. Seasonal activity of northern long-eared bats.



■ Northern Long-Eared Bat Range □ State or Province Boundary

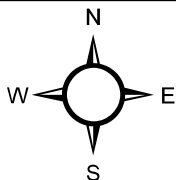


Figure 3. Range-wide distribution of the northern long-eared bat (*Myotis septentrionalis*).

Project No. 683

0 350 700
Miles



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the southern portions of their range, they appear to be less abundant, and are thought of as rare in Alabama, South Carolina, and Georgia (Mumford and Cope 1964, Barbour and Davis 1969, Amelon and Burhans 2006, Whitaker and Mumford 2009, Timpone et al. 2010). Although occasionally captured/recorded in western portions of their range, they are uncommon when records are compared to eastern areas, and may now occupy this area as a result of range expansion following settlement (Sparks et al. 2011).

When female northern long-eared bats emerge from hibernation, they migrate to maternity colonies. The distance traveled from winter hibernacula to summer roosting areas is not known. Maternity colonies are typically found in hollow trees and under bark although they also use bat-houses, buildings, and other anthropogenic structures (Amelon and Burhans 2006). After parturition, pups usually achieve volancy by 21 days (Kunz 1971, Krochmal and Sparks 2007). As the offspring become volant, average number of bats using a maternity roost declines (Lacki and Schwierjohann 2001, Sparks 2003).

A wide variety of deciduous tree species, as well as occasional coniferous species, are used as nursery colonies indicating that it is tree form, not species that is important for roosts (Caceres and Barclay 2000, Carter and Feldhamer 2005). This species regularly uses both live and dead trees (Sasse and Pekins 1996, Foster and Kurta 1999, Carter and Feldhamer 2005). The northern long-eared bat may choose either tree condition, depending on the presence or availability within an area, or possibly due to competition with or predation from other wildlife (Perry and Thill 2007, Perry et al. 2007). Roost trees may be habitable for one to several years, depending on the species and condition of the tree. The species may also use several other structures as summer roost sites. These can be natural or man-made (e.g. bridges, barns/homes, rocky cracks or crevices). Northern long-eared bats make extensive use of bat-houses when these structures are available (Whitaker et al. 2006). Some males and non-reproductive females remain near their winter hibernacula throughout summer while others migrate varying distances. This may be due to a preference for cooler environments in the absence of pups (Barbour and Davis 1969, Amelon and Burhans 2006). Males can be caught at hibernacula on most nights during summer, although there may be a large turnover of individuals between nights. Structurally, summer roosts used by males are similar to those used by maternity colonies. Trees used by males of the species are often smaller than those used by maternity colonies, perhaps because males are often solitary or form small groups and thus need less space or they may have different thermal requirements than females.

4.2 Gray Bat

4.2.1 Description

The gray bat is a monotypic species that occupies a limited geographic range in limestone karst areas of the southeastern United States. Most gray bat populations occur in Alabama, Arkansas, Kentucky, Missouri and Tennessee (Barbour and Davis 1969) with small maternity populations as far north as southern Indiana (Brack et al. 1984a) and as far west as southeastern Kansas (USFWS 1997).



The gray bat weighs about 10 grams (0.35 ounce) at maturity and its right forearm measures about 40.5 – 45.5 millimeters (1.6 – 1.8 inches). The wing membrane connects to the foot at the ankle rather than at the base of the first toe, as in other species of *Myotis*. The gray bat is monochromatic, i.e., the fur is one color – gray. However, young and newly molted individuals are a bright silvery gray whereas just before molt, the fur may be anywhere between a darker gray to blondish or russet color. Color changes are due to environmental factors, with lighter colors the result of bleaching from the ammonia in urine, and thus may be most pronounced in reproductive females.

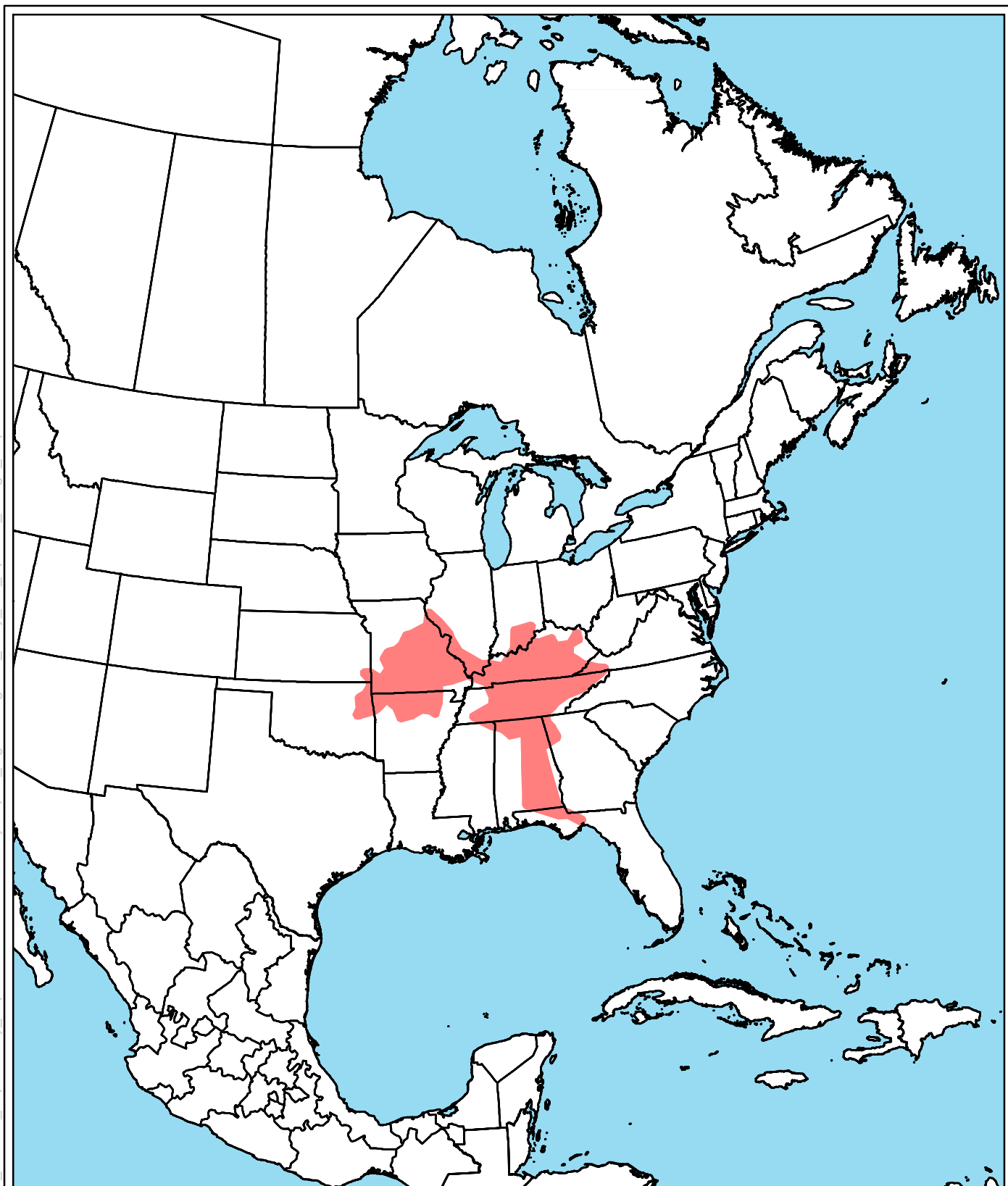
Federal Register Documents

[41 FR 17736 17740](#): 28 April 1976: Final Listing: Endangered
[40 FR 17590 17951](#): 21 April 1975: Proposed Listing: Endangered

4.2.2 Status

On 28 April 1976, the gray bat was listed as endangered under ESA of 1973. A recovery plan for the species was completed on 1 July 1982 (Brady et al. 1982). Critical habitat was not designated.

When the gray bat was listed as federally endangered, there were approximately 128,000 individuals. Range-wide, the gray bat population has seen a 62 percent increase over the last 20 years (USFS 2005). A census conducted in 2002 estimated the gray bat population at 2,600,000 individuals and current estimates suggest that the population may exceed 3,000,000 individuals (USFS 2005). Cave protection measures instituted for the conservation of gray bats have been largely successful and populations at 73 percent of all caves are stable or increasing. Seventy-nine percent of gray bat colonies in the western portion of their range are stable or increasing (Figure 4).



Gray Bat Range State or Province Boundary

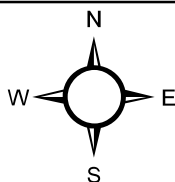


Figure 4. Range-wide distribution of the gray bat (*Myotis grisescens*).

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4.2.3 Ecology

4.2.3.1 Winter Hibernation and Summer Roosting

Gray bats are true “cave bats” requiring caves for winter hibernation and summer roosting. Gray bats migrate seasonally and hibernacula may be hundreds of miles from summer roosts. Tuttle (1976a) found bats traveled distances of 16 to 523 kilometers (10 - 325 mi) from winter hibernacula to summer ranges, but in the western portion of their range, migration distances are much shorter (Sasse et al. 2007). Extensive banding work centered on Marvel Cave in Stone County Missouri indicated that bats from this site moved as far as 640 kilometers (398 mi) although the vast majority moved less than 200 kilometers (124 mi) (Elder and Gunier 1978). Similar observations were obtained during a state-wide Missouri effort at banding bats (LaVal and LaVal 1980). Hibernacula used by gray bats typically have a strong vertical component (the farther south the steeper the vertical component) with domed rooms that trap cold air with temperatures ranging from 6° to 11.6° Celsius (43° - 52°F) (Tuttle 1976a; 1979). Mating begins soon after adults arrive at hibernacula in autumn and females begin hibernating immediately thereafter. Females may begin hibernation by early September. Adult males and juveniles remain active for several weeks but are usually hibernating by early November. Hibernation continues through April (Brady et al. 1982).

Females store sperm over the winter, become pregnant soon after emerging from hibernation, and give birth to a single young by late May or early June (Brady et al. 1982). Colony members are loyal to their colony home range, but tend to disperse in groups among several different caves within that area (Brady et al. 1982). Males form bachelor colonies in spring (late March to mid-May), although many remain with females until young are born. During the reproductive season, adult males roost in different caves (or in different sections of maternity caves) than adult females and usually begin roosting together again after young become volant (Brady et al. 1982). Maternity colonies are formed in caves with domed ceilings that trap warm air with temperatures ranging from 14° to 26° Celsius (57° - 79°F) (Tuttle 1976a). These caves often contain underground streams and are usually located within 1 to 4 kilometers (0.6 - 2.5 mi) of rivers or other bodies of water (Tuttle 1976b, USFWS 1997). Occasionally, summer roosts have been found in storm sewers (Decher and Choate 1995), mines (Brack et al. 1984b), railroad tunnels, dams, buildings (Evans and Drilling 1992), and bridges (Mumford and Cope 1958, Davis and Cockrum 1963, Kiser et al. 2002). Gray bats use a wide variety of caves during spring and fall transient periods.

4.2.3.2 Food Habits and Foraging Ecology

The gray bat is generally associated with streams and wetlands (Brady et al. 1982, Clawson and Titus 1992) and commonly forages over wooded riparian corridors, often low over the water. Forested areas surrounding caves, flyways, and foraging areas

are also important to the survival of gray bats (Tuttle 1979) and are routinely used while foraging, particularly by juveniles (Brack and Laval 2006). Depending upon colony size and available habitat, individuals may travel distances of 19 to 34 kilometers (12 to 21 mi) for foraging (LaVal and LaVal 1980). However, Tuttle (1976a) suggested that growth rates of young may be reduced as the distance from roosts to foraging areas increases. Adult females often feed more on aquatic insects (Orders Trichoptera, Plecoptera, Ephemeroptera, and Diptera) while juveniles forage more in woodlands and eat more terrestrial insects (Orders Lepidoptera, Coleoptera, Homoptera, Hemiptera, and Hymenoptera) (Brack and Laval 2006). One reason juveniles foraged more in woodlands and ate more coleopterans than adults may be that the coleopterans provide a greater energy reward per unit of capture effort. Best and Milam (1997) reported that insects from the orders Lepidoptera, Diptera, and Coleoptera were the primary prey of gray bats in Alabama. Lacki et al (1995) reported a similar diet in Kentucky.

Although gray bats often forage over waterways such as streams, rivers, and lakes (Tuttle 1976b, LaVal et al. 1977, Best and Hudson 1996), specific macro-habitat characteristics of waterways and surrounding lands important to gray bats are uncertain. Gray bats in Missouri foraged over waterways adjacent to forested areas more often than waterways adjacent to pastures (LaVal et al. 1977). Moreover, bat activity levels in forested riparian areas are higher than in non-forested riparian areas, especially with regard to most Myotids (Hayes and Adam 1996).

In Missouri, diets were compared to insect availability (Brack and Laval 2006). Proportional availability of insects varied among locations, over the season, between seasons, and between early-evening and late-night samples. Similarly, the diet varied among locations, over time, between early and late samples, and among sample groups by sex, age, and reproductive condition. However, there was poor correlation between corresponding diet and insect samples. Gray bats forage individually over long distances along streams and wooded riparian habitats. While this habitat produces a characteristic assemblage of insect prey, proportional availability varies temporally and spatially. Thus, although specific diet samples do not match corresponding insect samples, on a broader scale, diets and insect availability do correspond. On a micro-scale, the gray bat is an opportunistic forager, feeding on readily available prey, but on a macro-scale is selective, feeding in aquatic-based habitats where specific types of insect prey are abundant.

4.2.4 Causes of Past/Current Decline

The recovery plan (Brady et al. 1982) lists human disturbance, environmental disturbance (largely pesticides), impoundment of waterways, cave commercialization and improper gating, and natural calamities as the cause for the decline that led to listing.

Although natural calamities factors such as flooding, cave-ins, freezing, and disease occasionally impact gray bats, population decline has been attributed chiefly to human disturbance of bats and alteration of their habitat (Barbour and Davis 1969, Mohr 1972, Tuttle 1979, Brady et al. 1982). Human activities that have resulted in major impacts to bat colonies include cave exploration, cave commercialization, and vandalism (Brady et al. 1982). Disturbance can occur either in summer when maternity colonies use caves, or in winter when caves are used as hibernacula. Disturbances in hibernacula can cause arousals that use up energy (fat) reserves. Natural and/or human-caused changes in the microclimate of caves and mines used as hibernacula can adversely affect the species (Richter et al. 1993). Disturbance of maternity caves is most harmful from late May through mid-July when nonvolant young are on the roosts; thousands may die from a single disturbance (Brady et al. 1982). Gray bats may also abandon summer caves as a result of human intrusion (Barbour and Davis 1969).

Important impacts caused by humans also include environmental alterations, including deforestation, chemical contamination, and impoundment of waterways. Deforestation may decrease prey availability; Brack and Laval (2006) found that adults, and especially juveniles, foraged in woodlands where they consume terrestrial-based prey. Thus, habitat for the species should include both aquatic and wooded, especially riparian, habitats. The frequent use of caves near rivers has made the gray bats particularly vulnerable to inundation by man-made impoundments. Impoundments may also have secondary impacts by changing the aquatic prey base and by increasing human recreational use of caves and foraging habitat.

Chemical contamination has been implicated in the decline of most North American bats (USFWS 2007). Because aquatic insects are an important part of the diet, of gray bats, pollutants that enter the aquatic environment may have a large impact. Exposure is dermal (through the skin), by inhalation, or ingestion (Schmidt et al. 2001).

In the late 1970s and early 1980s, bat mortality caused by organochlorine pesticides – neurotoxins such as DDT and its break-down products (dieldrin, heptachlor epoxide) - was documented in Missouri (Clark et al. 1978) and Texas caves. Geluso et al. (1976) and Clark et al. (1978) documented mortality in gray bats and probable population declines resulting from routine insecticide use. Organochlorine pesticides are fat soluble and thus are stored in body fats. Lethal concentrations of dieldrin were found in the brains of dead juvenile gray bats (Clark et al. 1978) and mortality of the bats was tied directly to insecticide residues acquired through insect prey. Mortality occurred about the time the young began to fly and hunt on their own, but were still dependent on their mothers' milk. The adult females, in response to the need for heavy milk production, mobilized stored fats, and the fat-soluble toxins stored in those fats.

Despite the 1972 ban of DDT in the United States, organochlorine pesticides, which are very stable compounds and thus remain in the environment for long periods, are still found in bats today.

With restrictions on the use of organochlorine pesticides in the 1970s, organophosphates (OPC) and carbamates have become the most widely used pesticides in the world. They act primarily by inhibiting an enzyme essential for nerve function within the peripheral and central nervous system and they are essentially the same ingredients in tabun, sarin, soman, and cyclosarin, the most toxic chemical warfare agents known. Toxicity induces a diverse array of abnormal behaviors such as tremors and eventual paralysis. Chronic, sub-lethal exposure adversely affects thermoregulation, food consumption, and reproduction. Bats suffering sublethal exposure may be unable to fly, catch prey, avoid predation or even obstacles while in flight, keep warm, care for young, or complete other tasks requisite for survival. With acute exposure, death occurs from respiratory failure. A study in Indiana indicated that chlorpyrifos is nearly ubiquitous in the carcasses and guano of bats (Eidels et al. 2006), although this was a small sample that contained no gray bats.

Populations of hibernating gray bats are almost assuredly vulnerable to WNS. First discovered in 2006 in New York, it has been killing populations of hibernating bats in the northeastern United States, and is spreading into the mid-west. On 29 May 2012, the USFWS officially confirmed the presence of WNS in gray bats found in Hawkins and Montgomery counties, Tennessee. The presence of the suspected causative agent of WNS (a fungus) has also been detected on gray bats in Missouri (L. W. Robbins, Personal Communication).

4.3 Indiana Bat

4.3.1 Description

The Indiana bat is a medium-sized bat in the genus *Myotis*. The forearm length has a range of 35 to 41 millimeters (1.4 – 1.6 in). The head and body length range from 41 to 49 millimeters (1.6 – 1.9 in). Its appearance most closely resembles that of congeners little brown bat (*M. lucifugus*) and northern long-eared bat. Indiana bats differ from similar *Myotis* species in that they have a distinctly keeled calcar (cartilage that extends from the ankle to support the tail membrane). Other minor differences include smaller and more delicate hind feet, shorter hairs on the feet that do not extend past the toenails, and a pink nose. The fur lacks luster, and the wing and ear membranes have a dull, flat coloration that does not contrast with the fur (USFWS 2007). Fur on the chest and belly is lighter than fur on the back, but is not as



strongly contrasting as that of similar *Myotis* species. Overall color is slightly grayer, while the little brown bat and northern bat are browner. The skull has a crest and tends to be smaller, flatter, and narrower than that of the little brown bat (USFWS 2007) .

4.3.2 Status

The USFWS listed the Indiana bat as endangered on 11 March 1967. The most current range-wide estimate of the population is 523,636 individuals, which represents about 60 percent of the estimated population of 1960 (USFWS 2015). Long-term, detailed documentation of population changes are lacking across most of its range, with the exception of the state of Indiana (Brack et al. 1984b, Johnson et al. 2002, Brack et al. 2003), although such information now being acquired in most states. It is probable that habitat loss during summer (USFWS 2007) and winter disturbances during hibernation (Johnson et al. 1998) both contributed to the overall decline of the species.

Federal Register Documents
[41 FR 41914](#); 24 September 1976: Final
Critical Habitat, Critical habitat-mammals
[40 FR 58308 58312](#); 16 December 1975:
Proposed Critical Habitat, Critical
habitat- mammals
[32 FR 4001](#); 11 March 1967: Final
Listing, Endangered

A recovery plan for the species was completed on 14 October 1983. In October 1996, the Indiana Bat Recovery Team released a Technical Draft Indiana Bat Recovery Plan. In October 1997, a preliminary version entitled "Agency Draft of the Indiana Bat Recovery Plan," which incorporated changes from the 1996 Technical Draft, was released. Subsequently, an agency draft entitled "Indiana Bat (*Myotis sodalis*) Revised Recovery Plan" was distributed for comments in March 1999. In April 2007 USFWS released the "Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision". Critical habitat was designated on 24 September 1976, and includes 11 caves and 2 abandoned mines in Illinois, Indiana, Kentucky, Missouri, Tennessee, and West Virginia.

4.3.3 Ecology

The Indiana bat is a "tree bat" in summer and a "cave bat" in winter. There are four ecologically distinct components of the annual life cycle: winter hibernation, spring staging and autumn swarming, spring and autumn migration, and the summer season of reproduction. The U.S. Fish & Wildlife Service Recovery Plan (2007) provides a description of the life history. Figure 5 provides an annual chronology of seasonal activities.

4.3.3.1 Summer Roosting Ecology

The summer range of the Indiana bat is large and includes much of the eastern deciduous forestlands between the Appalachian Mountains and Midwest prairies (Figure 6). Distribution throughout the range is not uniform and summer occurrences

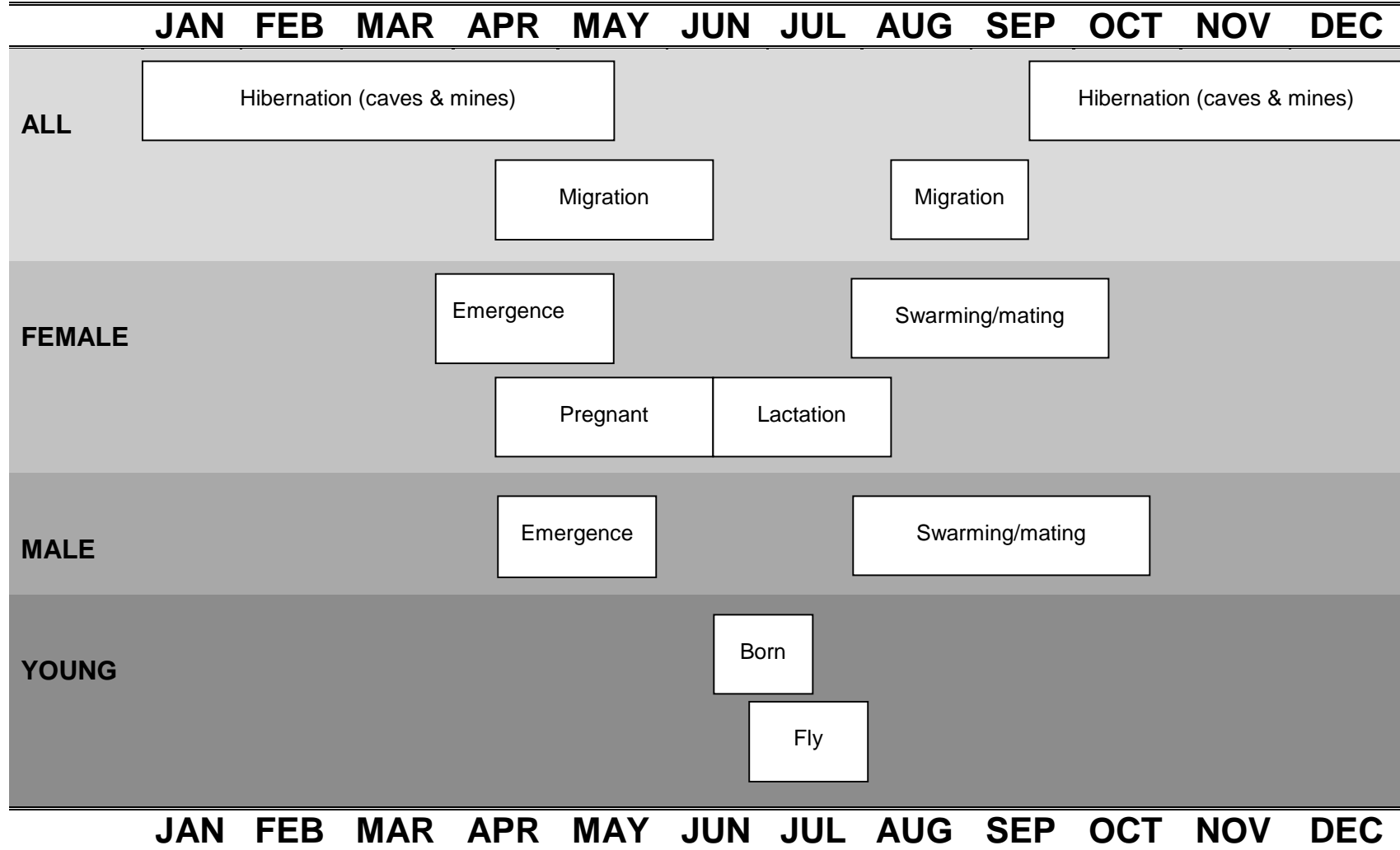


Figure 5. Seasonal chronology of Indiana bat activities.

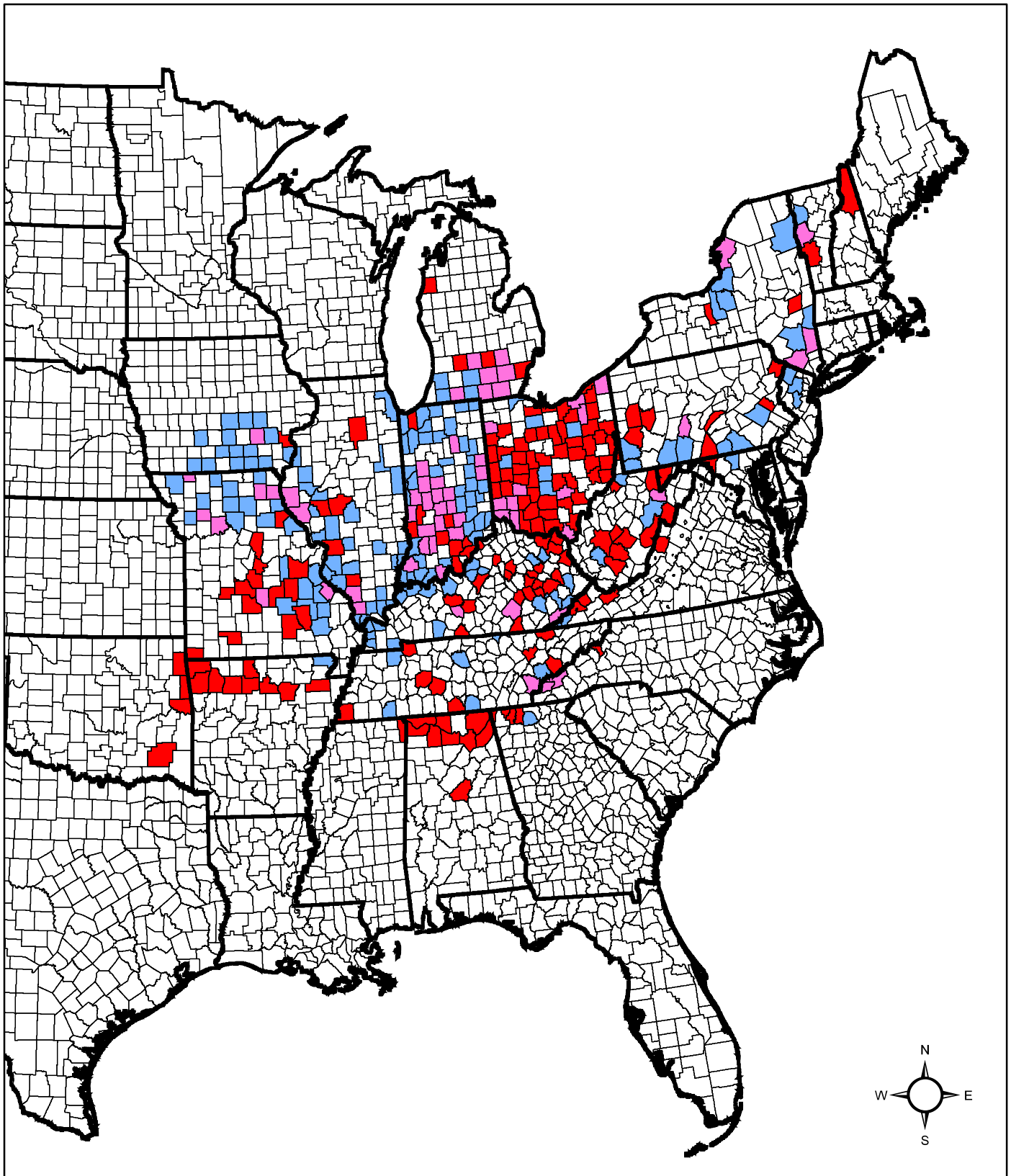


Figure 6. Rangewide distribution of the Indiana bat during summer, showing counties with reproductive (adult female and/or young-of-the-year) and non-reproductive records.

County with Record of
Indiana Bat Reproductive
Occurrence

County with Record of
Indiana Bat Summer
Non-Reproductive Occurrence

County with Record of Indiana Bat
Reproductive and Summer
Non-Reproductive Occurrence

are more frequent in southern Iowa and Michigan, northern Missouri, Illinois, and Indiana. Greater tree densities do not equate to more bats (Brack et al. 2002). Cooler summer temperatures associated with latitude or altitude likely affect reproductive success and the summer distribution of the species (Brack et al. 2002).

4.3.3.1.1 Males

Some males remain near hibernacula throughout summer while others migrate varying distances (Whitaker and Brack 2002). Males can be caught at hibernacula on most nights during summer (Brack 1983, Brack and LaVal 1985), although there may be a large turnover of individuals between nights (Brack 1983). Woodland roosts appear similar to maternity roosts (Kiser and Elliott 1996, Schultes and Elliott 2002, Brack and Whitaker 2004, Brack et al. 2004), although smaller diameter trees may be used. Less space may be required for a single bat than a colony of bats, or thermal requirements may differ. Males appear somewhat nomadic; over time, the number of roosts and the size of an area used increases. Activity areas encompass roads of all sizes, from trails to interstate highways. Roosts have also been located near roads of all sizes (Kiser and Elliott 1996, Schultes and Elliott 2002, Brack et al. 2004), including adjacent to an interstate highway (Brack et al. 2004).

4.3.3.1.2 Females and Maternity Colonies

When female Indiana bats emerge from hibernation, they migrate to maternity colonies that may be located up to several hundred miles away (Kurta and Murray 2002). Females form nursery colonies under exfoliating bark of dead, dying, and living trees in a variety of habitat types, including uplands and riparian habitats. A wide variety of tree species, including occasional pines (Britzke et al. 2003) are used as nursery colonies indicating that it is tree form, not species that is important for roosts. Since many roosts are in dead or dying trees, they are often ephemeral. Roost trees may be habitable for one to several years, depending on the species and condition of the tree (Callahan et al. 1997) Indiana bats exhibit strong site fidelity to summer roosting and foraging areas (Kurta and Murray 2002, Kurta et al. 2002). Females are pregnant when they arrive at maternity roosts. Parturition typically occurs between late June and early July. A maternity colony typically consists of 25 to 325 adult females. Nursery colonies often use several roost trees (Kurta et al. 1993, Foster and Kurta 1999, Kurta and Murray 2002), moving among roosts within a season. Most members of a colony coalesce into a single roost tree about the time of parturition, which begins to break up again as soon as young are volant.

Roosts that contain large numbers of bats (more than 20 bats) are often called primary roosts, while secondary roosts hold fewer bats. Primary roost trees are often greater than 46 centimeters (18 in) diameter at breast height (dbh) and secondary roost trees are often greater than 23 centimeters (9 in) dbh (Gardner et al. 1991, Callahan et al. 1997, Kurta et al. 2002, Miller et al. 2002, Carter 2003). Numerous suitable roosts may

be required to support a single nursery colony, possibly about 45 stems per hectare (20/acre) (Gardner et al. 1991, Miller et al. 2002, Carter 2003).

Roost trees are often located where they have solar exposure, with 20 to 80 percent canopy closure (Humphrey et al. 1977, Gardner et al. 1991, Kurta et al. 1993, Kurta et al. 1996, Kurta et al. 2002, Carter 2003). They are often exposed to 10 or more hours of solar radiation per day (Kurta et al. 2002). The need for solar exposure may vary with latitude.

Indiana bats live on anthropogenic landscapes and recent research indicates females do include roads in their active area. Although bats do cross roads, the studies that document this behavior were not designed to gauge a graded response (Gardner et al. 1991, Brown et al. 2001, Kiser et al. 2002, Kurta et al. 2002, Brack and Whitaker 2006).

4.3.3.2 Food Habits and Foraging Ecology

Like many other species of microchiropterans, the Indiana bat often uses travel corridors that consist of open flyways such as streams, woodland trails, small infrequently used roads, and possibly utility corridors, regardless of suitability for foraging or roosting (Brown and Brack 2003). Members of maternity colonies forage in a variety of woodland settings, including upland and floodplain forest (Humphrey et al. 1977, Brack 1983, Gardner et al. 1991). Foraging activity is concentrated above and around foliage surfaces, such as over the canopy in upland and riparian woods, around crowns of individual or widely spaced trees, and along edges. They forage less frequently over old fields, and occasionally over bushes in open pastures. Forest edges, small openings, and woodlands with patchy trees provide more foraging opportunities than dense woodlands. Most species of woodland bats forage prominently along edges, less in openings, and least within forests (Grindal 1996). Openings also provide a better supply of insects than do wooded areas (Tibbels and Kurta 2003).

5.0 Methods

Studies were completed generally following the acoustic guidelines provided by the USFWS 2015 *Range-wide Indiana Bat Summer Survey* (Table 1), which is also applicable to the northern long-eared bat. Given that the linear impact of project removing ± 1.4 kilometers of suitable forested habitat, the guidelines require a minimum sampling effort of 4 detector nights. ESI completed 34 detector nights, exceeding the required minimum sampling effort.

5.1 Level of Effort and Detector Placement

ESI completed **34** detector nights (detector night = 1 detector for 1 night) of sampling at six sites along the project area. Total sampling effort exceeds the minimum level required by USFWS.

Table 1. USFWS Northern Long-Eared Bat and Indiana Bat Acoustic Survey Guidelines.

2015 ACOUSTIC GUIDELINES	
1.	The number of acoustic sites required for a project:
	a. Linear projects: 2 detector nights per km (0.6 mi), or
	b. Areal projects: 4 detector nights per 0.5 square km (123 ac).
2.	Detector sites should not be less than 200 m apart, but spread throughout the project area.
3.	A qualified biologist must identify detector sites, placing them in areas most suitable for detecting Indiana & northern bats.
	a. forest-canopy openings
	b. near water sources
	c. wooded fence lines that are adjacent to large openings or connect two larger blocks of suitable habitat
	d. blocks of recently logged forest where some potential roost trees remain
	e. road and/or stream corridors with open tree canopies or canopy height of more than 33 feet (10 meters)
	f. woodland edges
4.	The acoustic sampling period for each site must begin at sunset and end at sunrise (1 detector-night).
5.	Use weatherproofing only when absolutely necessary; if used, sampling must continue throughout both nights
6.	Do not sample when:
	a. Temperatures are below 10° C (50° F),
	b. Sustained wind speeds greater than 9 miles/hour (4 meters/second; 3 on Beaufort scale), and
	c. Precipitation that is intermittent or lasts in excess of 30 minutes during the first 5 hours of deployment.
7.	Download and process calls using one or more approved acoustic analysis program(s). A maximum likelihood estimator (MLE) is used to determine the likelihood of misidentifications in cases where protected species are identified. In cases where a significant MLE score is obtained, then a qualified biologist can review all calls collected at the site on the night(s) in question to determine if there was an error with the software.
8.	Acoustic files are saved and submitted to USFWS.
Source: U.S. Fish and Wildlife Service; 2015	

5.2 Site Selection

Detector sites were selected based on the need to comply with the recommendations of Table 1 including spreading the sampling effort throughout the project area and placing detectors to avoid acoustic clutter which can dramatically lower the quality of the recorded calls recorded (Britzke 2004, Broders et al. 2004).

In addition to low clutter, high quality acoustic sites also are sites with high bat traffic. Such sites include: 1) borders of riparian corridors running through open landscapes; 2) fencerows adjacent open habitats; 3) other open linear corridors, including logging and other woodland roads/trails and pipeline rights-of-way (ROWs).

Sites used for this survey included forest edge and stream corridors (Table 2, Figure 7). An acoustic detector equipped with a high frequency microphone was placed at each of these six sites. To reduce the influence of ground clutter, microphones were mounted ± 1.5 meters above ground and angled away from vegetation.

Table 2. GPS coordinates for the Kansas Expressway Expansion Project acoustic survey in Greene County, Missouri.

Acoustic Monitoring Site	Latitude WGS 84	Longitude WGS 84
01	37° 07' 41.4" N	93° 19' 03.6" W
02	37° 07' 41.1" N	93° 19' 03.0" W
03	37° 07' 41.7" N	93° 19' 02.1" W
04	37° 07' 43.0" N	93° 19' 02.5" W
05	37° 07' 37.6" N	93° 19' 02.2" W
06	37° 07' 35.8" N	93° 19' 03.2" W

One detector was placed at each of six sites on 6 August, and was programmed to begin recording 30 minutes before sunset and to cease recording 30 minutes after sunrise. Detectors at sites 01-03 and 05-06 were removed the afternoon of 10 August. A detector at site 04 remained in place from 11 August to 14 August. Examination of the logs indicated the detectors all operated as programmed.

5.3 Habitat Assessment

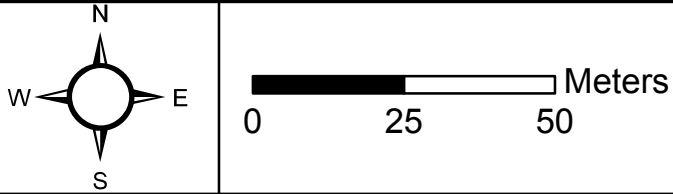
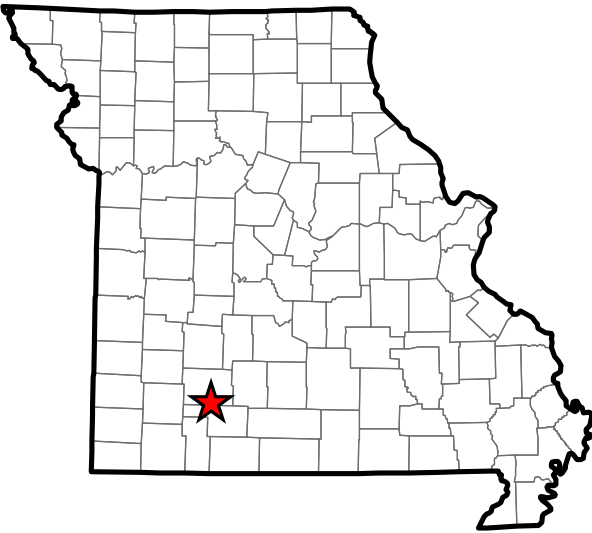
ESI assessed the project area for suitability for use by northern long-eared bats while placing the detectors. Completed data sheets are provided in Appendix B and photographs are provided in Appendix C. The emphasis of this description is habitat form: size and relative abundance of large trees and snags that potentially serve as roost trees, canopy closure, understory, clutter/openness, distance to water, and flight corridors. Habitat form is emphasized because the northern long-eared bat roosts in many tree species.

Habitat characterization identifies components of canopy and subcanopy layers. Trees that reach into the canopy are canopy trees, regardless of their diameter/size. As defined in the Indiana Bat Habitat Suitability Index Model (3D/Environmental 1995), dominant trees are the large trees in the canopy (>40 centimeters [16 in] diameter at breast height [dbh]).



Figure 7. Monitoring locations for the Kansas Expressway Expansion Project acoustic survey in Greene County, Missouri.

- ▲ Acoustic Monitoring Site
- Right-of-Way (ROW)



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



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Current literature seems to suggest that these trees have the greatest likelihood of being used by maternity colonies of many bats including the northern long-eared bat. Many smaller trees are often also found in the canopy, and in some situations, the canopy can be entirely composed of small-diameter trees. ESI's habitat characterization identifies both dominant and subdominant elements of the canopy.

The subcanopy vegetation layer is well defined in classical ecological literature. It is that portion of the forest structure between the ground vegetation (to approximately 0.6 meter [2 ft]) and the canopy layers, usually beginning at about 7.6 meters (25 ft). The amount of vegetation in the understory is termed clutter.

5.4 Weather and Temperature

In order to assure compliance with USFWS guidelines, ESI examined weather data from a weather station at the Springfield National Airport in Springfield, Missouri for the nights of 6 to 14 August 2015. These results indicate that the nights of 6 to 8 August were not compliant with USFWS guidelines (18 of the 34 total detector nights). Maximum sustained wind speed was recorded at 9.2 miles per hour during 6 and 7 August and 16.1 miles per hour during 8 August. Rain occurred after approximately 4 hours of surveying on 6 August. Temperatures ranged between a low of 17.2° Celsius (63°F) and a high of 28.8° Celsius (84°F). However, due to the nature of the project, all calls regardless of weather conditions were reviewed.

5.5 Data Analysis

Multiple methods are used by researchers to identify bat calls. First, a statistically-based filter can be used to select calls that most likely belong to a particular species. For example, the Kentucky field office of USFWS used a filter for several years to identify calls consistent with the Indiana bat. However, in order to reduce error rates, such filters do not consider call sequences in which more than one bat is represented. Second, calls can be identified manually based on qualitative characters. This technique is more time intensive, but also allows a greater degree of control to be exercised. Third, USFWS has recently approved three software packages which are capable of analyzing many calls in a short period of time and classifying those calls to species and using a maximum likelihood estimator to help inform decisions about whether a species is present or not. Under current USFWS guidelines, a qualified biologist may review calls identified by the identification software to ensure accurate identifications.

All call files were downloaded and processed through Kaleidoscope Pro software ([Kaleidoscope Pro version 2.2.2], Wildlife Acoustics, Inc., www.wildlifeacoustics.com) and Bat Call Identification BCID software ([BCID East version 2.7c], C. Ryan Allen, Bat Call Identification, Inc., www.batcallid.com).

Both software packages extract parameters including the frequency, time, and slope components of each pulse. Each pulse is then assigned to species and species-level identifications are based on the most frequently identified species. In some cases even very low confidence identifications are of value including instances where biologists attempt to locate a rare species such as the Indiana bat. In other cases, such as academic research or studies aimed at regulatory compliance, a more complete level of identification is required. Both software packages allow users the option of tightening or loosening the stringency of the rule governing species-level identifications, and can also be adjusted to restrict the analysis to only those species that are expected to be present (to avoid mis-identifications). BCID is specifically designed to select all calls consistent with those made by Indiana bats so they can be visually reviewed and identified by a qualified biologist.

In this case ESI included all of the 10 species that may occur in the project area: big brown (*Eptesicus fuscus*), silver-haired (*Lasionycteris noctivagans*), hoary (*Lasiurus cinereus*), eastern red (*Lasiurus borealis*), eastern pipistrelle (*Perimyotis subflavus*), evening (*Nycticeius humeralis*) little brown (*Myotis lucifugus*), gray, northern long-eared, and Indiana bat. Identifications using this software can be greater than 90 percent correct when using highly consistent calls. BCID and Kaleidoscope settings chosen for analysis included allowing all calls to be classified to the species level based on the greatest percentage of the call classified as a single species. Acoustic data are provided on disk in Appendix D.

If either software package had a positive detection for high frequency (≥ 35 kHz) or myotid calls, all calls for that detector night were visually examined by a qualified biologist, Mr. Kory Armstrong and/or Dr. Lynn Robbins.

6.0 Results

6.1 Analysis of Call Sequences

6.1.1 Kaleidoscope Identified Calls

Kaleidoscope identified a total of 6968 bat calls recorded over 34 detector nights (Table 3).

Table 3. Bat calls identified by the Kaleidoscope software with automated call identification.

Acoustic Monitoring Site	EPFU	LABO	LACI	LANO	MYGR	MYLU	MYSE	MYSO	NYHU	PESU	Total Bat Calls
01	92	24	1	46	1	2	1	1	4	24	196
02	446	103	15	309	2	21	1	6	49	134	1086
03	290	133	15	458	1	18	0	2	22	104	1043
04	860	277	524	574	42	21	1	0	146	166	2611
05	270	206	224	121	13	7	1	2	18	104	966
06	274	286	0	150	12	5	1	1	31	306	1066
Total by Species	2232	1029	779	1658	71	74	5	12	270	838	6968

EPFU=*Eptesicus fuscus* (big brown bat); LANO=*Lasionycteris noctivagans* (silver-haired bat); LABO=*Lasiurus borealis* (eastern red bat); LACI=*Lasiurus cinereus* (hoary bat); MYLU=*Myotis lucifugus* (little brown bat); MYSE=*Myotis septentrionalis* (northern long-eared bat); MYGR=*Myotis grisescens* (gray bat); MYSO=*Myotis sodalis* (Indiana bat); NYHU=*Nycticeius humeralis* (evening bat); PESU=*Perimyotis subflavus* (eastern pipistrelle bat)

6.1.2 BCID Identified Calls

BCID identified a total of 4528 bat calls recorded over 34 detector nights (Table 4). Of these, 1692 were classified as unknown calls that did not pass the filter (>5 pulses and >70% of pulses belonging to a single species).

Table 4. Bat calls identified by the BCID software with automated call identification.

Acoustic Monitoring Site	UNKN	EPFU	LABO	LACI	LANO	MYGR	MYLU	MYSE	MYSO	NYHU	PESU	Total Bat Calls
01	58	49	1	0	27	1	0	0	1	2	15	154
02	309	152	10	3	228	6	4	0	1	41	95	849
03	149	27	7	6	320	0	1	0	0	24	61	595
04	687	200	25	10	516	15	7	0	1	77	118	1656
05	101	80	11	2	183	4	0	0	1	13	106	501
06	388	105	4	0	64	11	0	0	0	15	186	773
Total by Species	1692	613	58	21	1338	37	12	0	4	172	581	4528

EPFU=*Eptesicus fuscus* (big brown bat); LANO=*Lasionycteris noctivagans* (silver-haired bat); LABO=*Lasiurus borealis* (eastern red bat); LACI=*Lasiurus cinereus* (hoary bat); MYLU=*Myotis lucifugus* (little brown bat); MYSE=*Myotis septentrionalis* (northern long-eared bat); MYGR=*Myotis grisescens* (gray bat); MYSO=*Myotis sodalis* (Indiana bat); NYHU=*Nycticeius humeralis* (evening bat); PESU=*Perimyotis subflavus* (eastern pipistrelle bat); UNKN=Unknown calls

6.2 Visual Vetting

Detector nights identified as having mid-range frequency calls were visually vetted by a qualified biologist. Eight call sequences consistent with northern long-eared bats and seven consistent with gray bats were confirmed through visual identification.

6.3 Maximum Likelihood Estimator

Maximum likelihood estimators are a multivariate statistical technique that is used to test the strength of a proposed relationship based on known or assumed error rates. In this case the proposed relationship is the presence of protected bats that have been identified by analytical software. The maximum likelihood estimator takes into account

the number of call sequences identified as a species and compares that to the number of call sequences that were identified belonging to a similar species based on the assumed error rates. Assumed error rates are obtained by testing the software packages against libraries of known calls. The goal is to provide a mechanism to eliminate errors resulting from misclassification. Maximum likelihood analysis identified northern long-eared and gray bats as being present.

6.4 Habitat Characterization of Acoustic Monitoring Sites

Acoustic monitoring sites were placed in areas with open canopy or no canopy, where bats likely forage or commute. The following describes the general habitat setting for the sites:

- Site 01 was along a forest edge adjacent to a stream. Representative tree species included oak (*Quercus sp.*) and black walnut (*Juglans nigra*) and willow (*Salix sp.*) in the canopy.
- Site 02 was adjacent an open shrub covered area along a forested edge. Tree species noted in the dominant canopy were oak and willow.
- Site 03 was along a path adjacent dense wooded edge. High roosting potential was observed and consisted of large trees and snags.
- Site 04 was adjacent a stream along a forested edge. High roosting potential was observed and consisted of large trees and snags. Representative tree species included oak, willow, and hickory (*Carya sp.*).
- Site 05 was in a clearing adjacent a pond and stream. Tree species observed were oak, walnut and willow.
- Site 06 was adjacent a stream within an area of high roosting potential. Multiple large trees and snags were observed.

Table 5 provides general habitat characteristics of Sites 01-06.

7.0 Discussion

7.1 Acoustic Monitoring

Efforts to identify the echolocation calls of bats have a long and somewhat tortured past. Recent efforts using libraries of known calls and advanced statistical techniques have produced a series of tools that can have more than a 90 percent accuracy rate (Britzke et al. 2002, Britzke 2004, Britzke et al. 2011).

Table 5. Habitat characteristics of acoustic sites for the Kansas Expressway Expansion Project acoustic survey in Greene County, Missouri.

Acoustic Monitoring Site	Water Source		Tree Species			Canopy Closure	Clutter		Roost Tree		Habitat Type	Herb. Cover
	Type	Distance (m)	Dominant Canopy	Subdominant Canopy	Subcanopy		Rating	Composition	Potential	Composition		
01	Stream	10	<i>Quercus sp.</i> , <i>Juglans nigra</i> , <i>Salix sp.</i>	<i>Robinia pseudoacacia</i>	N/A	M	M	Lower Branches, Saplings	M	Lrg trees	FE, SR	M
02	Stream	15	<i>Quercus sp.</i> , <i>Salix sp.</i>	<i>Juglans nigra</i>	N/A	O	M	Shrubs	M	Lrg trees, Snags	FE, SR	M
03	N/A	N/A	<i>Quercus sp.</i> , <i>Juglans nigra</i>	<i>Salix sp.</i>	N/A	C	M	Saplings, Shrubs	H	Lrg trees, Snags	FE, ML, OF	S
04	Stream	5	<i>Quercus sp.</i> , <i>Salix sp.</i> , <i>Carya sp.</i>	<i>Juglans nigra</i>	N/A	M	C	Lower Branches, Saplings, Shrubs	H	Lrg trees, Snags	FE, SR	D
05	Pond	5	<i>Quercus sp.</i> , <i>Salix sp.</i>	<i>Juglans nigra</i>	N/A	M	O	Shrubs	M	Lrg trees, Snags	FE, VP	M
06	Stream	2	<i>Quercus sp.</i> , <i>Salix sp.</i> , <i>Carya sp.</i>	<i>Juglans nigra</i>	N/A	M	M	Lower branches, Shrubs	H	Lrg trees, Snags	FE, VP	M

Tree Species: hickory (*Carya sp.*), black walnut (*Juglans nigra*), black locust (*Robinia pseudoacacia*), oak (*Quercus sp.*), willow (*Salix sp.*)

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

Roost Potential Rating: M=Moderate, H=High

Habitat Type: FE=Forest Edge, ML=Mature Lowland, SR=Stream/River, VP=Vernal Pool

Herb (Herbaceous) Cover: S=Sparse, M=Moderate, D=Dense

These high accuracy rates are obtained by developing a library of calls that are collected from bats of known identification and using those to develop a statistical tool that can maximize identification rates.

The statistical tool is then compared to a second set of calls of known identification to determine an accuracy rate. Such approaches have clearly demonstrated the potential value of acoustic analyses.

Unfortunately, error rates for field-collected data are higher than those obtained by comparison to library calls for a number of reasons. First, library calls are collected under ideal or nearly ideal recording conditions, whereas calls collected during surveys such as this are restricted to the best available sites. Second, most libraries are screened to remove poor quality calls (i.e., bad recordings). In addition, efforts to identify free-ranging calls focus on the search-phase calls, which are produced by bats during commuting flights, and other calls used during feeding are eliminated. Finally most call libraries contain only a few thousand calls. For example, Britzke et al. (2011) used a library containing 1846 call sequences to develop the most successful set of tools currently known. That same library is the basis of the software package used in this study and is also used to train ESI staff to conduct visual reviews when needed.

7.2 Roost Potential and Foraging Habitat

Northern long-eared bats make use of exfoliating bark on dead trees and limbs similar to those used by Indiana bats, but they also make extensive use of cavities in live trees (Sasse and Pekins 1996, Foster and Kurta 1999, Cryan et al. 2001, Sparks 2003, Timpone et al. 2010). Overall habitat at the sites should be considered as having moderate potential for use by northern long-eared bats.

7.3 Conclusions and Recommendations

Acoustic survey efforts completed for this project complied with guidelines set by the USFWS and the Indiana Bat Recovery Team to survey summer habitat for the presence/absence of the federally threatened northern long-eared bat.

Acoustic surveys provided evidence indicating that both the federally threatened northern long-eared bat and federally endangered gray bat are present in the project area. Additionally, based on the number of calls consistent with these protected species, it possible the area provides important summer roosting habitat for northern long-eared as well as foraging habitat for both northern long-eared and gray bats.

Removal of summer habitat may likely adversely affect both northern long-eared and gray bats.

Due to known karst features in the area ESI also recommends additional investigation for the presence potential underground habitat within the project limits and surrounding area that may provide winter roosting for all three federally protected species.

8.0 Literature Cited

- 3D/Environmental. 1995. Literature summary and habitat suitability index model. Components of summer habitat for the Indiana bat, *Myotis sodalis*. Authors: R. C. Romme, K. Tyrell, V. Brack, Jr. Report submitted to the Indiana Department of Natural Resources, Division of Wildlife, Bloomington, Indiana by 3D/Environmental, Cincinnati, Ohio. Federal Aid Project E-1-7, Study No. 8, 38 pp.
- Amelon, S. and D. Burhans. 2006. Conservation assessment: *Myotis septentrionalis* (northern long-eared bat) in the Eastern United States. U.S. Department of Agriculture, Forest Service, General Technical Report NC-260: Conservation Assessments for Five Forest Bat Species in the Eastern United States.
- Barbour, R. W. and W. H. Davis. 1969. Bats of America. University Press of Kentucky, Lexington, Kentucky.
- Best, T. L. and M. K. Hudson. 1996. Movements of gray bats (*Myotis grisescens*) between roost sites and foraging areas. Journal of the Alabama Academy of Science 67:6-14.
- Best, T. L. and B. A. Milam. 1997. Variation in diet of the gray bat (*Myotis grisescens*). Journal of Mammalogy 78:569-583.
- Brack, V., Jr. 1983. The nonhibernating ecology of bats in Indiana with emphasis on the endangered Indiana bat, *Myotis sodalis*. Unpublished Ph.D. dissertation, Purdue University, West Lafayette, Indiana.
- Brack, V., Jr., S. A. Johnson, and R. K. Dunlap. 2003. Wintering populations of bats in Indiana, with emphasis on the endangered Indiana Myotis, *Myotis sodalis*. Proceedings of the Indiana Academy of Science 112:61-74.
- Brack, V., Jr. and R. K. LaVal. 1985. Food habits of the Indiana bat in Missouri. Journal of Mammalogy 66:308-315.

- Brack, V., Jr. and R. K. Laval. 2006. Diet of the gray Myotis (*Myotis grisescens*): variability and consistency, opportunism, and selectivity. *Journal of Mammalogy* 87:7-18.
- Brack, V., Jr., R. E. Mumford, and V. R. Holmes. 1984a. The gray bat (*Myotis grisescens*) in Indiana. *American Midland Naturalist* 111:205.
- Brack, V., Jr., C. W. Stihler, R. J. Reynolds, C. M. Butchkoski, and C. S. Hobson. 2002. Effect of climate and elevation on distribution and abundance in the mid-eastern United States. Pages 21-28 *in* The Indiana Bat: Biology and Management of an Endangered Species (A. Kurta and J. Kennedy, eds.). Bat Conservation International, Austin, Texas.
- Brack, V., Jr. and J. O. Whitaker, Jr. 2004. Bats of the Naval Surface Warfare Center at Crane, Indiana. *Proceedings of the Indiana Academy of Science* 113:66-75.
- Brack, V., Jr. and J. O. Whitaker, Jr. 2006. The Indiana Myotis (*Myotis sodalis*) on an anthropogenic landscape: Newport Chemical Depot, Vermillion County, Indiana. *Proceedings of the Indiana Academy of Science* 115:44-52.
- Brack, V., Jr., J. O. Whitaker, Jr., and S. E. Pruitt. 2004. Bats of Hoosier National Forest. *Proceedings of the Indiana Academy of Science* 113:78-86.
- Brack, V., Jr., A. M. Wilkinson, and R. E. Mumford. 1984b. Hibernacula of the endangered Indiana bat in Indiana. *Proceedings of the Indiana Academy of Science* 93:463-468.
- Brady, J., T. Kunz, M. Tuttle, and D. Wilson. 1982. Gray bat recovery plan. U.S. Department of Interior, Fish and Wildlife Service in cooperation with the Gray Bat Recovery Team, Denver, Colorado. 143 pp.
- Britzke, E. R. 2004. Acoustic surveys of bats in the eastern United States. *in* Indiana Bat and Coal Mining, A Technical Interactive Forum (K.C. Vories and A. Harrington, eds.) U.S. Department of Interior, Office of Surface Mining. Alton, Illinois.
- Britzke, E. R., J. E. Duchamp, K. L. Murray, R. K. Swihart, and L. W. Robbins. 2011. Acoustic identification of bats in the eastern United States: A comparison of parametric and nonparametric methods. *Journal of Wildlife Management* 73:660-667.
- Britzke, E. R., M. J. Harvey, and S. C. Loeb. 2003. Indiana bat, *Myotis sodalis*, maternity roosts in the southern United States. *Southeastern Naturalist* 2:235-242.
- Britzke, E. R., K. L. Murray, J. S. Heywood, and L. W. Robbins. 2002. Acoustic identification. *in* The Indiana Bat: Biology and Management of an Endangered Species (A. Kurta and J. Kennedy, eds.). Bat Conservation International, Austin, Texas.

- Broders, H. G., C. S. Findlay, and L. Zheng. 2004. Effects of clutter on echolocation call structure of *Myotis septentrionalis* and *M. lucifugus*. *Journal of Mammalogy* 85:273–281.
- Brown, R. J. and V. Brack, Jr. 2003. An unusually productive net site over an upland road used as a travel corridor. *Bat Research News* 44:187-188.
- Brown, R. J., R. A. King, and R. Rommé. 2001. First documented maternity colony of the Indiana bat in Greene County, Ohio (Abstract). *Bat Research News* 42:27.
- Caceres, M. C. and R. M. R. Barclay. 2000. *Myotis septentrionalis*. *Mammalian Species* 634:1-4.
- Callahan, E. V., R. D. Drobney, and R. L. Clawson. 1997. Selection of summer roosting sites by Indiana bats (*Myotis sodalis*) in Missouri. *Journal of Mammalogy* 78:818-825.
- Carter, T. C. 2003. Summer habitat use of roost trees by the endangered Indiana bat (*Myotis sodalis*) in the Shawnee National Forest of Southern Illinois. Ph.D. dissertation. Southern Illinois University, Carbondale, Illinois.
- Carter, T. C. and G. A. Feldhamer. 2005. Roost tree use by maternity colonies of the Indiana bats and the northern long-eared bats in southern Illinois. *Forest Ecology and Management* 219:259-268.
- Clark, D. R., Jr, R. K. LaVal, and D. M. Swineford. 1978. Dieldrin-induced mortality in an endangered species, the gray bat (*Myotis grisescens*). *Science* 199:1357-1359.
- Clawson, R. L. and R. R. Titus. 1992. Management plan for the Indiana and gray bat in Missouri. Missouri Department of Conservation, Jefferson City, Missouri.
- Cryan, P. M., M. A. Bogan, and G. M. Yanega. 2001. Roosting habits of four bat species in the Black Hills of South Dakota. *Acta Chiropterologica* 3:43-52.
- Davis, R. and E. L. Cockrum. 1963. Bridges utilized as day roosts by bats. *Journal of Mammalogy* 3:428-430.
- Decher, J. and J. R. Choate. 1995. *Myotis grisescens*. *Mammalian Species* 510:1-7.
- Eidels, R. R., J. O. Whitaker, Jr, and D. W. Sparks. 2006. Organophosphate Insecticide residues in bats and guano from Indiana. *in* Proceedings of The American Society of Mammalogists, 85th Annual Meeting. .
- Elder, W. H. and W. J. Gunier. 1978. Sex ratios and seasonal movements of gray bats (*Myotis grisescens*) in southwestern Missouri and adjacent states. *American Midland Naturalist* 99:463-472.
- Evans, J. E. and N. Drilling. 1992. Element stewardship abstract for gray bat. Nature Conservancy.

- Foster, R. W. and A. Kurta. 1999. Roosting ecology of the northern bat (*Myotis septentrionalis*) and comparisons with the endangered Indiana bat (*Myotis sodalis*). *Journal of Mammalogy* 80:659-672.
- Gardner, J. E., J. D. Garner, and J. E. Hofmann. 1991. Summer roost selection and roosting behavior of *Myotis sodalis* (Indiana bat) in Illinois. Unpublished report. Illinois Natural History Survey, Illinois Department of Conservation, Section of Faunistic Surveys and Insect Identification. Champaign, Illinois. 56 pp.
- Geluso, K. N., J. S. Altenbach, and D. E. Wilson. 1976. Bat mortality: pesticide poisoning and migratory stress. *Science* 194:184-186.
- Grindal, S. D. 1996. Habitat use by bats in fragmented forests. Pages 260-272 *in* Bats and Forests Symposium (R. M. R. Barclay and R. M. Brigham, eds.), October 19-21, 1995. Research Branch, British Columbia Minister of Forests Research Program. Victoria, British Columbia, Canada.
- Hayes, J. P. and M. D. Adam. 1996. The influence of logging riparian areas on habitat utilization by bats in western Oregon. *in* Bats and Forests Symposium (R. M. R. Barclay and R. M. Brigham, eds.), October 19-21, 1995. Research Branch, British Columbia Minister of Forests Research Program. Victoria, British Columbia, Canada. Victoria, B.C. .
- Humphrey, S. R., A. R. Richter, and J. B. Cope. 1977. Summer habitat and ecology of the endangered Indiana bat, *Myotis sodalis*. *Journal of Mammalogy* 58:334-346.
- Johnson, S. A., V. Brack, Jr., and R. K. Dunlap. 2002. Management of hibernacula in the state of Indiana. Pages 100-109 *in* The Indiana Bat: Biology and Management of an Endangered Species (A. Kurta and J. Kennedy, eds.). Bat Conservation International, Austin, Texas.
- Johnson, S. A., V. Brack, Jr., and R. E. Rolley. 1998. Overwinter weight loss of Indiana bats (*Myotis sodalis*) from hibernacula subject to human visitation. *American Midland Naturalist* 139:255-261.
- Kiser, J. D. and C. L. Elliott. 1996. Foraging habitat, food habits, and roost tree characteristics of the Indiana Bat (*Myotis sodalis*) during autumn in Jackson County, Kentucky. Unpublished report to Kentucky Department of Fish and Wildlife Resources. Frankfort, Kentucky. 75 pp.
- Kiser, J. D., J. R. MacGregor, H. D. Bryan, and A. Howard. 2002. Use of concrete bridges as night roosts. Pages 208-215 *in* The Indiana Bat: Biology and Management of an Endangered Species (A. Kurta and J. Kennedy, eds.). Bat Conservation International. Austin, Texas.
- Krochmal, A. R. and D. W. Sparks. 2007. Timing of birth and estimation of age of juvenile *Myotis septentrionalis* and *Myotis lucifugus* in west-central Indiana. *Journal of Mammalogy* 88:649-656.

- Kunz, T. H. 1971. Reproduction of some vespertilionid bats in central Iowa. *American Midland Naturalist* 86:477-486.
- Kurta, A., D. King, J. A. Teramino, J. M. Stribley, and K. J. Williams. 1993. Summer roosts of the endangered Indiana bat (*Myotis sodalis*) on the northern edge of its range. *American Midland Naturalist* 129:132-138.
- Kurta, A. and S. W. Murray. 2002. Philopatry and migration of banded Indiana bats (*Myotis sodalis*) and effects of radio transmitters. *Journal of Mammalogy* 83:585-589.
- Kurta, A., S. W. Murray, and D. H. Miller. 2002. Roost selection and movements across the summer landscape. Pages 118-129 *in* The Indiana Bat: Biology and Management of an Endangered Species (A. Kurta and J. Kennedy, eds.). Bat Conservation International, Austin, Texas.
- Kurta, A., K. J. Williams, and R. Mies. 1996. Ecological, behavioral, and thermal observations of a peripheral population of Indiana bats (*Myotis sodalis*). Pages 102-117 *in* Bats and Forests Symposium (R. M. R. Barclay and R. M. Brigham, eds.), October 19-21, 1995. Research Branch, British Columbia Minister of Forests Research Program. Victoria, British Columbia, Canada.
- Lacki, M. J., L. S. Burford, and J. O. Whitaker, Jr. 1995. Food habits of gray bats in Kentucky. *Journal of Mammalogy* 76:1256-1259.
- Lacki, M. J. and J. H. Schwierjohann. 2001. Day-roost characteristics of northern bats in mixed mesophytic forests. *The Journal of Wildlife Management* 65:482-488.
- LaVal, R. K., R. L. Clawson, M. L. LaVal, and W. Caire. 1977. Foraging behavior and nocturnal activity patterns of Missouri bats, with emphasis on the endangered species *Myotis grisescens* and *Myotis sodalis*. *Journal of Mammalogy* 58:592-599.
- LaVal, R. K. and M. L. LaVal. 1980. Ecological studies and management of Missouri bats, with emphasis on cave-dwelling species. *Missouri Department of Conservation: Terrestrial Series* 8:1-53.
- Miller, N. E., R. D. Drobney, R. L. Clawson, and E. V. Callahan. 2002. Summer habitat in northern Missouri. Pages 165-171 *in* The Indiana Bat: Biology and Management of an Endangered Species (A. Kurta and J. Kennedy, eds.). Bat Conservation International, Austin, Texas.
- Mohr, C. E. 1972. The status of threatened species of cave-dwelling bats. Pages 33-47 *in* Cave Bats: Their Ecology, Physiology, Behavior, and Future Survival. A Symposium with Recommendations. Bulletin of the National Speleological Society. Huntsville, Alabama.
- Mumford, R. E. and J. B. Cope. 1958. Summer records of *Myotis sodalis* in Indiana. *Journal of Mammalogy* 39:586-587.

- Mumford, R. E. and J. B. Cope. 1964. Distribution and status of the Chiroptera of Indiana. *American Midland Naturalist* 72:473-489.
- Perry, R. W. and R. E. Thill. 2007. Roost selection by male and female northern long-eared bats in a pine-dominated landscape. *Forest Ecology and Management* 247:220-226.
- Perry, R. W., R. E. Thill, and D. M. Leslie, Jr. 2007. Selection of roosting habitat by forest bats in a diverse forested landscape *Forest Ecology and Management* 238:156-166.
- Richter, A. R., S. T. Humphrey, J. B. Cope, and V. Brack, Jr. 1993. Modified cave entrances: Thermal effect on body mass and resulting decline of endangered Indiana bats (*Myotis sodalis*). *Conservation Biology* 7:407-415.
- Sasse, D. B., R. Clawson, M. J. Harvey, and S. L. Hensley. 2007. Status of populations of the endangered gray bat in the western portion of its range. *Southeastern Naturalist* 6:165-172.
- Sasse, D. B. and P. J. Pekins. 1996. Summer roosting ecology of northern long-eared bats (*Myotis septentrionalis*) in the White Mountain National Forest. Pages 91-101 *in* Bats and Forests Symposium (R. M. R. Barclay and R. M. Brigham, eds.), October 19-21, 1995. Research Branch, British Columbia Minister of Forests Research Program. Victoria, British Columbia, Canada.
- Schmidt, A., V. Brack, Jr., R. Rommé, K. Tyrell, and A. Gehrt. 2001. Bioaccumulation of pesticides in bats from Missouri. Pages 8-21 *in* Pesticides and Wildlife (J. J. Johnston, ed.). American Chemical Society Symposium No. 771.
- Schultes, K. L. and C. L. Elliott. 2002. Roost tree selection by Indiana bats and northern bats on the Wayne National Forest, Ohio. Unpublished report to U.S. Fish & Wildlife Service, Reynoldsburg, Ohio Field Office and U.S. Department of Agriculture, Forest Service, Wayne National Forest.
- Sparks, D. W. 2003. How does urbanization impact bats? Ph.D. Dissertation. Indiana State University, Terre Haute, Indiana. 121 pp.
- Sparks, D. W., C. J. Schmidt, and J. R. Choate. 2011. Bats of Kansas. Publication Number 5, Indiana State University Center for North American Bat Research and Conservation. 62 pp.
- Tibbels, A. E. and A. Kurta. 2003. Bat activity is low in thinned and unthinned stands of red pine. *Canadian Journal of Forest Research* 33 (12):2436-2442.
- Timpone, J. C., J. G. Boyles, K. L. Murray, D. P. Aubrey, and L. W. Robbins. 2010. Overlap in roosting habits of Indiana bats (*Myotis sodalis*) and northern bats (*Myotis septentrionalis*). *American Midland Naturalist* 163:115-123.

- Turner, G. O., D. M. Reeder, and J. T. H. Coleman. 2011. A five-year assessment of mortality and geographic spread of white-nose syndrome in North American bats and a look to the future. *Bat Research News* 52:13-27.
- Tuttle, M. D. 1976a. Population ecology of the gray bat (*Myotis grisescens*): Factors influencing growth and survival of newly volant young. *Ecology* 57:587-595.

- Tuttle, M. D. 1976b. Population ecology of the gray bat (*Myotis grisescens*): Philopatry, timing and patterns of movement, weight loss during migration, and seasonal adaptive strategies. Pages 1-38 in Occasional Papers from the Museum of Natural History, University of Kansas.
- Tuttle, M. D. 1979. Status, causes of decline, and management of endangered gray bats. *Journal of Wildlife Management* 43:1-17.
- USFS. 2005. Mark Twain National Forest, Missouri: programmatic biological assessment forest plan revision. U.S. Department of Agriculture, Forest Service, Eastern Region, Milwaukee, Wisconsin. 303 pp.
- USFWS. 1997. Endangered species – gray bat. U.S. Department of Interior, Fish and Wildlife Service, Fort Snelling, Minnesota.
- USFWS. 2007. Indiana bat (*Myotis sodalis*) draft recovery plan: First revision. U.S. Department of Interior, Fish and Wildlife Service, Fort Snelling, Minnesota. 258 pp.
- USFWS. 2015. 2015 Rangewide population estimate for the Indiana bat (*Myotis sodalis*) by USFWS region. U.S. Department of Interior, Fish and Wildlife Service, Ecological Services Field Office, Bloomington, Indiana.
- Whitaker, J. O., Jr. and V. Brack, Jr. 2002. Distribution and summer ecology in Indiana. Pages 48-54 in *The Indiana Bat: Biology and Management of an Endangered Species* (A. Kurta and J. Kennedy, eds.). Bat Conservation International, Austin, Texas.
- Whitaker, J. O., Jr. and R. E. Mumford. 2009. *Mammals of Indiana* Indiana University Press. Bloomington, Indiana, 661 pp.
- Whitaker, J. O., Jr., D. W. Sparks, and V. Brack, Jr. 2006. Use of artificial roost structures by bats at the Indianapolis International Airport. *Environmental Management* 38:28-36.

APPENDIX A RESUMES





ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.

Résumé

Kory M. Armstrong

EDUCATION

M.S., Biology, Missouri State University, 2013

Masters Thesis: *Artificial Roosting Habitat for Bats: Successes, Failures and Options*

B.S., Biology, Drury University, 2009

QUALIFICATIONS AND EXPERIENCE

Mr. Armstrong is an environmental scientist who often serves as project manager for both environmental services and natural resources projects. His experience includes aquatic and terrestrial studies, with an emphasis on bat ecology. He manages all aspects of environmental consulting projects, including proposals, budgets, staffing, and agency coordination. He leads field surveys involving endangered bat concerns for a variety of clients. He conducts National Environmental Policy Act (NEPA) evaluations for the telecommunications industry, post-construction mortality surveys for the wind energy industry, and completes wetland delineations, and point count (raptor) surveys. Mr. Armstrong is ESI's lead for acoustic monitoring studies.

He is proficient with the following field techniques and equipment:

- Acoustic studies of bats including the use of all common varieties of bat detector. He has collected reference calls throughout the U.S. and is an acknowledged expert in both quantitative and qualitative identifications.
- Mist net set up, bat handling and identification, and morphometric processing (species, weight, gender, and various measurements)
- Roost tree identification
- Emergence counts
- Habitat assessments
- Radio telemetry
- Use of handheld, sub-meter accurate Trimble GPS unit
- Interpretation of soil and groundwater data
- Point count surveys
- Post-construction mortality surveys

PROJECT EXPERIENCE

Project Manager – Arkansas Highway Transportation Department, Bridge Replacements along Highway 7: 2015. Supervised and conducted summer mist net and acoustic surveys for federally endangered Indiana, federally endangered gray, and federally threatened northern long-eared bats at two bridge sites in Perry County.

Captured three northern long-eared bats and tracked one to a roosting area. Coordinated with the client and multiple other state and federal agencies including the Arkansas Game and Fish Commission, U.S. Fish and Wildlife Service, and U. S. Forest Service. Prepared and submitted final report.

Project Manager – Kansas Department of Transportation (KDOT), Five Projects: 2015. Assisted KDOT in understanding their regulatory requirements under the Endangered Species Act as it related to the northern long-eared bat, newly-listed as a threatened species. Supervised rapid collection and analysis of acoustic data in five different counties within 7-day period to ensure survey completion within the USFWS-mandated survey window.

Project Manager – Kansas Department of Health and Environment (KDHE): 2015. Assisted KDHE in regulatory compliance under Section 7 of the Endangered Species Act as it related to gray and northern long-eared bats. Supervised and conducted collection and analysis of acoustic data at sites in southeast Kansas.

Project Manager – Talawanda Transmission Line: 2015. Supervised and conducted mist net surveys for federally threatened northern long-eared bats along a proposed 15-kilometer transmission line in Pittsburg County, Oklahoma.

Project Manager – Confidential Client: 2015. Supervised and conducted quantitative and qualitative acoustic analyses for three projects in Cherokee, Muskogee, and Wagoner counties in Oklahoma. Qualitatively identified northern long-eared bats in Cherokee County.

Project Manager – Confidential Client, Kansas Expressway Expansion: 2015. Assisted a client in understanding regulatory requirements under the Endangered Species Act relative to a highway expansion project. Supervised collection and analysis of acoustic data at sites near Springfield, Missouri.

Field Supervisor – U.S. Fish and Wildlife Service, Ozark Plateau National Wildlife Refuge: 2015-2017. Supervised mist net and harp trap surveys of three portal entrances as an ongoing two-year study during fall swarming and spring emergence periods for Ozark big-eared, northern long-eared, and gray bats.

Field Supervisor – Atlantic Cost Pipeline LLC: 2015. Supervised collection and analysis of acoustic data at more than 800 sites along a natural gas pipeline in North Carolina and Virginia. Identified potential calls of Indiana and northern long-eared bats at numerous sites. Located a roost of Rafinesque's big-eared bats. Provided support in studies of Rafinesque's big-eared bats and southeastern myotis.

Field Supervisor – Marathon, Grayling Well Pad: 2015. Supervised collection and analysis of acoustic data at 4 acoustic monitoring stations for a proposed oil pad near Grayling Michigan.

Biologist – Indiana Department of Transportation, Interstate 69, Pre- and Post-construction Surveys: 2015. Conducted summer mist net survey for federally endangered Indiana and federally threatened northern long-eared bats along final ROW for Section 3, and potential ROW for section 6. Conducted quantitative (using programs) and qualitative (visual) analysis of bat calls collected during the project.

Team Leader – NEXUS Pipeline: 2015. Conducted summer mist net survey for federally endangered Indiana and federally threatened northern long-eared bats along a 250-mile pipeline in Michigan and Ohio.

Biologist – Confidential Clients: 2013 – 2015. Managed numerous environmental and natural resource projects and led multiple endangered and threatened bat ecological field surveys. Completed mist net and acoustic surveys including visual call analysis. Conducted field and desktop habitat assessments, collected and interpreted soil and groundwater data and assisted with wetland delineations. Coordinated with government and private agencies and conducted NEPA evaluations.

Research Assistant – Missouri State University: 2011 – 2013. Collected and cataloged bat echolocation calls recorded during acoustic monitoring and performed visual analyses to test the accuracy of software programs Kaleidoscope and Bat Call Identifier (BCID). Led efforts for construction of artificial bat roosts used for habitat mitigation and conservation purposes. Performed mist net surveys and identified Missouri bats species. Completed post-construction mortality surveys.

Biologist – Missouri Department of Conservation: 2011 – 2012. Conducted spawning and rearing efforts for state protected fish species. Conducted water quality monitoring for potential waste runoff in local watersheds.

Biologist – NWO Inc.: 2010 – 2011. Collected, identified, and analyzed catch and bi-catch data from commercial fishing vessels in the Bering Sea. Conducted viability assessments, population densities and volumetric estimations of marine organisms including protected and prohibited species.

PROFESSIONAL AFFILIATIONS

The Wildlife Society
Southeastern Bat Diversity Network
Midwest Bat Working Group
Ohio Bat Working Group



ENVIRONMENTAL SOLUTIONS & INNOVATIONS, INC.

Résumé

Lynn W. Robbins, Ph.D.

EDUCATION

Ph.D., Biology, Texas Tech University, 1983. Dissertation: "Evolutionary Relationships in the Family Emballonuridae (*Chiroptera*)"

M.S., Biology, Fort Hays State University, 1978. Thesis: "Nongeographic and Interspecific Variation in Four Species of *Hylomyscus* (*Rodentia: Muridae*) in Southern Cameroon"

B.S., Zoology, Long Beach State University, 1967.

QUALIFICATIONS AND EXPERIENCE

Dr. Robbins is a wildlife biologist involved in a variety of terrestrial ecology research positions and has extensively studied bats and their habitat. Many of Dr. Robbins' projects concern federally endangered Indiana bats (*Myotis sodalis*) and the northern long-eared bat (*M. septentrionalis*). He is experienced in many ecological field techniques, including: species identification, habitat assessment, trapping, netting, radio-telemetry and tracking, guano analysis, and GPS/GIS, mapping and orientation. Dr. Robbins is an expert in acoustic sampling analysis and has hosted Robbins Invitational Workshop that includes topics on recognition of false-positives during presence/probable absence surveys, comparison of error rates and types among three candidate software packages, addressing problem identifications, simultaneous comparison of multiple acoustic monitoring instruments, and ethical considerations of biological consulting.

Dr. Robbins is an experienced public speaker, having taught university-level courses, presented educational lectures to the public, and presented technical papers to professional organizations. He also authored and co-authored numerous papers and presentations.

PROJECT EXPERIENCE

Project Manager – U.S. Fish and Wildlife Service, Ozark Plateau National Wildlife Refuge: 2015-2017. Supervised mist net and harp trap surveys of three portal entrances as an ongoing two-year study during fall swarming and spring emergence periods for Ozark big-eared, northern long-eared, and gray bats.

Team Leader – Arkansas Highway Transportation Department, Bridge Replacements along Highway 7: 2015. Supervised and conducted summer mist net and acoustic surveys for federally endangered Indiana, federally endangered gray, and federally threatened northern long-eared bats at two bridge sites in Perry County. Captured three northern long-eared bats and tracked one to a roosting area. Coordinated with the client and multiple other state and federal agencies including the Arkansas Game and Fish Commission, U.S. Fish and Wildlife Service, and U. S. Forest Service. Prepared and submitted final report.

Team Leader – Talawanda Transmission Line: 2015. Supervised and conducted mist net surveys for federally threatened northern long-eared bats along a proposed 15-kilometer transmission line in Pittsburg County, Oklahoma.

Biologist – Confidential Client: 2015. Supervised and completed quantitative and qualitative acoustic analyses for three projects in Cherokee, Muskogee, and Wagoner counties in Oklahoma. Qualitatively identified northern long-eared bats in Cherokee County.

Field Supervisor – Kansas Department of Transportation (KDOT), Five Projects: 2015. Assisted KDOT in understanding their regulatory requirements under the Endangered Species Act as it related to the northern long-eared bat, newly-listed as a threatened species. Supervised rapid collection and analysis of acoustic data in five different counties within 7-day period to ensure survey completion within the USFWS-mandated survey window.

Field Supervisor – Kansas Department of Health and Environment (KDHE): 2015. Assisted KDHE in regulatory compliance under Section 7 of the Endangered Species Act as it related to gray and northern long-eared bats. Collected and analyzed acoustic data at sites in southeast Kansas.

Biologist – Confidential Client, Kansas Expressway Expansion: 2015. Assisted a client in understanding regulatory requirements under the Endangered Species Act relative to a highway expansion project. Supervised collection and analysis of acoustic data at sites near Springfield, Missouri.

Team Leader – NextEra Wind Energy Site: 2015. Supervised and conducted mist net surveys for summer bats including the federally threatened northern long-eared bat and federally endangered Indiana Bat at a proposed wind energy site in Osborn County, Missouri.

Biologist – Atlantic Cost Pipeline LLC: 2015. Conducted qualitative review of potential calls of Indiana and northern long-eared bats at numerous sites in North Carolina and Virginia.

Biologist – Environmental Consulting, Confidential Client Transmission Line: 2014. Completed acoustic monitoring and mist-net survey in Webster and Dallas counties, Missouri.

Biologist – U.S. Army Corps of Engineers: 2014. Completed acoustic and mist-net survey on the Mississippi and Illinois Rivers in St. Charles, Lincoln, and Pike counties, Missouri, and Calhoun and Greene Counties, Illinois.

Biologist – Environmental Consulting, Confidential Client: 2014. Completed an endangered bat survey at a new Missouri State Park in Shannon County, Missouri.

Biologist – Missouri National Guard: 2013, 2014. Completed acoustic and mist-net surveys for endangered bats at the Camp Crowder Training Site in Newton County, Missouri.

Biologist – Confidential Client, Natural Gas Pipeline: 2013. Completed mist net survey to establish presence and demography of Indiana bats and subsequent radio-tracking to determine roost locations in Ralls, Monroe, and Randolph counties, Missouri.

Biologist – Sho-Me-Power Electric Cooperative, Transmission Line. 2012 and 2014. Completed endangered bat surveys in Webster County, West Virginia.

Biologist – Confidential Client, Wind Energy Site: 2011. Prepared Habitat Conservation Plan/Incidental Take Permit and completed Indiana bat surveys in Schuyler County, Missouri.

Biologist – Confidential Client, Wind Farm Facility: 2009-2010. Completed mist-net and acoustic surveys for Indiana bats in Schuyler County, Missouri.

Biologist – Sho-Me Power Electric Cooperative. 2010. Completed habitat suitability assessment and presence/absence surveys for Indiana bats in Franklin and Washington counties, Missouri.

Biologist – Missouri National Guard: 2010. Completed acoustic monitoring and mist-net survey for endangered bats at the Wappapello Training Site in Benton County, Missouri.

Biologist – Missouri National Guard: 2010. Completed acoustic monitoring and mist-net surveys for endangered bats at the Macon Training Site in Macon County, Missouri.

Biologist – National Park Service: 2009-2012. Completed Indiana bat summer habitat assessment use to inform adaptive management actions at Ozark National Scenic Riverways in Shannon, Carter, Dent, and Texas counties, Missouri.

Biologist – Confidential Client, Wind Energy Site: 2009-2010. Studied and recorded Indiana bat activity using telemetry and acoustic detectors in two counties in northern Missouri.

Biologist – Confidential Client, Wind Energy Site: 2008. Completed Habitat assessment and recorded bat activity in Atchison County, Missouri.

Biologist – Confidential Client, Wind Energy Site: 2008-09. Completed presence/absence survey and determined activity of Indiana bats in Nodaway County, Missouri.

Biologist – Missouri Department of Conservation, Natural Resources: 2007-2008. Completed study of winter ecology and the effects of fire on bats in southern Missouri.

Biologist – Confidential Client: 2007-2008. Completed analysis of anabat detector call sequences for Nodaway County, Missouri.

Biologist – Confidential Client: 2007. Completed presence/absence survey of Indiana bats in Nodaway County, Missouri.

Biologist – Confidential Client: 2007. Completed presence/absence survey of Indiana bats, and determined the activity levels of Indiana bats and other species in Adair, and Sullivan counties, Missouri.

Biologist – Missouri National Guard: 2006. Completed acoustic surveys for bats with emphasis on endangered bats at Camp Crowder and Camp Clark in Newton and Vernon counties, Missouri.

Biologist – National Park Service: 2003-2004. Completed inventory of distribution, composition, and reproductive success of bats in George Washington Carver and Wilson's Creek National Parks, Missouri, Tallgrass Prairie National Preserve, Kansas, Homestead National Monument, Nebraska, and Herbert Hoover National Historic Site, Iowa, and Hopewell Culture National Historic Park, Ohio.

Biologist – DOD through Kansas Biological Survey: 2002-2003. Completed a bat survey with emphasis on rare and endangered species at Fort Leavenworth in Kansas,

Biologist – Fish and Wildlife Service, Columbia Missouri Field office: 2001-2002. Completed study to determine an effective sampling protocol for Indiana bats, mist-nets vs. acoustic detectors.

Biologist – Missouri Department of Conservation: 2001-2002. Completed study of Indiana bat summer habitat use by the in northern Missouri.

Biologist – Bat Conservation International, Inc.: 2001. Studied competitive interactions between Indiana bats and other species in northern Missouri.

Biologist – SMSU Faculty Research Grant: 2001. Study completed for the summer habitat use by the endangered Indiana Bat and associated species in northern Missouri.

Biologist – North American Bat Conservation Partnership: 2002. Studied the use of artificial roosts by Indiana bats in northern Missouri.

SELECTED PUBLICATIONS

Taulman, J. F., Robbins, L. W. 2014. Range expansion and distributional limits of the nine-banded armadillo in the United States: an update of Taulman & Robbins (1996). *Journal of Biogeography*. doi: 10.1111/jbi.12319.

Stanley, W.T., L.W. Robbins, et al. 2013. A new hero emerges: another exceptional mammalian spine and its potential adaptive significance. *Biol Lett* 9:20130486. <http://dx.doi.org/10.1098/rsbl.2013.0486>.

Romeling, S.R., C.R. Allen, and L.W. Robbins. 2012. Acoustically Detecting Indiana Bats: How Long Does It Take? *Bat Research News*, 53: 51-58.

Allen, C.R., S.R. Romeling, and L.W. Robbins. 2011. Acoustic Monitoring and Sampling Technology. *Proceedings of Protecting threatened bats at coal mines: a technical interactive forum*. U.S. Dept. of Interior. 173-188.

Britzke, E.R., J. Duchamp, R.S. Swihart, K.M. Murray, and L.W. Robbins. 2011. Acoustic identification of bats in the eastern United States: A comparison of parametric and nonparametric methods. *J. Wildlife Management*. 75:660-667.

- Timpone, J.C., J.G. Boyles, D. Aubrey, and L.W. Robbins. 2010. Overlap in roosting habits of the Indiana bat (*Myotis sodalis*) and the northern bat (*Myotis septentrionalis*). *American Midland Naturalist*, 163:115-123.
- Boyles, J.G., J.C. Timpone, and L.W. Robbins. 2009. Bats of Missouri. Indiana State University Center for N.A. Bat Research and Conservation. No. 3: 60pp
- Robbins, L. W., K. L. Murray, and P. McKenzie. 2008. Evaluating the Effectiveness the Standard Mist Netting Protocol for the Endangered Indiana Bat (*Myotis sodalis*). *Northeastern Naturalist*.15:275-282
- Mormann, B., and L.W. Robbins. 2007. Winter Roosting Ecology of Eastern Red Bats in Southwest Missouri. *Journal of Wildlife Management*. 71:213-217
- Dunbar, M.B., J.O. Whitaker, Jr., and L.W. Robbins. 2007. Winter Feeding by Bats in Southwestern Missouri. *Acta Chiropterologica*. 9:305-310.
- Brack, V., Jr., C.R. Davis, and L.W. Robbins. 2007. Bats of Fort Leavenworth Military Reservation and Nearby Ares of Eastern Kansas and Western Missouri. *Kansas Academy of Science* Pp. 73-82
- Kolaks, J. and L Robbins. 2007. Missouri's Winter Bats. *Missouri Conservationist*, 68:14-19.
- Boyles, J.G., and L.W. Robbins. 2006. Characteristics of Summer and Winter Roost Trees of Evening Bats (*Nycticeius humeralis*) in Southwestern Missouri. *American Midland Naturalist*, 155:210-220.
- Timpone, J.C., J.G. Boyles, and L.W. Robbins. 2006. Potential for niche-overlap in roosting sites between evening bats (*Nycticeius humeralis*) and big brown bats (*Eptesicus fuscus*). *Northeastern Naturalist*. 13:597-602.
- Boyles, J.G., B. Mormann, and L.W. Robbins. 2005. Use of a Subterranean Winter Roost by a Male Evening Bat (*Nycticeius humeralis*).*Southeastern Naturalist*, 4(2):375-377.
- Davis, C.R., F. B. Stangl, Jr., and L.W. Robbins. 2005. Mammals of Fort Leavenworth, Kansas: A 60-Year Followup to Brumwell (1951). *The Prairie Naturalist* 37(2):101-116.
- Mormann, B., M. Milam, and L. Robbins. 2004. Hibernation: Red Bats Do It In The Dirt. "Bats", the official publication of Bat Conservation International. 22(2):6-9.
- Boyles, J.G., J.C. Timpone, and L.W. Robbins. 2003. Winter Records and Notes on the Roosting Ecology of Red Bats, *Lasiurus borealis* and Evening Bats, *Nycticeius humeralis* in Missouri. *Bat Research News*, 44:59-61.
- Britzke, E. R., and L. W. Robbins. 2002. Distribution of the Eastern Woodrat, *Neotoma floridana*, in Missouri. *The Southwestern Naturalist*. 47:125-127.
- Britzke, E. R., K. L. Murray, J. E. Heywood, and L. W. Robbins. 2002. Acoustic Identification. In *The Indiana Bat: Biology and Management of an Endangered Species* (A. Kurta and J. Kennedy, eds) Bat Conservation International, Austin, Texas.

- Murray, K. L., E. R. Britzke, and L. W. Robbins. 2001. Variation in Search-Phase Calls of Bats. *J. Mammalogy*, 82:728-737.
- Britzke, E. R., K. L. Murray, B. M. Hadley, and L. W. Robbins. 1999. Measuring Bat activity with the Anabat II System. *Bat Research News*, 40:1-3.
- Murray, K. L., E. R. Britzke, B. M. Hadley, and L. W. Robbins. 1999. Surveying Bat Communities: A Comparison Between Mist Nets and the Anabat II Detector System. *Acta Chiropterologica*. 1(1):105-112.
- Ebola Virus Study Team. 1999. A search for Ebola Virus in Animals in the Democratic Republic of the Congo and Cameroon: Ecologic, Virologic, and Serologic Surveys, 1979-1980. *The Journal of Infectious Diseases*. 1999:179 (supplement 1):S139-147.
- Robbins, L. W., and E. R. Britzke. 1999. Discriminating *Myotis sodalis* from *Myotis lucifugus* with Anabat--a Critique. *Bat Research News*, 40:75-76.

PRESENTATIONS

- Hale, B., and L. W. Robbins. 2012. Comparison of Methods to Estimate Home Range of *Myotis sodalis*. The North American Symposium on Bat Research, San Juan, Puerto Rico.
- Robbins, L. W. 2012. How Good are Mathematical Algorithms and Statistical Probabilities in the Identification of Species Specific Call Sequences. The North American Symposium on Bat Research, San Juan, Puerto Rico.
- Allen, C. R., S. Romeling, and L. W. Robbins. 2012. Acoustically Detecting Indiana Bats: How long does it take? Midwestern Bat Working Group, Terre Haute, IN.
- Robbins, L.W. 2012. Wind, Wings and White-Nose Syndrome. Ozark Summit, Springfield, MO. Keynote Address.
- Allen, R., S. Romeling, and L. Robbins. 2010. Acoustic Sampling: A Comparison of Detectors and Automated Software. Annual Meeting, North American Society for Bat Research, Denver, 27 – 30 October.
- Allen, R., and L. Robbins. 2010. Efficient Repeatable Approach to Echolocation Call Identification. Bi-annual Meeting, Ozark Summit, Tahlequah, 19 – 21 October.
- Robbins, L., R. Allen, and S. Romeling. 2010. Acoustic Monitoring and Sampling Technology. Annual Meeting, Bats and Mines, Charleston, 31 September – 01 October.
- Lemen, J., and L. Robbins. 2010. Modeling Indiana Bat Maternity Roost and Capture Site Habitat. Annual Meeting, North American Society for Bat Research, Denver, 27 – 30 October.
- Dey, S. N. and L. W. Robbins. 2009. Roost Tree Selection and Roost Fidelity of the Female Indiana Bat (*Myotis sodalis*) in N. Missouri. North American Symposium on Bat Research, Portland, Oregon.

Robbins, L.W. 2009. Protocol for Determining the Presence or Absence of Indiana Bats: Does One Size Fit All? North American Symposium on Bat Research, Portland, OR.

PROFESSIONAL AFFILIATIONS

American Society of Mammalogists
The Wildlife Society
North American Society for Bat Research
Central Plains Society of Mammalogists
S.E. Bat Diversity Network

**APPENDIX B
DATA SHEETS**





2015

Property of: Environmental Solutions & Innovations, Inc.
4525 Este Avenue, Cincinnati, OH 45232 (Phone: 513-451-1777)

HABITAT ASSESSMENT

Project #: 683 Date: Aug 6, 2015 State: MO County: GREENE
Project Name: KSEXPWY Site Name#: KSEXPWY USGS Quad: _____
Permitted Biologist: Lynn Robbins Other Field Staff: Ben Spitz State Permit #: _____
(full name) (full name) Federal Permit #: _____

Net/Trap/ Detector	Net/Trap/ Detector #	Latitude	Longitude	Picture #	Waypoint #
ES1801	SMS410	37° 07' 41.45" N	93° 19' 03.64" W	104-0244	
		"N	"W		
		"N	"W		
		"N	"W		

Distance to closest water source (meters): 10 Type of water source: streamWater source name: unmarked

ESTIMATED WATER SOURCE CHARACTERISTICS (IF UNDER NETS OR DETECTOR):

Bank Height: _____ meters Channel Width: _____ meters Stream Width: _____ meters

Substratum: _____ Bedrock _____ Boulder _____ Cobble _____ Gravel _____ Sand _____ Silt/Clay

Still Water Present (Y/N): _____ Average Water Depth: _____ m or cm Clarity (H,M,L): _____

VEGETATION:

Dominant Canopy Species (> 40 cm/16" dbh)

Oak
walnut
willow

Subdominant Canopy Species (< 40 cm/16" dbh)

chestnut

Estimated dbh range: Lg: _____ Sm: _____

Estimated dbh range: Lg: _____ Sm: _____

Relative abundance of dominant vs. subdominant (ratio): _____

Estimated canopy closure: _____ Closed ☒ Moderate _____ OpenRoost tree potential consists of: ☒ Large Trees _____ Snags _____ NeitherRoost tree potential for the area is: _____ High ☒ Moderate _____ Low

Roost potential comments: _____

Subcanopy clutter: _____ Closed ☒ Moderate _____ OpenSubcanopy comprised largely of: ☒ Lower Branches of Canopy Trees ☒ Saplings _____ Shrubs

Common Subcanopy Species: _____

Habitat Description: Stream side with aquatic plants

Check all that apply:

<input type="checkbox"/> Mature Upland Forest	<input type="checkbox"/> Recently Logged Forest	<input type="checkbox"/> Crop/Pasture Land	<input type="checkbox"/> Other _____
<input type="checkbox"/> Young Upland Forest	<input checked="" type="checkbox"/> Forest Edge	<input checked="" type="checkbox"/> Stream/River	_____
<input type="checkbox"/> Mature Lowland Forest	<input type="checkbox"/> Woodlot	<input type="checkbox"/> Vernal Pool	_____
<input type="checkbox"/> Young Lowland Forest	<input type="checkbox"/> Old Field	<input type="checkbox"/> Deepwater Lake/Pond	_____

Herbaceous Cover: _____ Sparse ☒ Moderate _____ Dense



2015

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HABITAT ASSESSMENT (continued)

Project #: *KS EXPWY* State/County: *MO Greene* Site Name/#: *1* Initials: *LWR*

SKETCH NETS and/or DETECTORS



paved path



stream



LEGEND

Net: ● — ●

Detector:

COMMENTS

220



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HABITAT ASSESSMENT

Project #: 683 Date: Aug 6, 2015 State: MO County: GREENE
 Project Name: RSEVPMY Site Name#: RSEVPMY 2 USGS Quad: _____
 Permitted Biologist: Lynn Robbins Other Field Staff: Ben Spitz State Permit #: _____
 (full name) (full name) Federal Permit #: _____

Net/Trap/ Detector	Net/Trap/ Detector #	Latitude	Longitude	Picture #	Waypoint #
<u>ES1602</u>	<u>SD*25</u>	<u>37° 07' 41.19" N</u>	<u>83° 19' 03.06" W</u>	<u>104-0206</u>	<u>KE02</u>
		"N	"W		
		"N	"W		
		"N	"W		

Distance to closest water source (meters): _____ Type of water source: _____

Water source name: _____

ESTIMATED WATER SOURCE CHARACTERISTICS (IF UNDER NETS OR DETECTOR):

Bank Height: _____ meters Channel Width: _____ meters Stream Width: _____ meters

Substratum: _____ Bedrock _____ Boulder _____ Cobble _____ Gravel _____ Sand _____ Silt/Clay

Still Water Present (Y/N): _____ Average Water Depth: _____ m or cm Clarity (H,M,L): _____

VEGETATION:

Dominant Canopy Species (> 40 cm/16" dbh)

Oak
Willow

Subdominant Canopy Species (< 40 cm/16" dbh)

hackberryEstimated dbh range: Lg: 18 Sm: 16Estimated dbh range: Lg: 15 Sm: 3

Relative abundance of dominant vs. subdominant (ratio): _____

Estimated canopy closure: ☒ Closed ☐ Moderate ☒ OpenRoost tree potential consists of: ☒ Large Trees ☒ Snags ☐ NeitherRoost tree potential for the area is: ☐ High ☒ Moderate ☐ Low

Roost potential comments: _____

Subcanopy clutter: ☐ Closed ☒ Moderate ☒ OpenSubcanopy comprised largely of: ☐ Lower Branches of Canopy Trees ☐ Saplings ☒ Shrubs

Common Subcanopy Species: _____

Habitat Description: Shrubby open area next to forest edge and stream

Check all that apply:

☐ Mature Upland Forest ☐ Recently Logged Forest ☐ Crop/Pasture Land ☐ Other _____
☐ Young Upland Forest ☒ Forest Edge ☒ Stream/River _____
☐ Mature Lowland Forest ☐ Woodlot ☐ Vernal Pool _____
☐ Young Lowland Forest ☐ Old Field ☐ Deepwater Lake/Pond _____

Herbaceous Cover: ☐ Sparse ☒ Moderate ☐ Dense



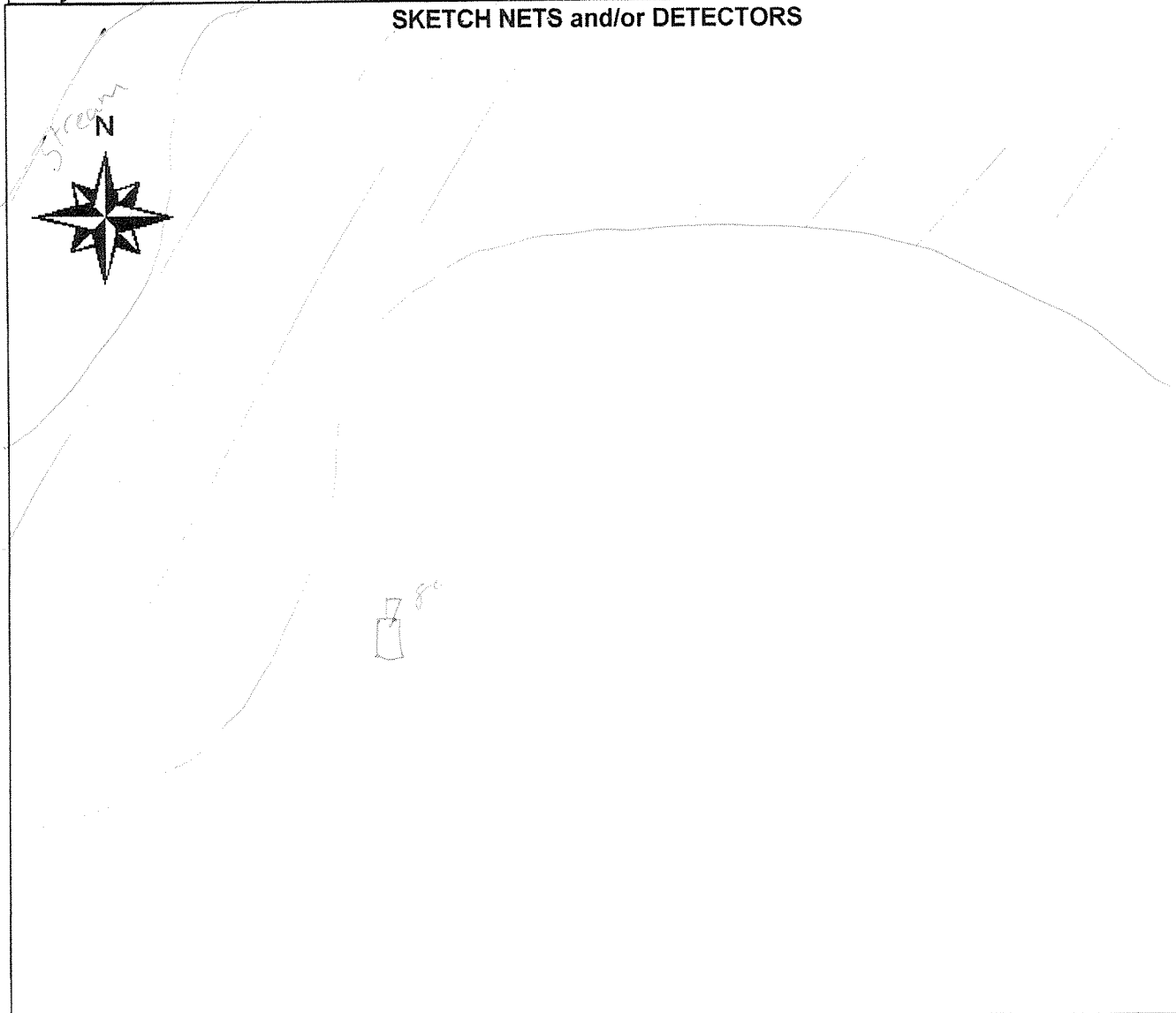
2015

Property of: Environmental Solutions & Innovations, Inc.
4525 Este Avenue, Cincinnati, OH 45232 (Phone: 513-451-1777)

HABITAT ASSESSMENT (continued)

Project #:	State/County: <i>MO, Greene</i>	Site Name/ #: <i>K&E Hwy 2</i>	Initials: <i>LR</i>
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SKETCH NETS and/or DETECTORS



LEGEND

Net: ● — ●

Detector:

tree line

COMMENTS



2015

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HABITAT ASSESSMENT

Project #: 683 Date: Aug. 6, 2015 State: MO County: GREENE
 Project Name: RSEXPWV Site Name/ID: RSEXPWV 3 USGS Quad: _____
 Permitted Biologist: _____ Other Field Staff: _____ State Permit #: _____
 (full name) (full name) Federal Permit #: _____

Net/Trap/ Detector	Net/Trap/ Detector #	Latitude	Longitude	Picture #	Waypoint #
ESI03	SD2 M	37° 07' 41.75" N	93° 19' 02.1" W		
		° ' " N	° ' " W		
		° ' " N	° ' " W		
		° ' " N	° ' " W		

Distance to closest water source (meters): _____ Type of water source: _____

Water source name: _____

ESTIMATED WATER SOURCE CHARACTERISTICS (IF UNDER NETS OR DETECTOR):

Bank Height: _____ meters Channel Width: _____ meters Stream Width: _____ meters

Substratum: _____ Bedrock _____ Boulder _____ Cobble _____ Gravel _____ Sand _____ Silt/Clay

Still Water Present (Y/N): _____ Average Water Depth: _____ m or cm Clarity (H,M,L): _____

VEGETATION:

Dominant Canopy Species (> 40 cm/16" dbh)

Oak
Walnut

Subdominant Canopy Species (< 40 cm/16" dbh)

WillowEstimated dbh range: Lg: 20 Sm: 16Estimated dbh range: Lg: 15 Sm: 9

Relative abundance of dominant vs. subdominant (ratio): _____

Estimated canopy closure: ☒ Closed ☐ Moderate ☐ OpenRoost tree potential consists of: ☒ Large Trees ☒ Snags ☐ NeitherRoost tree potential for the area is: ☒ High ☒ Moderate ☐ Low

Roost potential comments: _____

Subcanopy clutter: ☐ Closed ☒ Moderate ☐ OpenSubcanopy comprised largely of: ☐ Lower Branches of Canopy Trees ☒ Saplings ☒ ShrubsCommon Subcanopy Species: PrunellaHabitat Description: Open field with grass path next to forest edge

Check all that apply:

☐ Mature Upland Forest ☐ Recently Logged Forest ☐ Crop/Pasture Land ☐ Other _____
☐ Young Upland Forest ☒ Forest Edge ☒ Stream/River _____
☒ Mature Lowland Forest ☐ Woodlot ☐ Vernal Pool _____
☒ Young Lowland Forest ☒ Old Field ☐ Deepwater Lake/Pond _____

Herbaceous Cover: ☒ Sparse ☐ Moderate ☐ Dense



2015

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HABITAT ASSESSMENT (continued)

Project #: KSEXPWY	State/County: MO/Greene	Site Name/ #: KSEXPWY 3	Initials: LWR
SKETCH NETS and/or DETECTORS			
LEGEND	COMMENTS		
Net: ● — ●			
Detector:			
steering:			



2015

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HABITAT ASSESSMENT

Project #: 687Date: Aug. 6, 2015State: MOCounty: GreeneProject Name: KSEXPVSite Name#: KSEXPV 4

USGS Quad: _____

Permitted Biologist: Lynn Robison
(full name)Other Field Staff: B. Spitz
(full name)

State Permit #: _____

Federal Permit #: _____

Net/Trap/ Detector	Net/Trap/ Detector #	Latitude	Longitude	Picture #	Waypoint #
ESI 07	JN5408	37° 07' 42.27"N	93° 09' 02.56"W		REC4
		° ' "N	° ' "W		
		° ' "N	° ' "W		
		° ' "N	° ' "W		

Distance to closest water source (meters): 2Type of water source: CreekWater source name: unnamed

ESTIMATED WATER SOURCE CHARACTERISTICS (IF UNDER NETS OR DETECTOR):

Bank Height: _____ meters Channel Width: _____ meters Stream Width: _____ meters

Substratum: _____ Bedrock _____ Boulder _____ Cobble _____ Gravel _____ Sand _____ Silt/Clay

Still Water Present (Y/N): _____ Average Water Depth: _____ m or cm Clarity (H,M,L): _____

VEGETATION:

Dominant Canopy Species (> 40 cm/16" dbh)

Subdominant Canopy Species (< 40 cm/16" dbh)

elm
willow
Hicory
Walnut

Estimated dbh range: Lg: 22 Sm: 17Estimated dbh range: Lg: 12 Sm: 6Relative abundance of dominant vs. subdominant (ratio): 1:6

Estimated canopy closure: _____ Closed _____ Moderate _____ Open

Roost tree potential consists of: _____ Large Trees _____ Snags _____ Neither

Roost tree potential for the area is: _____ High _____ Moderate _____ Low

Roost potential comments: _____

Subcanopy clutter: _____ Closed _____ Moderate _____ Open

Subcanopy comprised largely of: _____ Lower Branches of Canopy Trees _____ Saplings _____ Shrubs

Common Subcanopy Species: DrumHabitat Description: forest edge next to stream

Check all that apply:

____ Mature Upland Forest _____ Recently Logged Forest _____ Crop/Pasture Land _____ Other _____

____ Young Upland Forest _____ Forest Edge _____ Stream/River _____

____ Mature Lowland Forest _____ Woodlot _____ Vernal Pool _____

____ Young Lowland Forest _____ Old Field _____ Deepwater Lake/Pond _____

Herbaceous Cover: _____ Sparse _____ Moderate _____ Dense



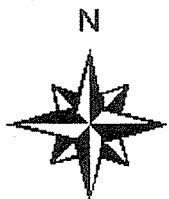
2015

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HABITAT ASSESSMENT (continued)

Project #: 687 State/County: Site Name/ #: H-SEX-2074 Initials: LWR

SKETCH NETS and/or DETECTORS



Stream

1450

grass path

LEGEND

Net:



Detector:



Free line



COMMENTS



2015

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HABITAT ASSESSMENT

Project #: 683Date: Aug 6, 2015State: MO County: GREENEProject Name: KSEXPWYSite Name/#: KSEXPWY 5

USGS Quad: _____

Permitted Biologist: LYNN RUBBIN
(full name)Other Field Staff: B SPITZ
(full name)

State Permit #: _____

Federal Permit #: _____

Net/Trap/ Detector	Net/Trap/ Detector #	Latitude	Longitude	Picture #	Waypoint #
<u>SD1B</u>	<u>SD2R</u>	<u>37° 07' 37.65" N</u>	<u>93° 19' 02.02" W</u>		<u>Keos</u>
		"N	"W		
		"N	"W		
		"N	"W		

Distance to closest water source (meters): _____ Type of water source: _____

Water source name: _____

ESTIMATED WATER SOURCE CHARACTERISTICS (IF UNDER NETS OR DETECTOR):

Bank Height: _____ meters Channel Width: _____ meters Stream Width: _____ meters

Substratum: _____ Bedrock _____ Boulder _____ Cobble _____ Gravel _____ Sand _____ Silt/Clay

Still Water Present (Y/N): _____ Average Water Depth: _____ m or cm Clarity (H,M,L): _____

VEGETATION:

Dominant Canopy Species (> 40 cm/16" dbh)

Subdominant Canopy Species (< 40 cm/16" dbh)

Willow
OakWalnutEstimated dbh range: Lg: 25 Sm: 19Estimated dbh range: Lg: 14 Sm: 4Relative abundance of dominant vs. subdominant (ratio): 1:5

Estimated canopy closure: _____ Closed _____ Moderate _____ Open

Roost tree potential consists of: _____ Large Trees _____ Snags _____ Neither

Roost tree potential for the area is: _____ High _____ Moderate _____ Low

Roost potential comments: _____

Subcanopy clutter: _____ Closed _____ Moderate _____ Open

Subcanopy comprised largely of: _____ Lower Branches of Canopy Trees _____ Saplings _____ Shrubs

Common Subcanopy Species: PeachHabitat Description: Sparse trees with pond

Check all that apply:

____ Mature Upland Forest _____ Recently Logged Forest _____ Crop/Pasture Land _____ Other _____

____ Young Upland Forest _____ Forest Edge _____ Stream/River _____

____ Mature Lowland Forest _____ Woodlot _____ Vernal Pool _____

____ Young Lowland Forest _____ Old Field _____ Deepwater Lake/Pond _____

Herbaceous Cover: _____ Sparse _____ Moderate _____ Dense

2015

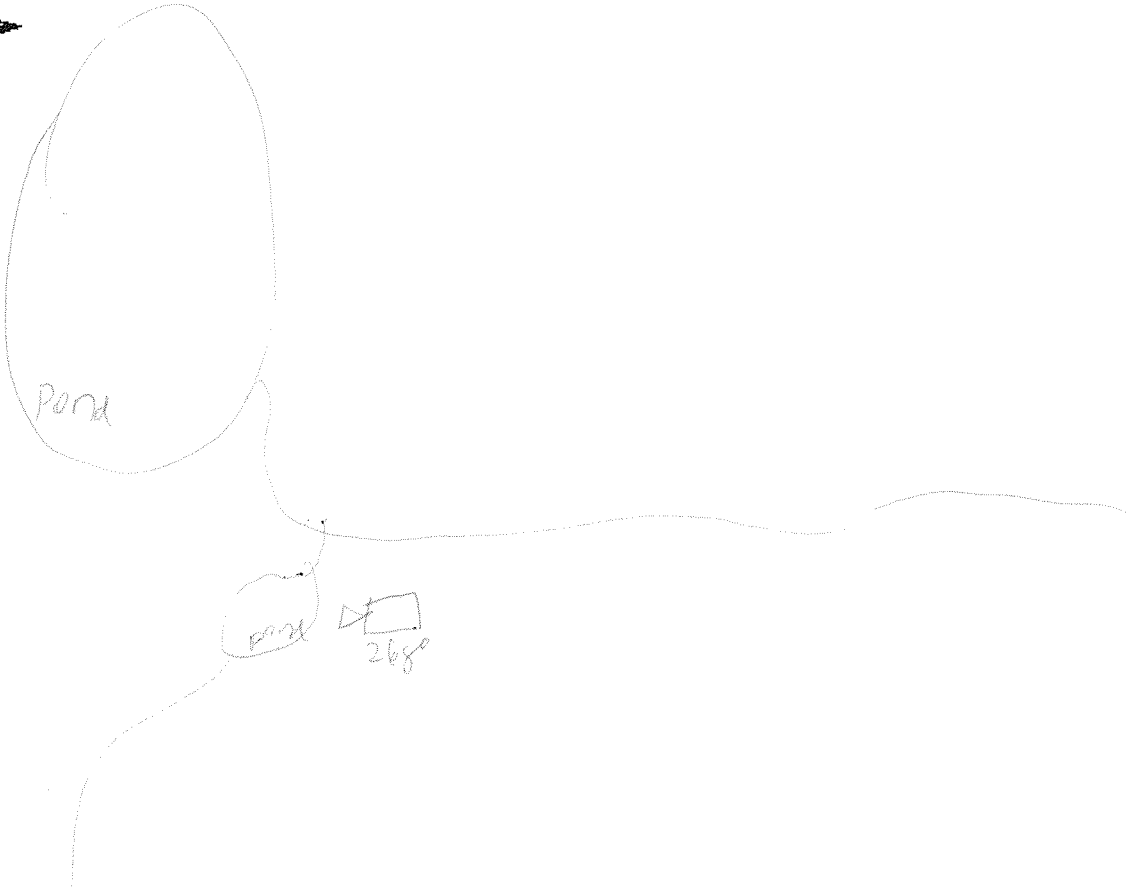
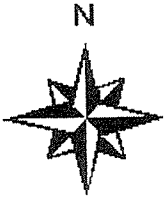
Property of: Environmental Solutions & Innovations, Inc.
4525 Este Avenue, Cincinnati, OH 45232 (Phone: 513-451-1777)



HABITAT ASSESSMENT (continued)

Project #: 683	State/County: MO/Greene	Site Name/ #: KSEXpwy 5	Initials: bwp
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SKETCH NETS and/or DETECTORS



LEGEND

Net: ● — ●

Detector: □

COMMENTS

268



2015

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HABITAT ASSESSMENT

Project #: 683 Date: Aug 6, 2015 State: MD County: GREENE
 Project Name: KS EXPWY Site Name/ID: KS EXPWY 6 USGS Quad: _____
 Permitted Biologist: LYNN ROBBINS Other Field Staff: _____ State Permit #: _____
 (full name) (full name) Federal Permit #: _____

Net/Trap/ Detector	Net/Trap/ Detector #	Latitude	Longitude	Picture #	Waypoint #
<u>C2</u>	<u>ES0096</u>	<u>37° 07' 35.83" N</u>	<u>93° 14' 03.28" W</u>	<u>104-0124</u>	<u>KR06</u>
		"N	"W		
		"N	"W		
		"N	"W		

Distance to closest water source (meters): 2 Type of water source: Stream
 Water source name: unnamed

ESTIMATED WATER SOURCE CHARACTERISTICS (IF UNDER NETS OR DETECTOR):

Bank Height: _____ meters Channel Width: _____ meters Stream Width: _____ meters
 Substratum: ___ Bedrock ___ Boulder ___ Cobble ___ Gravel ___ Sand ___ Silt/Clay
 Still Water Present (Y/N): _____ Average Water Depth: _____ m or cm Clarity (H,M,L): _____

VEGETATION:

Dominant Canopy Species (> 40 cm/16" dbh) Subdominant Canopy Species (< 40 cm/16" dbh)
Willow hickory
Oak
Hickory

Estimated dbh range: Lg: 27 Sm: 16 Estimated dbh range: Lg: 15 Sm: 10

Relative abundance of dominant vs. subdominant (ratio): 1:3

Estimated canopy closure: ___ Closed ☒ Moderate ___ Open
 Roost tree potential consists of: ☒ Large Trees ☒ Snags ___ Neither
 Roost tree potential for the area is: ☒ High ___ Moderate ___ Low
 Roost potential comments: _____

Subcanopy clutter: ___ Closed ☒ Moderate ___ Open
 Subcanopy comprised largely of: ☒ Lower Branches of Canopy Trees ___ Saplings ☒ Shrubs

Common Subcanopy Species: Podocarpus

Habitat Description: stream with edge trees

Check all that apply:

___ Mature Upland Forest ___ Recently Logged Forest ___ Crop/Pasture Land ___ Other _____
 ___ Young Upland Forest ☒ Forest Edge ☒ Stream/River _____
 ___ Mature Lowland Forest ___ Woodlot ☒ Vernal Pool _____
 ___ Young Lowland Forest ___ Old Field ___ Deepwater Lake/Pond _____


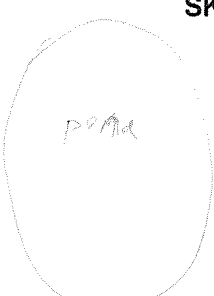



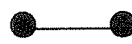


Herbaceous Cover: ___ Sparse ☒ Moderate ___ Dense



2015

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HABITAT ASSESSMENT (continued)

Project #: 683	State/County: MO, GREENE	Site Name/#: KSEXPY6	Initials: LWR
SKETCH NETS and/or DETECTORS			
<div style="display: flex; justify-content: space-around; align-items: flex-start;"><div style="text-align: center;"><p>N</p></div><div style="text-align: center;"><p>Pond</p></div><div style="text-align: center;"><p>Pond</p></div><div style="text-align: center;"><p>358°</p></div><div style="text-align: center;"><p>Stream</p></div></div>			
LEGEND		COMMENTS	
Net: 		<hr/> <hr/> <hr/> <hr/>	
Detector: 			
Tree line: 			

**APPENDIX C
PHOTOGRAPHS**



Acoustic Detector Site 01



Acoustic Detector Site 02



Acoustic Detector Site 03



Acoustic Detector Site 04



Acoustic Detector Site 05



Acoustic Detector Site 06

APPENDIX D
ACOUSTIC DATA: KALEIDOSCOPE AND BCID OUTPUT DETECTOR LOG FILES
(PROVIDED ELECTRONICALLY)

