Indiana Bat and Northern Long-Eared Bat Summer Presence/Absence Acoustic Surveys Big Blue River Wind Project Henry County, Indiana July 24 – August 9, 2016

Prepared for:

Calpine

717 Texas Avenue, Suite 1000
Houston, Texas 77002

Prepared by:

Kevin L. Murray, Kent Irwin, and Rebecca Schmitt

Western EcoSystems Technology, Inc.

408 West Sixth Street
Bloomington, Indiana 47404

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WEST Inc.

EXECUTIVE SUMMARY

Calpine is currently assessing the feasibility of developing the Big Blue River Wind Project (BBRWP) located in Henry County, Indiana. The BBRWP is within the range of both the federally endangered Indiana bat (*Myotis sodalis*; INBA) and federally threatened northern long-eared bat (*M. septentrionalis*; NLEB). Calpine contracted Western EcoSystems Technology, Inc. (WEST) to conduct bat acoustic surveys at the BBRWP during summer 2016. The principal objectives of the acoustic surveys were to: 1) determine the presence or probable absence of INBA and NLEB at the BBRWP during the summer, and 2) determine sites where follow-up mist-netting should be conducted. This report summarizes the results of the acoustic surveys conducted during summer 2016.

Acoustic surveys were completed at 28 acoustic survey sites (56 acoustic survey locations [two detector locations per site]), from July 24 to August 9, 2016, for a total of 117 detector-nights. Probable INBA or NLEB calls (p-value < 0.5) were identified by Kaleidoscope at 18 of 56 locations, including probable INBA calls at 14 locations and probable NLEB calls at four locations. One INBA call was confirmed by qualitative review at site 25 (location BBR 25a). Follow-up mist-netting was conducted at BBR 25a. One call at location BBR 1a was identified as a *Myotis* species call, and one call at location BBR 16b was an unidentified high-frequency call. Mist-netting was conducted at both of these locations at a presence/probable absence level (i.e., nine mist-net nights per site) to provide additional data to make final presence/probable absence determinations. Results of mist-net surveys at these three locations (BBR 25a, 1a, and 16b) will be provided in a separate report. No NLEB calls were confirmed by qualitative review at any site or location.

STUDY PARTICIPANTS

Western EcoSystems Technology, Inc.

Kevin Murray	Project Manager, Acoustic Analyst
Rebecca Schmitt	Project Coordinator, Technical Editor
Kent Irwin	Acoustic Analyst, Report Compiler
Kyle Ganow	Acoustic Crew Leader
Virginia Jaquish	Acoustic Crew Leader
Rachael Pruitt	Acoustic Technician

REPORT REFERENCE

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BACKGROUND AND PROJECT OVERVIEW

Calpine is currently assessing the feasibility of developing the Big Blue River Wind Project (BBRWP) located in east-central Indiana (Figure 1, the Project Area). Calpine contracted Western EcoSystems Technologies, Inc. (WEST) to assist with following the US Fish and Wildlife Service (USFWS) Land-Based Wind Energy Guidelines (WEG; USFWS 2012) to perform an analysis of risk to certain bat species. The WEG included tiered evaluations of risk to bats, beginning with the early stages of project development, and close coordination with the USFWS and state wildlife agencies. WEST performed a desktop “critical issues” Tier 1 analysis to identify the nature and expected significance of potential wildlife impact issues that could result from the development of the BBRWP. The Tier 1 analysis included information provided by the USFWS and Indiana Department of Natural Resources (IDNR) regarding wildlife resources within the Project Area.

The USFWS identified potential impacts to bats as a potential concern for the BBRWP. The Tier 1 analysis noted the Project Area occurred within the known range of the endangered Indiana bat (*Myotis sodalis*; INBA) and threatened northern long-eared bat (*M. septentrionalis*; NLEB), both of which are protected under the federal and Indiana Endangered Species acts. The Project Area contained potential summer habitat for the INBA and NLEB in the form of forested areas. WEST conducted acoustic surveys to determine if threatened or endangered bat species were present. The principal objectives of the acoustic surveys were to: 1) determine the presence or probable absence of INBA and NLEB within the Project Area during the summer, and 2) determine sites where follow-up mist-netting should be conducted. The Project Area is divided into geographic phases due to the large size and uneven distribution of suitable bat habitat within the Project Area (Figure 2). This report summarizes the results of acoustic surveys conducted during summer 2016 in the Southern Phase and Expansion Area of the Project Area.

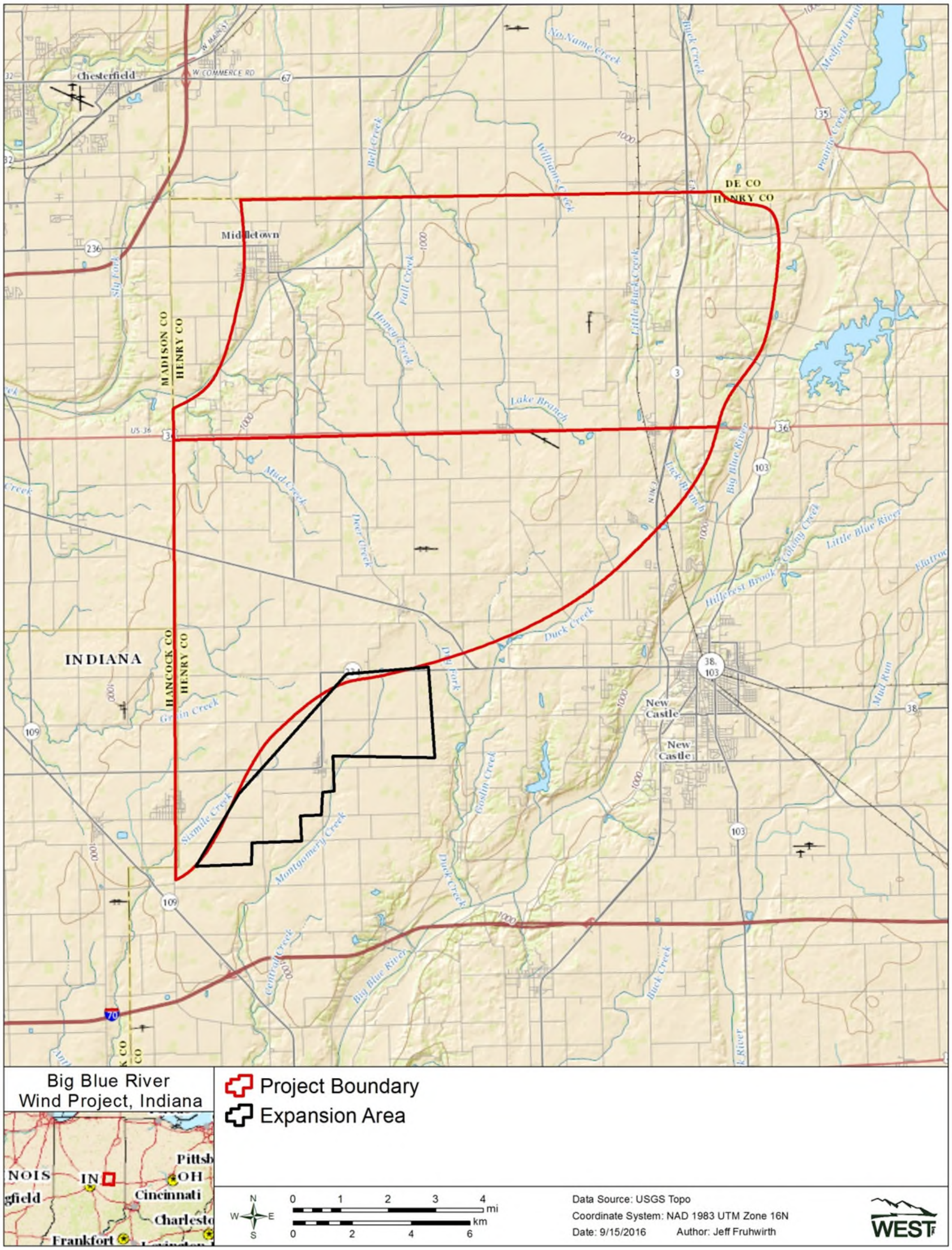

Figure 1. Location of the Big Blue River Wind Project boundary in Henry County, Indiana.

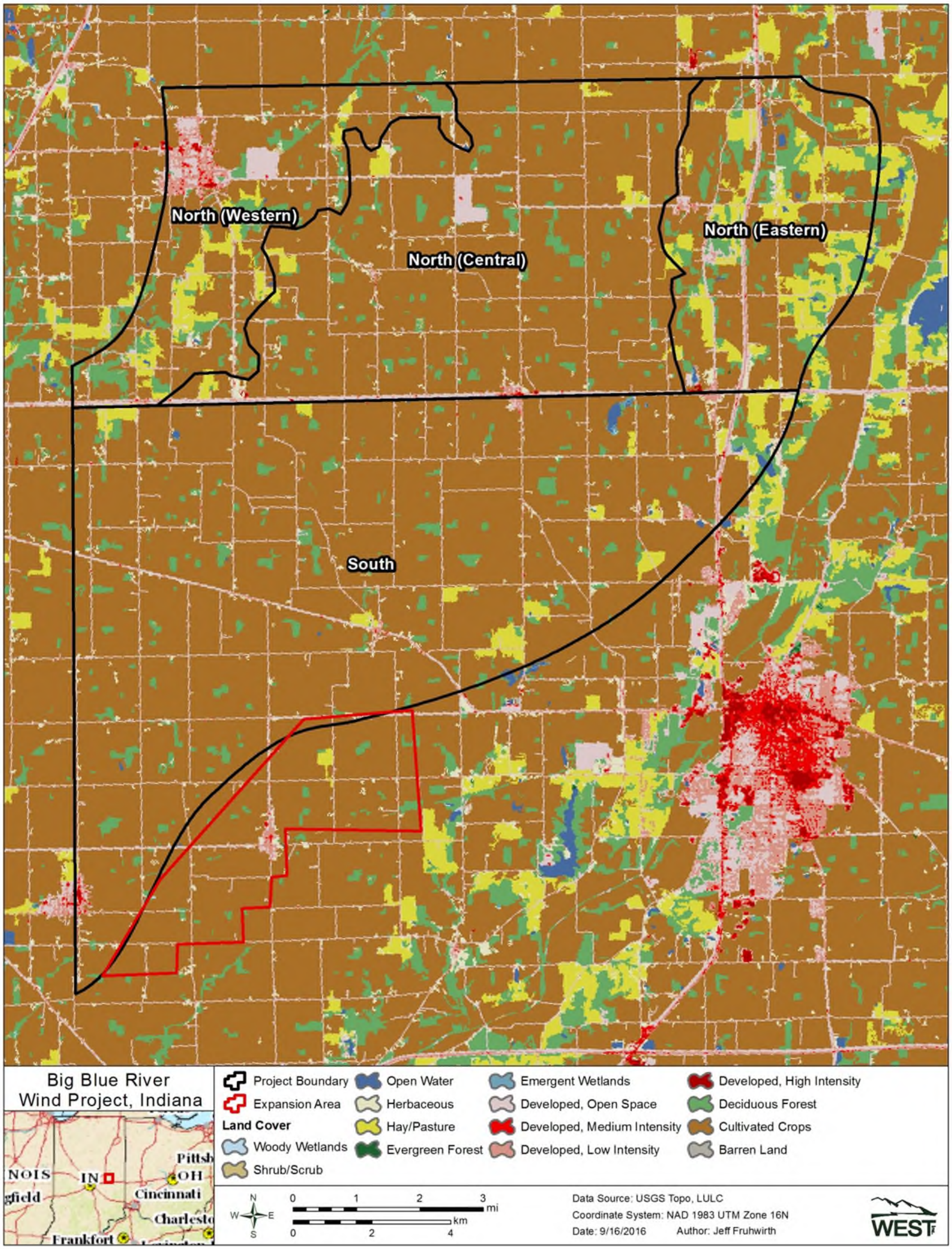

Figure 2. Project phases and landcover at the Big Blue River Wind Project in Henry County, Indiana.

METHODS

Acoustic surveys followed the 2016 Range-Wide Indiana Bat Summer Survey Guidelines (USFWS 2016). USFWS guidance called for NLEB surveys to adhere to INBA survey guidelines and recommended: 1) desktop habitat assessment, 2) acoustic presence/probable absence surveys, and 3) follow-up mist-net and telemetry surveys. The desktop habitat assessment showed there were 3,360 acres (ac; 14 square kilometers [km^2]) of potential forest habitat within the Southern Phase and Expansion Area (Table 1). USFWS recommends two detector locations per 123 acres of suitable INBA and NLEB habitat. Based on these recommendations and the amount of potential bat habitat present within the Project Area, the proposed survey effort for the BBRWP is 56 locations (28 sites with 2 locations per site).

Table 1. A summary of forested areas surveyed at the Big Blue River Wind Project in Henry County, Indiana, in 2016.

Phases	Total Size (Acres)	Acres of Forest	Proposed Survey Effort (Sites)
Southern	**34,517**	**3,009**	**25**
Expansion Area	**5,268**	**351**	**3**
Total	**39,785**	**3,360**	**28**

Acoustic Presence/Absence Surveys

Acoustic surveys were conducted between July 24 and August 9, 2016, following USFWS guidance (USFWS 2016). WEST conducted surveys at 28 sites with two survey locations at each site for a total of 56 acoustic survey locations. Each location was surveyed for at least two nights for a total of 117 detector-nights. Bats were surveyed using full spectrum Song Meter SM3 and SM4 detectors (Wildlife Acoustics, Inc.). Acoustic survey locations were selected by a permitted bat biologist (K.L. Murray). Acoustic survey sites were reviewed and approved by the USFWS prior to conducting surveys. WEST placed detectors in suitable habitat for INBA and NLEB, including forest edges, small clearings and forest-canopy openings, near water sources, and forested riparian edges. Detectors were placed in areas with open tree canopies or canopy heights greater than 33 feet (ft; 10 meters [m]) and were spaced at least 656 ft (200 m) apart. Detectors were elevated at least 9.8 ft. (3.0 m) above ground level (AGL) to minimize acoustic interference from vegetation. Detectors were programmed to record from sunset to sunrise each survey night.

If weather conditions such as persistent rain (more than 30 minutes), strong sustained winds (greater than nine miles per hour [mph] average for more than 30 minutes), or cold temperatures (below 10°C [50°F] for more than 30 minutes) occurred during the first five hours of a survey night, then that location was surveyed for an additional night unless target species were detected or bat activity was unaffected by weather conditions (USFWS 2016). For each acoustic survey location, the date, start and end time, site description, site coordinates, and weather data were recorded. Representative photographs of each acoustic survey location were taken.

Bat calls were quantitatively identified using the USFWS-approved Automated Acoustic Bat Identification Software Program (Kaleidoscope Pro, version 3.1.7, Wildlife Acoustics, Inc.). All probable calls identified as INBA or NLEB by automated identification software were reviewed by a qualified biologist with extensive acoustic identification experience (K.L. Murray). In addition, all calls recorded on nights with probable INBA or NLEB detections were reviewed. If call sequences were not characteristic of the INBA or NLEB, contained distinct calls produced by another species, or were of insufficient quality, they were reclassified.

Descriptions of average call parameters for INBA and NLEB are provided in Murray et al. (2001) and Britzke et al. (2011). INBA calls typically have a minimum frequency (Fmin) between 40 and 42 kilohertz (kHz) and minimum call slopes between 100 and 150 octaves per second (O/sec). Calls with Fmin values > 44 kHz are considered “high Fmin” and not diagnostic of INBA calls. Calls with minimum slope below 80 O/sec are considered “low slope” and not diagnostic of INBA calls. NLEB calls typically have high bandwidths (> 50 kHz) and high maximum frequencies (Fmax; > 90 kHz). Calls with bandwidth < 40 kHz are considered low bandwidth and are not diagnostic of NLEB. Calls with Fmax values below 80 kHZ are considered “low Fmax” and are not diagnostic of NLEB. The echolocation calls of INBA and NLEB are steep, frequency modulated calls with very little to no curvilinear call structure. Calls with pronounced curvilinear call structure are not diagnostic of either species.

The echolocation calls of *Myotis* species typically have a consistent Fmin within a call sequence (i.e., the Fmin values of individual pulses within a call sequence are relatively constant). However, Fmin values typically vary considerably within echolocation call sequences emitted by eastern red bats (*Lasiurus borealis*). Call sequences with variable Fmin values are considered “fluctuating Fmin” and are not diagnostic of *Myotis* species. Accurate bat call identification is dependent upon recording good quality, search-phase echolocation calls. Approach-phase or terminal-phase calls, clutter calls (i.e., calls recorded near vegetative clutter), and poor quality calls cannot be reliably identified (Britzke et al. 2002, 2013).

RESULTS

Acoustic surveys were completed at 28 acoustic survey sites (56 acoustic survey locations [two detector locations per site]), from July 24 to August 9, 2016, for a total of 117 detector-nights. Maps of the acoustic survey locations are included in Appendix A, and UTM coordinates and site descriptions for each location are listed in Table 2. Photographs of acoustic survey locations are included in Appendix B. to assess study conditions for compliance with USFWS guidance (USFWS 2016), weather was monitored using the New Castle Indiana weather station on Weather Underground’s Wundermap (http://www.wunderground.com/wundermap/).

A total of 25,507 calls were recorded and analyzed using Kaleidoscope. Of those calls, 131 were identified as potential INBA, and 42 calls were identified as potential NLEB. Kaleidoscope identified either INBA or NLEB calls, including probable and non-probable call identifications, at 41 acoustic survey locations (Table 2). Probable INBA or NLEB calls (maximum likelihood estimator [MLE] p-value < 0.5) were identified by Kaleidoscope at 18 locations, including probable INBA calls at 14 locations and probable NLEB calls at four locations (Table 3). A detailed qualitative analysis summary is provided in Table 4. One INBA call was confirmed by qualitative review at site 25 (location BBR 25a). Follow-up mist-netting was conducted at BBR 25a, and an INBA was captured. No INBA were confirmed at any other sites or locations. One call at location BBR 1a was identified as a *Myotis* species call, and one call at location BBR 16b was an unidentified high-frequency call. Mist-netting was conducted at both of these sites at a presence/probable absence level (i.e., nine mist-net nights per site) to provide additional data to make final presence/probable absence determinations. No INBA were captured at these two sites. No NLEB calls were confirmed by qualitative review at any site or location. Detailed results of mist-net surveys at these three sites will be provided in a separate report.

Table 2. Acoustic survey location coordinates, descriptions, and results of acoustic identification software from the 2016 Big Blue River Wind Project. Site where the presence of the Indiana bat (INBA; *Myotis sodalis*) was verified via qualitative analysis is highlighted.

Site ID	Easting	Northing	Acoustic Detector Site Description	Total Bat Calls	Calls Identified	Detector Nights	Calls/ Detector Night	COTO	EPFU	LABO	LACI	LANO	MYLU	MYSE*	MYSO*	NYHU	PESU	UNKN
BBR1a	627339	4427891	Riparian Edge	162	158	2	81.0		91	24	11	16	3	1	3	9		4
BBR1b	627415	4427506	Riparian Edge	264	260	2	132.0		140	83	7	13	5	1		11		4
BBR2a	627540	4428526	Forest Edge	217	217	2	108.5		72	68	29	15	3		1	28	1	0
BBR2b	627540	4428526	Forest Edge	204	196	2	102.0		96	66	3	9	1		2	18	1	8
BBR3a	633593	4427352	Forest Edge	968	940	2	484.0		547	173	50	61	2		1	104	2	28
BBR3b	633954	4427783	Forest Edge	236	227	2	118.0		145	43	15	9	3		1	10	1	9
BBR4a	636672	4427074	Forest Edge	342	331	2	171.0	1	197	78	4	9	5		4	32	1	11
BBR4b	636892	4426920	Forest Edge	300	286	2	150.0		134	109	5	19	4	1	1	13		14
BBR5a	625292	4420375	Forest Edge	449	439	2	224.5		211	115	46	24	5			35	3	10
BBR5b	624950	4420509	Forest Edge	271	263	2	135.5		184	58		6	3	1	1	10		8
BBR6a	631773	4422050	Forest Edge	264	254	2	132.0		105	87	8	12	3			36	3	10
BBR6b	631267	4422547	Forest Edge	275	259	2	137.5		87	112	5	17	18		2	17	1	16
BBR7a	630546	4424131	Forest Edge	796	767	2	398.0		411	166	25	21	2			141	1	29
BBR7b	630032	4424040	Forest Edge	616	612	2	308.0	1	440	131		6	9		2	23		4
BBR8a	631659	4425358	Forested Riparian	517	504	2	258.5	1	376	58	16	31	1		2	18	1	13
BBR8b	631751	4425071	Forest Clearing	230	227	2	115.0	1	124	43	18	9	1		1	30		3
BBR9a	634005	4424462	Forest Edge	1098	1074	2	549.0	1	331	519	16	24	21		5	154	3	24
BBR9b	634034	4424195	Pond	1176	1131	2	588.0	1	598	376	18	38	21	2	6	71		45
BBR10a	635406	4425462	Forest Edge	809	798	3	269.7		467	180	11	34		9	2	91	4	11
BBR10b	635856	4425670	Forest Clearing	526	482	2	263.0	2	226	130	5	51	6		1	57	4	44
BBR11a	635185	4424838	Forest Clearing	246	236	2	123.0		86	105	2	5	4	2	1	31		10
BBR11b	635841	4425367	Forest Clearing	597	571	2	298.5	3	480	36	8	34	1			9		26
BBR12a	628293	4426627	Forest Edge	311	303	2	155.5		226	32	16	21	3			5		8
BBR12b	628011	4426543	Riparian Edge	796	767	2	398.0	4	374	279	20	24	9	1		47	9	29
BBR13a	627779	4425270	Forest Edge	1155	1103	2	577.5		407	436	16	58	7	1	3	173	2	52
BBR13b	627731	4424873	Forest Edge	463	438	2	231.5		111	222	14	5	12	3	4	66	1	25
BBR14a	622182	4424390	Forest Edge	507	472	2	253.5	2	245	144	13	11	3			53	1	35
BBR14b	626210	4425277	Forest Edge	87	83	2	43.5		35	16	12	11				9		4
BBR15a	626223	4425076	Forest Edge	268	256	2	134.0		49	147	4	8	4			44		12
BBR15b	626210	4425277	Forest Edge	376	365	2	188.0		94	243		4	4		5	15		11
BBR16a	626362	4426250	Forest Clearing	80	78	2	40.0		46	23		5				4		2
BBR16b	626381	4426502	Forest Edge	443	429	2	221.5		256	106	14	24	5	1	2	21		14
BBR17a	627170	4423721	Forest Edge	637	596	2	318.5	1	165	295	43	15	9			67	1	41
BBR17b	626651	4423639	Field Clearing	239	233	2	119.5	1	90	77	4	12	3			46		6
BBR18a	630478	4426007	Forest Edge	556	543	2	278.0	1	280	156	16	36	3	1	1	49		13
BBR18b	631170	4426025	Forest Edge	238	234	2	119.0		156	44	10	10	1		1	11	1	4
BBR19a	638388	4426286	Forest Edge	833	807	3	277.7		413	202	49	73	10	1	1	55	3	26
BBR19b	638577	4426602	Forest Edge	1217	1196	3	405.7		680	375	6	37	19	4	2	73		21
BBR20a	636352	4429025	Pond	172	170	2	86.0		91	62	3	4	1		1	8		2

Table 2. Acoustic survey location coordinates, descriptions, and results of acoustic identification software from the 2016 Big Blue River Wind Project. Site where the presence of the Indiana bat (INBA; *Myotis sodalis*) was verified via qualitative analysis is highlighted.

Site ID	Easting	Northing	Acoustic Detector Site Description	Total Bat Calls	Calls Identified	Detector Nights	Calls/ Detector Night	COTO	EPFU	LABO	LACI	LANO	MYLU	MYSE*	MYSO*	NYHU	PESU	UNKN
BBR20b	636221	4429957	Forest Edge	330	324	3	110.0		193	88	2	24	4	2		10	1	6
BBR21a	624590	4425406	Forest Edge	281	273	2	140.5		87	119	12	9	7	1	3	32	3	8
BBR21b	624211	4425254	Forest Edge	281	266	2	140.5		158	61	7	12	7			20	1	15
BBR22a	624705	4427066	Forest Edge	553	540	2	276.5		244	194	21	16	7		1	57		13
BBR22b	624401	4426866	Forest Edge	281	266	2	140.5	2	88	120	2	12	4		2	34	2	15
BBR23a	622250	4425778	Pond	371	369	2	185.5		237	64	20	24				24		2
BBR23b	622717	4425481	Forest Edge	367	347	2	183.5		152	147	4	10	2	2	1	27	2	20
BBR24a	622909	4421752	Forest Edge	319	312	2	159.5		221	53	7	11	4		5	11		7
BBR24b	622154	4421180	Forest Edge	224	223	2	112.0		160	35	1	6				21		1
BBR25a	623703	4419774	Forest Edge	501	499	2	250.5	1	227	221		5	10	3	6	26		2
BBR25b	624110	4420047	Forest Edge	642	637	2	321.0	2	401	209		8	8		3	5	1	5
BBR26a	627473	4418719	Forest Edge	345	337	2	172.5		78	183		2	12	2	47	12	1	8
BBR26b	627482	4418350	Riparian Edge	564	554	2	282.0	2	337	145	3	20		1	3	43		10
BBR27a	629357	4419370	Forest Edge	492	489	3	164.0		288	99	31	38	5			28		3
BBR27b	628841	4419326	Forest Edge	233	231	2	116.5		108	95		5	4	1	1	16	1	2
BBR28a	623078	4420211	Forest Clearing	422	409	2	211.0		55	260	27	3	4		1	59		13
BBR28b	622463	4420369	Forest Edge	360	336	2	180.0		94	196	3	2	7	1	2	31		24
		Total		**25,507**	**24,717**	**117**	**218.0**	**27**	**12,394**	**7,908**	**682**	**1,028**	**299**	**42**	**131**	**2,150**	**56**	**790**

[1] = NAD 1983; Zone 17 S

Table 3. Results of the quantitative and qualitative analyses of acoustic bat calls of Indiana bat (INBA; *Myotis sodalis*) and northern long-eared bat (NLEB; *M. septentrionalis*) at the Big Blue River Wind Project. Kaleidoscope columns represent sites with probable NLEB or INBA calls ("Yes") and without probable NLEB or INBA calls ("No").

	Kaleidoscope Analysis		Qualitative Analysis	
Site ID	**NLEB**	**INBA**	**NLEB**	**INBA**
BBR1a	No	**Yes**	No	No
BBR1b	No	No	No	No
BBR2a	No	No	No	No
BBR2b	No	No	No	No
BBR3a	No	No	No	No
BBR3b	No	No	No	No
BBR4a	No	**Yes**	No	No
BBR4b	No	No	No	No
BBR5a	No	No	No	No
BBR5b	No	No	No	No
BBR6a	No	No	No	No
BBR6b	No	No	No	No
BBR7a	No	No	No	No
BBR7b	No	No	No	No
BBR8a	No	**Yes**	No	No
BBR8b	No	No	No	No
BBR9a	No	**Yes**	No	No
BBR9b	No	**Yes**	No	No
BBR10a	**Yes**	No	No	No
BBR10b	No	No	No	No
BBR11a	**Yes**	No	No	No
BBR11b	No	No	No	No
BBR12a	No	No	No	No
BBR12b	No	No	No	No
BBR13a	No	No	No	No
BBR13b	No	No	No	No
BBR14a	No	No	No	No
BBR14b	No	No	No	No
BBR15a	No	No	No	No
BBR15b	No	**Yes**	No	No
BBR16a	No	No	No	No
BBR16b	No	**Yes**	No	No
BBR17a	No	No	No	No
BBR17b	No	No	No	No
BBR18a	No	No	No	No
BBR18b	No	No	No	No
BBR19a	No	No	No	No
BBR19b	No	No	No	No
BBR20a	No	No	No	No
BBR20b	**Yes**	No	No	No
BBR21a	No	**Yes**	No	No
BBR21b	No	No	No	No
BBR22a	No	No	No	No

Table 3. Results of the quantitative and qualitative analyses of acoustic bat calls of Indiana bat (INBA; *Myotis sodalis*) and northern long-eared bat (NLEB; *M. septentrionalis*) at the Big Blue River Wind Project. Kaleidoscope columns represent sites with probable NLEB or INBA calls ("Yes") and without probable NLEB or INBA calls ("No").

	Kaleidoscope Analysis		Qualitative Analysis	
Site ID	**NLEB**	**INBA**	**NLEB**	**INBA**
BBR22b	No	**Yes**	No	No
BBR23a	No	No	No	No
BBR23b	**Yes**	No	No	No
BBR24a	No	**Yes**	No	No
BBR24b	No	No	No	No
BBR25a	No	**Yes**	No	**Yes**
BBR25b	No	**Yes**	No	No
BBR26a	No	**Yes**	No	No
BBR26b	No	**Yes**	No	No
BBR27a	No	No	No	No
BBR27b	No	No	No	No
BBR28a	No	No	No	No
BBR28b	No	No	No	No

Table 4. Qualitative analysis summary and justification for acoustic survey locations with probable target species calls (i.e., NLEB and INBA) at Big Blue River Wind Project (Summer 2016). Data summary column indicates how many nights had probable target species and how many probable target species calls were identified.

Site	Kaleidoscope Data Summary	Analysis Result	Justification
BBR 1a	1 night (7/26) 2 INBA calls	INBA absent NLEB absent	One call was characteristic eastern red bat approach-phase or clutter calls. This was not an INBA call due to fluctuating Fmin, high Fmin, and low slope (Murray et al. 2001, Britzke et al. 2011). The second call was identified as an unidentified *Myotis* species. The call had characteristics of both an INBA and a little brown bat (*Myotis lucifugus*). This site was netted at a presence/absence level of effort due to this ambiguous call and no target species were captured (USFWS 2016).
BBR 4a	1 night (8/3) 3 INBA calls	INBA absent	Calls were characteristic eastern red bat approach-phase or clutter calls. These were not INBA calls due to fluctuating Fmin, high Fmin, and low slope (Murray et al. 2001, Britzke et al. 2011).
BBR 8a	1 night (7/26) 2 INBA calls	INBA absent	One call was characteristic of an eastern red bat approach-phase or clutter call. This was not an INBA call due to fluctuating Fmin and high Fmin (Murray et al. 2001, Britzke et al. 2011). The other call was an unidentified high frequency bat because it contained mostly fragmentary and approach-phase calls which are not reliable for species identification (Britzke et al. 2013)
BBR 9a	1 night (7/25) 3 INBA calls	INBA absent	All three calls were characteristic eastern red bat approach-phase or clutter calls. These were not INBA calls due to fluctuating Fmin, high Fmin, and low slope (Murray et al. 2001, Britzke et al. 2011).
BBR 9b	1 night (7/31) 5 INBA calls 2 NLEB calls	INBA absent	All seven calls were characteristic eastern red bat approach-phase or clutter calls. These were not INBA or NLEB calls due to fluctuating Fmin, high Fmin, low bandwidth and low slope (Murray et al. 2001, Britzke et al. 2011).
BBR 10a	1 night (7/26) 1 INBA call 7 NLEB calls	INBA absent NLEB absent	All seven NLEB calls were characteristic big brown bat calls. Calls were misidentified as NLEB due to presence of 2^{nd} harmonics. The INBA call was not an INBA due to fluctuating Fmin, and very low slope (Murray et al. 2001, Britzke et al. 2011).
BBR 11a	1 night (8/1) 2 NLEB calls	NLEB absent	Both calls were characteristic eastern red bat approach-phase or clutter calls. This was not an INBA call due to fluctuating Fmin and high Fmin (Murray et al. 2001, Britzke et al. 2011).

Table 4. Qualitative analysis summary and justification for acoustic survey locations with probable target species calls (i.e., NLEB and INBA) at Big Blue River Wind Project (Summer 2016). Data summary column indicates how many nights had probable target species and how many probable target species calls were identified.

Site	Kaleidoscope Data Summary	Analysis Result	Justification
BBR 15b	1 night (8/2) 5 INBA calls	INBA absent	All five calls were characteristic eastern red bat approach-phase or clutter calls. These were not INBA calls due to pronounced curvilinear call structure, fluctuating Fmin, high Fmin, and very low slope (Murray et al. 2001, Britzke et al. 2011).
BBR 16b	1 night 2 INBA calls 1 NLEB call	INBA absent NLEB absent	Two of three potential target species calls were characteristic eastern red bat approach-phase or clutter calls. These calls were not INBA or NLEB calls due to fluctuating Fmin, low bandwidth and low slope (Murray et al. 2001, Britzke et al. 2011). The third call was identified as a high frequency unknown because it contained low bandwidth fragmentary calls and approach-phase calls which are not reliable for species identification (Britzke et al. 2013). This site was netted at a presence/absence level of effort due to this ambiguous call and no target species were captured (USFWS 2016).
BBR 20b	1 night (8/6) 2 NLEB calls	NLEB absent	Both calls were characteristic eastern red bat approach-phase or clutter calls. These calls were not NLEB calls due to fluctuating Fmin, low Fmax and low slope (Murray et al. 2001, Britzke et al. 2011).
BBR 21a	1 night (7/29) 3 INBA calls 1 NLEB calls	INBA absent NLEB absent	2 INBA calls and NLEB call were characteristic of an eastern red bat approach-phase or clutter call. These were INBA or NLEB calls due to fluctuating Fmin, high Fmin, and low slope (Murray et al. 2001, Britzke et al. 2011). The other call was an unidentified high frequency bat because it contained only 4 low bandwidth, fragmentary pulses which are not reliable for species identification (Britzke et al. 2013). This call was not characateristic of an INBA due high Fmin (Murray et al. 2001, Britzke et al. 2011)
BBR 22b	1 night (8/3) 2 INBA calls	INBA absent	One call was characteristic of an eastern red bat approach-phase or clutter call. This was not an INBA call due to fluctuating Fmin, high Fmin, pronounced curvilinear call structure, and very low slope (Murray et al. 2001, Britzke et al. 2011). The other call was characteristic of a little brown bat. This was not an INBA call due to low slope (Murray et al. 2001, Britzke et al. 2011).

Table 4. Qualitative analysis summary and justification for acoustic survey locations with probable target species calls (i.e., NLEB and INBA) at Big Blue River Wind Project (Summer 2016). Data summary column indicates how many nights had probable target species and how many probable target species calls were identified.

Site	Kaleidoscope Data Summary	Analysis Result	Justification
BBR 23b	1 night (7/31) 2 NLEB calls		Both calls were characteristic eastern red bat approach-phase or clutter calls. These calls were not NLEB calls due to fluctuating Fmin, low Fmax and very low slope (Murray et al. 2001, Britzke et al. 2011).
BBR 24a	2 nights (7/29, 7/30) 5 INBA calls	INBA absent	All five calls were characteristic eastern red bat approach-phase or clutter calls. These were not INBA calls due to pronounced curvilinear call structure, fluctuating Fmin, high Fmin, and low slope (Murray et al. 2001, Britzke et al. 2011).
BBR 25a	**2 nights (8/7, 8/8)**	**INBA present**	**One call on one night was characteristic of INBA. An INBA was captured at this site.**
BBR 25b	1 night (8/7) 3 INBA calls	INBA absent	All three calls were characteristic eastern red bat approach-phase or clutter calls. These were not INBA calls due to fluctuating Fmin, high Fmin, and very low slope (Murray et al. 2001, Britzke et al. 2011).
BBR 26a	1 night (7/30) 47 INBA calls 2 NLEB calls	INBA absent NLEB absent	46 INBA calls and 1 NLEB call were characteristic eastern red bat approach-phase or clutter calls. These were not INBA calls due to fluctuating Fmin, high Fmin, and very low slope (Murray et al. 2001, Britzke et al. 2011). One NLEB call was a characteristic big brown bat call. This call was not a NLEB due to low Fmin (Murray et al. 2001, Britzke et al. 2011). One INBA calls was an unidentified high frequency call. It had only 3 pulses. Call identification is unreliable when calls have fewer than 5 pulses. This call was not an INBA due to high Fmin and low slope.
BBR 26b	1 night (8/3) 2 INBA calls 1 NLEB call	INBA absent NLEB absent	All three calls were characteristic eastern red bat approach-phase or clutter calls. These were not INBA or NLEB calls due to fluctuating Fmin, high Fmin, low bandwidth and low slope (Murray et al. 2001, Britzke et al. 2011).

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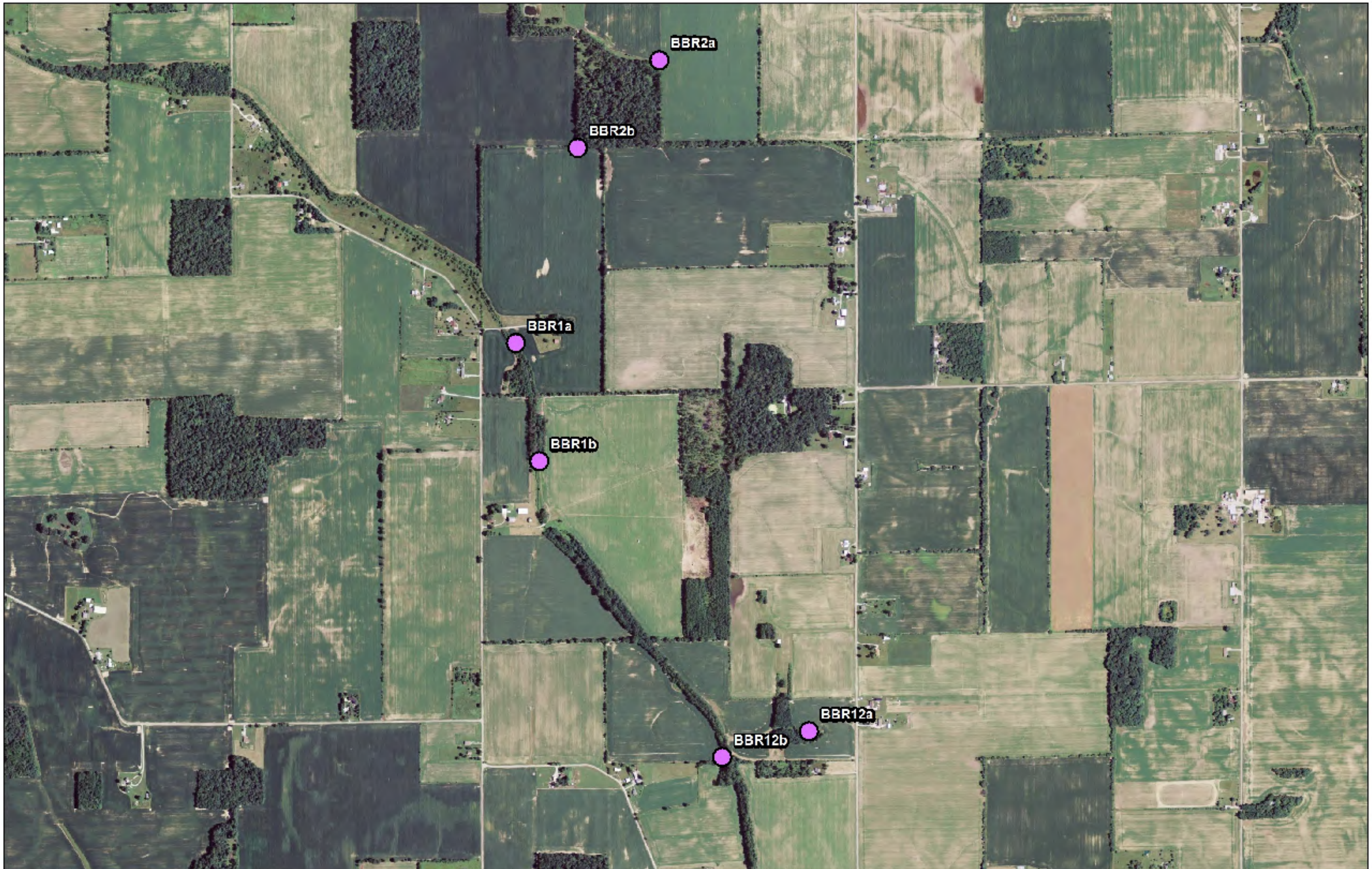
Appendix A. Maps of Acoustic Survey Locations



Big Blue River
Wind Project, Indiana

Data Source: USGS Topo;
USDA NAIP
Coordinate System: NAD 1983 UTM Zone 16N
Date: 9/16/2016
Author: Jeff Fruhwirth

0 0.25 mi
0 0.5 km

Acoustic Sites

N W E S

WEST

Big Blue River
Wind Project, Indiana

Data Source: USGS Topo;
USDA NAIP
Coordinate System: NAD 1983 UTM Zone 16N
Date: 9/15/2016
Author: Jeff Fruhwirth

0 0.1 mi
0 0.25 km

Acoustic Sites

N
W E
S

WEST

Big Blue River
Wind Project, Indiana

Data Source: USGS Topo;
USDA NAIP
Coordinate System: NAD 1983 UTM Zone 16N
Date: 9/16/2016
Author: Jeff Fruhwirth

0 0.1 0.2 mi
0 0.25 km

● Acoustic Sites

N
W E
S

WEST

Big Blue River
Wind Project, Indiana

Data Source: USGS Topo;
USDA NAIP
Coordinate System: NAD 1983 UTM Zone 16N
Date: 9/15/2016
Author: Jeff Fruhwirth

0 0.1 mi

0 0.25 km

Acoustic Sites

N
W E
S

WEST

Big Blue River
Wind Project, Indiana
Data Source: USGS Topo;
USDA NAIP
Coordinate System: NAD 1983 UTM Zone 16N
Date: 9/15/2016
Author: Jeff Fruhwirth

0 0.1 0.2 0.3 mi
0 0.25 0.5 km

Acoustic Sites

N W E S

WEST

Big Blue River
Wind Project, Indiana

Data Source: USGS Topo;
USDA NAIP
Coordinate System: NAD 1983 UTM Zone 16N
Date: 9/15/2016
Author: Jeff Fruhwirth

0 0.1 mi

0 0.25 km

Acoustic Sites

N
W E
S

WEST

Big Blue River
Wind Project, Indiana

Data Source: USGS Topo;
USDA NAIP
Coordinate System: NAD 1983 UTM Zone 16N
Date: 9/15/2016
Author: Jeff Fruhwirth

0 0.1 0.2 mi
0 0.25 km

Acoustic Sites

N
W E
S

Big Blue River
Wind Project, Indiana

Data Source: USGS Topo;
USDA NAIP
Coordinate System: NAD 1983 UTM Zone 16N
Date: 9/16/2016
Author: Jeff Fruhwirth

0 0.1 0.2 mi
0 0.25 km

Acoustic Sites

N
W E
S

Big Blue River
Wind Project, Indiana

Data Source: USGS Topo;
USDA NAIP
Coordinate System: NAD 1983 UTM Zone 16N
Date: 9/16/2016
Author: Jeff Fruhwirth

0 0.1 0.2 0.3 0.4 mi
0 0.25 0.5 km

Acoustic Sites

N
W E
S

WEST

Big Blue River
Wind Project, Indiana

Data Source: USGS Topo;
USDA NAIP
Coordinate System: NAD 1983 UTM Zone 16N
Date: 9/15/2016
Author: Jeff Fruhwirth

0 0.1 0.2 mi

0 0.25 km

Acoustic Sites

N
W E
S

Big Blue River
Wind Project, Indiana

Data Source: USGS Topo;
USDA NAIP
Coordinate System: NAD 1983 UTM Zone 16N
Date: 9/15/2016
Author: Jeff Fruhwirth

0 0.1 0.2 mi

0 0.25 km

Acoustic Sites

N
W E
S

Big Blue River
Wind Project, Indiana

Data Source: USGS Topo;
USDA NAIP
Coordinate System: NAD 1983 UTM Zone 16N
Date: 9/15/2016
Author: Jeff Fruhwirth

0 0.1 0.2 0.3 mi
0 0.25 0.5 km

Acoustic Sites

N
W E
S

WEST

Big Blue River
Wind Project, Indiana

Data Source: USGS Topo;
USDA NAIP
Coordinate System: NAD 1983 UTM Zone 16N
Date: 9/15/2016
Author: Jeff Fruhwirth

0 0.1 0.2 mi
0 0.25 km

Acoustic Sites

N W E S

WEST

Appendix B. Photographs of Acoustic Survey Locations

Acoustic Station BBR1a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR1b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR2a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.



Acoustic Station BBR2b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR3a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR3b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR4a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR4b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR5a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR5b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR6a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR6b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.



Acoustic Station BBR7a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR7b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR8a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR8b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR9a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR9b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR10a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR10b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR11a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR11b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR12a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR12b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.



Acoustic Station BBR13a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR13b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR14a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR14b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR15a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR15b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR16a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR16b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR17a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR17b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR18a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR18b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR19a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR19b - Detector Placement/Microphone Orientation.

Acoustic Station BBR20a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR20b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR21a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR21b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR22a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR22b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR23a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR23b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR24a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

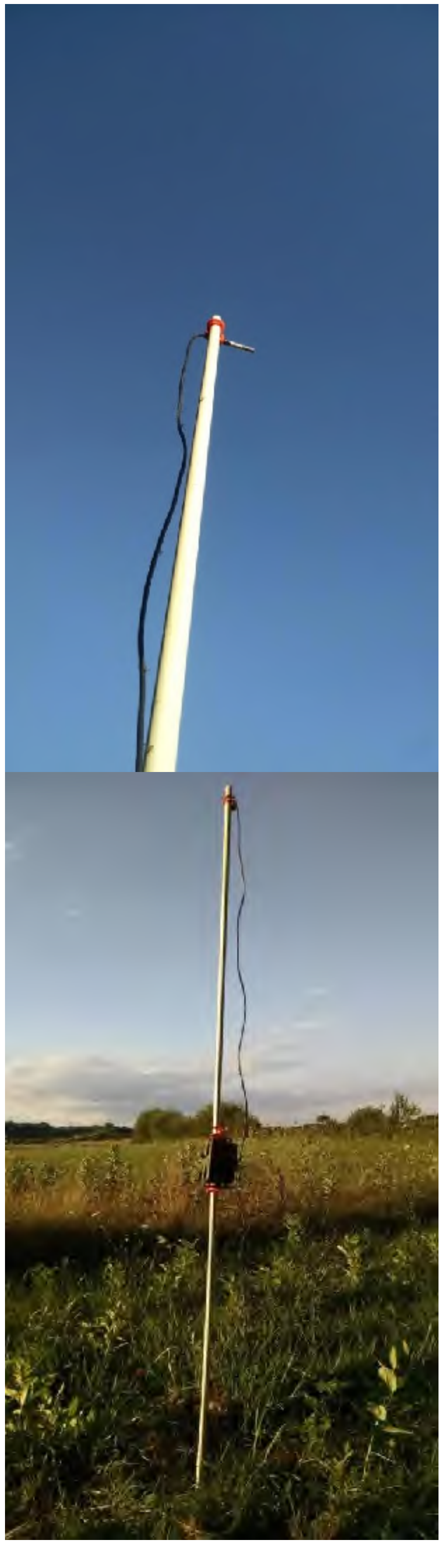
Acoustic Station BBR24b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR25a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

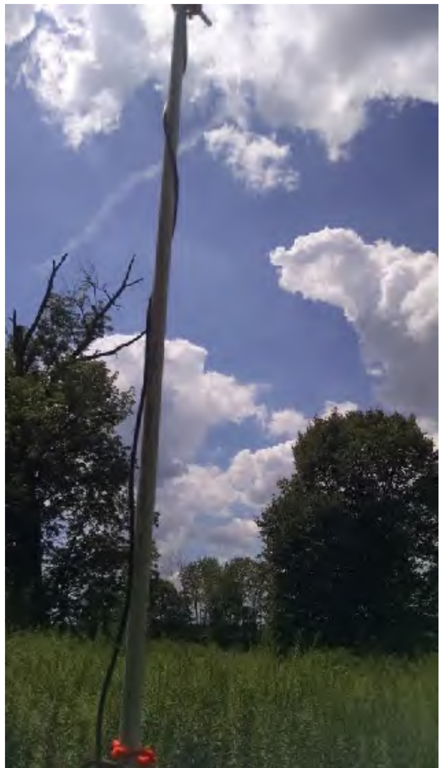
Acoustic Station BBR25b - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.


Acoustic Station BBR26a - Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR26b Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.



Acoustic Station BBR27a Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.



Acoustic Station BBR27b Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Acoustic Station BBR28a Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.


Acoustic Station BBR28b Top Photo: Cone of Detection; Bottom Photo: Detector Placement/Microphone Orientation.

Appendix C. Settings of Song Meter SM3BAT Detectors

Appendix C. Song Meter SM3BAT Detector Settings used during surveys.

ID	Setting 1	Setting 2	Setting 3
01	HPF	1K	1K
02	Gain	12dB	12dB
03	FS WAC	Wav Format	Auto Rate
04	ZC	OFF	DIV 16
05	FRQMin	16K	16K
06	FRQMax	192K	192K
07	DMin	1.5ms	1.5ms
08	DMax	200ms	200ms
09	TRGLVL	12dB	12dB
10	TRGWIN	5s	5s
11	TRGMax	15s	15s
12	REPEAT		
13	At Time	18:00:00	
14	RECORD	14:00:00	
15	UNTCOUNT	Forever	